

**COUNTY OF LOS ANGELES - DEPARTMENT OF HEALTH SERVICES
PUBLIC HEALTH PROGRAMS AND SERVICES - DISEASE CONTROL
PROGRAMS
VETERINARY PUBLIC HEALTH AND RABIES CONTROL**

Overview of Zoonoses

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Animals and Public Health

Today, infectious animal diseases are a major cause of morbidity and mortality in Los Angeles County. These diseases will persist beyond our life-times, therefore prudent measures must be taken today to prevent and control disease tomorrow. Controlling disease now reduces our future health expenditures. Treatment of end stage disease can be very expensive and may not be effective.

Close agreement on the importance of surveillance and an active, trained work force to control disease exists among public health professionals. Disease surveillance/prevention/control requires a solid foundation in basic detection and control measures. Wishful thinking and expressions of concern have no impact on disease. Control of disease can be accomplished only through concrete, specific actions geared toward protecting the community as a whole.

There are more than 200 diseases of animals transmissible to people (zoonoses) currently causing a wide variety of human illness. In addition, as yet undefined zoonotic diseases probably exist that pose infectious risks for people. The Institute of Medicine reported on various factors implicated in the emergence of infectious diseases within the United States and insisted that, "The significance of zoonoses in the emergence of human infections cannot be overstated." Effective control of many human zoonoses first, or concomitantly, requires control in animals. The role of simian immunodeficiency virus, which is closely related to human immunodeficiency virus-2 presents fertile territory for speculation and investigation.

These emerging, infectious diseases illustrate why an effective surveillance system is vital to community disease control. An early warning mechanism gives local authorities time to put control measures into effect to reduce the community's health care costs. The development of a proactive approach to public health includes having trained staff who can quickly enact control measures.

The world is becoming smaller as we approach the twenty-first century. We increasingly find that our neighbor's disease problems become ours. This is particularly true in Los Angeles County with such cultural and animal diversity.

Animals as Sentinels

Over 100 years of experience has shown animal and human health are closely related.

Like people, domestic animals and wildlife are exposed to infectious diseases and environmental contaminants in the air, soil, water, and food and they can suffer from acute and chronic diseases from such exposure. Often animals serve as disease sentinels, or early warning systems, for the community.

Some advantages of using animals as sentinels include: lower cost, shorter latency of disease development and greater ease of obtaining tissue samples and autopsy data. Sentinel animals have shorter life spans than people and diseases with long latency periods will manifest themselves in sentinel animals before people. To understand what is happening in animals requires regular and systematic analysis of data to identify health hazards. Sick animals can alert people to environmental dangers just as a barking dog alerts its owner of an intruder.

Animal surveillance for such infectious diseases as: bubonic plague, equine viral encephalomyelitis, hantavirus, and rabies is done routinely by health departments. Animal outbreaks of these diseases typically precede human outbreaks, allowing time for preventive action to reduce or prevent human cases.

Animals can also reveal health hazards associated with environmental pollution. Environmental diseases are highly preventable causes of morbidity and mortality. The classic example was the use of canaries in mines. The simplicity of the system exemplifies the ease with which some animal sentinel systems can be used.

In the 1950s, Japanese veterinarians recognized "dancing cat fever" in local cats in the fishing village of Minimata, then a similar disease appeared in fishermen and their families. Investigation revealed the source of the outbreak to be mercury poisoning in locally caught fish. Fish off the coast of Los Angeles are contaminated with DDT. Since 1965, birds have been used for an indication of pesticide contamination in the United States.

In Chicago, a study during the 1970s revealed that children who lived in households with dogs that had high blood concentrations of lead were six times more likely to have high blood lead concentrations themselves.

Reportable Diseases

The director of health services is accountable for all reportable human diseases in Los Angeles County. Since 1972, the director is also accountable for all reportable animal

diseases. Medical practitioners are legally required to report such diseases to the local health authorities, who in turn are required to investigate the reports and take whatever action is necessary to control the disease. Generally, any person having knowledge of any disease outbreak, or the occurrence of a case of an unusual disease, shall promptly notify the health authorities. Such a reporting requirement of sentinel cases is crucial if we want to effectively control disease. Disease containment requires the ability to determine the cause of disease, or death, so a logical approach to control can be taken.

Zoonoses

In California, over 45% of human diseases reportable to the California Department of Health Services are zoonoses (table 1). In 1997 it was confirmed that the prion causing bovine spongiform encephalopathy (mad cow disease) is also responsible for atypical Creutzfeldt-Jakob disease (CJD). This expands the list of zoonoses. In 1996, with the report of seventeen cases of atypical CJD, it was suspected the patients obtained the infectious prion from eating contaminated beef. Since first recognized in 1985, mad cow disease has caused the destruction of over a million cows in Britain. The cows were exposed to the infectious agent in their food which had been contaminated with protein from sheep infected with scrapie (ovine spongiform encephalopathy). Twenty people in the United Kingdom have the new CJD variant and one person in France. All but one are dead. There is no known treatment for the disease in people or animals.

These neurodegenerative diseases of people and animals have prolonged incubation periods, the appearance of widespread spongiform changes in the brain and production of an abnormal protein. These disorders were originally called subacute transmissible spongiform encephalopathies or slow virus diseases. There is no apparent antibody or cell-mediated immune response to the transmissible agent. The transmissible agents are resistant to commonly used physical and chemical inactivation methods or ultraviolet irradiation. In the United Kingdom, construction of massive incinerators were required to properly dispose of all the infected dairy cattle. Today, these diseases are called prion diseases and are seen in cattle, elk, mink, mule deer, people, and sheep.

In 1997, **Lancet** reported CJD, which was associated with consuming squirrel brains in people in Kentucky. In rural Kentucky, people scramble squirrel brains with eggs or put them in stews. This observation requires confirmation by studies of larger populations and a search for a prion agent in the brains of squirrels.

Table 1. **Reportable Human Diseases in California**

Acquired Immune Deficiency Syndrome (AIDS)	*Lymphocytic Choriomeningitis
Amebiasis	*Malaria
*Anisakiasis	Measles (Rubeola)
*Anthrax	Meningitis, Specify Etiology: Viral, Bacterial, Fungal, Parasitic

<ul style="list-style-type: none"> *Babesiosis Botulism (Infant, Food borne, Wound) *Brucellosis *Campylobacteriosis Chancroid Chlamydial Infections Cholera *Ciguatera Fish Poisoning Coccidioidomycosis *Colorado Tick Fever Conjunctivitis, Acute Infectious of the Newborn, Specify Etiology *Cryptosporidiosis *Cysticercosis *Dengue Diarrhea of the Newborn, Outbreaks Diphtheria *Domoic Acid Poisoning (Amnesic Shellfish Poisoning) *Echinococcosis (Hydatid Disease) *Ehrlichiosis *Encephalitis, Specify Etiology: Viral, Bacterial, Fungal, Parasitic *<i>Escherichia coli</i> 0157:H7 Infection *Food borne Disease *Giardiasis Gonococcal Infections <i>Haemophilus influenzae</i>, Invasive Disease *Hantavirus Infections Hemolytic Uremic Syndrome Hepatitis, Viral Hepatitis A Hepatitis B (specify acute case or chronic) Hepatitis C (specify acute case or chronic) Hepatitis D (Delta) Hepatitis, other, acute Kawasaki Syndrome (Mucocutaneous Lymph Node 	<ul style="list-style-type: none"> Meningococcal Infections Mumps Non-Gonococcal urethritis (Excluding Laboratory Confirmed Chlamydial Infections) *Paralytic Shellfish Poisoning Pelvic Inflammatory Disease (PID) Pertussis (Whooping Cough) *Plague, Human or Animal Poliomyelitis, Paralytic *Psittacosis *Q Fever *Rabies, Human or Animal Relapsing Fever Reye Syndrome Rheumatic Fever, Acute *Rocky Mountain Spotted Fever Rubella (German Measles) Rubella Syndrome, Congenital *Salmonellosis (Other than Typhoid Fever) *Scombroid Fish Poisoning Shigellosis Streptococcal Infections (Outbreaks of Any Type and Individual Cases in Food Handlers and Dairy Workers Only) *Swimmer's Itch (Schistosomal Dermatitis) Syphilis Tetanus Toxic Shock Syndrome *Toxoplasmosis *Trichinosis *Tuberculosis *Tularemia Typhoid Fever, Cases and Carriers Typhus Fever <i>Vibrio</i> Infections *Viral Hemorrhagic Fevers (e.g., Crimean-Congo, Ebola, Lassa and Marburg viruses) *Water-associated Disease *Yellow Fever *Yersiniosis
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Syndrome) Legionellosis Leprosy (Hansen Disease) *Leptospirosis *Listeriosis *Lyme Disease	
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*Zoonoses

In California, of animal diseases reportable to the California Department of Food and Agriculture (table 2) over 40% are zoonoses. Some zoonotic diseases on the two lists of reportable diseases overlap. Examples of such diseases include: anthrax, brucellosis, encephalomyelitis, erysipelas, listeriosis, rabies, and tuberculosis. There are other reportable animal diseases that occur in people and would be reportable to the health officer under Section 2503 - Occurrence of unusual diseases. Any person having knowledge of a case of an unusual disease not listed in Section 2500 shall promptly convey the facts to the local health officer.

Table 2. Animal diseases which all licensed veterinarians must report to the California Department of Food and Agriculture (Title 3, Division 2, Chapter 2, Article 9 - Reportable Animal and Poultry Disease).

A) Emergency Animal Diseases - report by telephone within 24 hours of discovery.

African horse sickness	Heartwater
African swine fever	Hog cholera
*African trypanosomiasis	*Ornithosis of poultry
*Anthrax	*Rift Valley fever
Bovine pleuropneumonia	Rinderpest
Bovine piroplasmiasis	Scrapie
Cattle scabies	Screwworms
Dourine	Sheep scabies
*Encephalomyelitis	*Venezuelan equine
Equine piroplasmiasis	*Vesicular exanthema
*Foot-and-mouth disease	*Vesicular stomatitis
Fowl plague	*Viscerotropic velogenic newcastle disease
*Glanders	

B) Domestic Diseases of Regulatory Importance - report by mail within 3 days of discovery.

Blue tongue	Johne's disease
Bovine leukemia	*Listeriosis
*Brucellosis	Malignant catarrhal fever
Contagious agalactia of goats and sheep	Pseudorabies
*Equine encephalomyelitis	Pullorum disease
Equine rhinopneumonitis	*Rabies of livestock
Equine infectious anemia	*Swine erysipelas
Equine viral arteritis	*Tuberculosis

*Zoonoses

Reverse Zoonoses

There are also diseases of people which are transmissible to animals and such diseases are referred to as reverse zoonoses (table 3). Some of the more common reverse zoonoses are in table 3. Los Angeles County's most recent outbreak of reverse zoonoses started in 1996 with the death of two circus elephants with extensive tuberculosis (*Mycobacteria tuberculosis*) involving over 80% of their lungs. This year an elephant with tuberculosis (*Mycobacteria tuberculosis*) died at the Los Angeles Zoo and a second one with tuberculosis was transferred to the San Francisco Zoo. This month the Los Angeles County Public Health Laboratory confirmed *Mycobacteria tuberculosis* in eight different elephants. Regulations to control the spread of tuberculosis in elephants are under development.

Table 3 **Reverse Zoonoses**

Examples of infectious diseases of people occasionally transferred to animals and transferred back to people. Recently termed reverse zoonoses.

AGENT	HUMAN DISEASE	ANIMAL DISEASE	ANIMALS
Mumps virus	Mumps	Parotiditis	Dogs
Infectious hepatitis	Hepatitis	Hepatitis	Nonhuman primates
Corynebacterium diphtheriae	Diphtheria	Ulcers on teats, mastitis	Cattle
Staphylococcus aureus	Furunculosis	Furunculosis, mastitis	Cattle
Streptococcus pyogenes	Pharyngitis, scarlet fever	Mastitis	Cattle
Giardia lamblia	Nausea, flatulence,	None known	Beavers

	diarrhea		
Mycobacteria tuberculosis	Tuberculosis	Tuberculosis	Deer, dogs, elephants

Zoonoses in Wildlife

People contact zoonoses from interaction with bats, birds, insects, opossums and rodents to name a few. Forty-two wildlife diseases that people can catch are listed in table 4 in the appendix. Malaria is a classic example. It halted the first attempt to construct the Panama canal. The canal is an engineering marvel and a triumph over wildlife disease.

Wildlife Disease Defeats the French

Actual construction of the Panama Canal began in 1882 by a French company. During seven years of digging, 22,000 men died of tropical diseases. This was equivalent to wiping out the entire construction crew twice, for the total number of men employed at any one time did not average more than 10,000.

The French canal builders did not know deadly malaria and yellow fever were caused by bites of certain mosquitoes. Mosquitoes and people serve as reservoirs for human malaria. Malaria also infects birds and lizards and monkeys. Jungle yellow fever infects monkeys. Serious errors were made in sanitation. French physicians were said to have ordered the legs of hospital beds placed in water to keep ants and other crawling bugs from the patients. The water became an additional breeding place for mosquitoes, which already were swarming in from marshes, streams, and pools in the hot, rainy region. The French abandoned their efforts.

United States Conquers Disease and Builds the Canal

During the Spanish-American War in 1898, the U.S. Navy sent the battleship *Oregon* from San Francisco to Cuba to reinforce the Atlantic fleet. The 13,000 mile trip around the tip of South America would have only been 4,600 miles through a canal. This convinced Congress that a canal was essential for national defense.

In 1902 the United States agreed to buy the concession of the French company for 40 million dollars. The United States paid Panama 10 million dollars plus 250,000 dollars a year for the use, occupation, and administration of a 10-mile-wide strip along the canal, 5 miles on each side. The United States took possession of the canal property on May 4, 1904.

The greatest obstacle to building the canal were the tropical diseases jungle yellow fever and malaria, for which there were no cures. Malaria comes from two Italian words that mean *bad air*. People gave the disease this name because of its association with the

musty, bad-smelling air of swamps. Deaths of howler and spider monkeys in the forest in Central and South America was common with yellow fever. Two medical discoveries allowed the project to succeed. It was determined that malaria is transmitted by the bite of the *Anopheles* mosquito.

In 1900, Dr. Walter Reed, of the U.S. Army headed a commission to investigate an epidemic of yellow fever among American troops in the Spanish-American War. He and other physicians conducted a series of daring experiments in which several physicians and soldiers volunteered to be infected with the disease. Two died as a result. The experiments proved yellow fever was transmitted by the bite of mosquitos.

The first 2 ½ years were devoted to the careful preparation that brought health and efficiency when actual construction started. Proper sanitation and mosquito control made the Canal Zone safe for men to live, raise their families and work.

Every lake, swamp, pond, and ditch that could be emptied was drained. Over those that could not be drained, a film of oil was spread to destroy mosquito eggs and larvae. All buildings above the ground were raised. Windows, doors, and porches were screened. People covered every vessel that held water. All railway cars were screened, and a hospital car was added to every train. Cities were given sewers and pure water. By 1906, yellow fever had been wiped out in the Canal Zone. By 1913, malaria was greatly reduced. In 1914 a ship made the first complete trip through the canal.

Zoonoses in Domestic Animals

Historically it has been shown that as zoonoses increase in animals it spills over into the human population. Man working with domestic animals comes into contact with zoonoses routinely. For the prion and viral diseases there is no effective treatment. Several of the bacterial diseases may be resistant to antibiotics. Effective treatments exist for some of the protozoan and metazoan diseases.

A variety of domestic animals are capable of transmitting disease to people including: cats, cattle, dogs, horses, poultry, sheep and swine. Forty-two examples are listed in table 5 in the appendix. Cat-scratch fever, Malignant pustule, Milker's nodules, Wool sorters disease, Q fever, and ringworm are lay terms for some of the diseases. Three diseases - anthrax, psittacosis, and salmonellosis will be briefly discussed.

Anthrax has been recognized as an infectious disease of people and animals for centuries. It was common in Rome during the last five centuries BC. In nineteenth century Europe, 20% to 30% of sheep and cattle died of anthrax each year. Sudden death is common in domestic livestock. The organism is found in the soil. Today, in anthrax areas, livestock is vaccinated against the disease.

Today, aerolization of anthrax by terrorists is of major concern. The death rate for untreated anthrax is over 90%. Anthrax is one of the common biological agents thought to be favored for use by terrorists and disgruntled citizens. Anthrax threats have become

rather common in the United States. For example, in December of 1998, four threats alleging use of anthrax were reported in the greater metropolitan Los Angeles area. All were hoaxes.

Psittacosis was described 100 years ago and is caused by an intracellular bacterium *Chlamydia psittaci*. All birds may be infected. Psittacosis is a common occupational hazard to workers in the pet bird industry and turkey-processing plants. Sporadic cases are commonly associated with ownership of pet birds. As a public health measure, all imported psittacine birds are placed in quarantine and placed on chlortetracycline feed for 30 days. In California, all parakeets are required to undergo treatment and are leg banded. The leg band allows an infected bird to be traced back to its origin.

Salmonellosis is a bacterial infection in people often related directly or indirectly to infection in animals. In 1975, the small pet turtle was the most common source of salmonellosis in the United States. Today in California, it is illegal to sell turtles with shells of less than 4 inches. Pet iguanas have recently become a common source of salmonellosis of people. Salmonella is often found on the surface of freshly laid eggs. Pasteurization of bulk egg products has controlled this problem.

Animal Populations 1974 - 1997

Between 1974-97, shifts have occurred in various animal populations in Los Angeles County (table 6). Livestock (cattle, sheep, poultry) once widespread, exist at very low numbers due to urbanization and the increase in land values. Traditional livestock (cattle, sheep, hogs, poultry) were replaced with "innovations" in agriculture (pot bellied pigs, ostriches, llamas, emus, miniature horses, etc.). In 1994 the horse population peaked at 150,000 and then began to decline as property values continued to rise.

Interestingly, attendance at the County fair, held in September in Pomona, has increased slightly from twenty years ago. It remains the largest fair in the nation, with livestock from all over the country entering the various shows. During this time, the human population has increased by over one million people and the companion animal population has increased proportionately to the human population.

Table 6. Changes in Los Angeles County's Animal Populations between 1974 - 1997

Population	Change
Livestock	Decrease
Poultry	Decrease
Horses	Decrease
City of Los Angeles Zoo	Increase
Companion animals (birds, cats, dogs)	Increase
Exotic pets (reptiles and fish)	Increase

Wild animal compounds	Increase
Animal smuggling	Increase

Wild Animals

Wildlife adapting to urban life and food supplies have increased their numbers. The opossum, a non-native species, has adapted to urban living and presents difficulties for animal control agencies. One of the major reservoirs of endemic typhus in Los Angeles County is the opossum. Several thousand coyotes are picked up by the Department of Animal Regulation in the City of Los Angeles annually. In the foothill regions, pet cats and small dogs may provide a food source for coyotes. Mountain lions have increased in the wild and now are viewed as a threat to people living in the foothills.

The County contains several wild animal compounds housing wildlife sometimes used in the movie and entertainment industry. Wild animal compounds may also house injured or abandoned wildlife, which may be rehabilitated and returned to the wild. Since 1974, the number and size of wild animal compounds holding native and foreign animals has increased. For example, the largest animal compound, Wildlife Waystation, was formed in 1976 and today houses more than 1,000 animals (local wildlife and wildlife foreign to the United States) on a 160-acre wild animal compound in the north end of the San Fernando Valley. Also about 2000 animals a year use the Waystation as a pit stop before being set free in the wild or being shipped to zoos. These compounds present a potential exotic animal disease threat to our domestic and wild animal populations.

The Los Angeles Zoo, the largest zoo on the west coast, has more than doubled its exotic animal population (lions, elephants, zebras, gorillas, giraffes, camels, etc.) during the past twenty years. In 1994, the Los Angeles City Zoo contained over 1,300 animals (350 different species) in 130 exhibits located on seventy-five acres. Twenty years earlier, the zoo's total population was 626 animals. The zoo continues to expand.

Companion Animals

Los Angeles County has over 2.6 million privately owned cats and dogs. There are over 1,000 pet stores in Los Angeles County. Our population of companion animals continues to increase with approximately one person in five owning at least one animal. Many of these animals have intimate contact with their owners, increasing the possibility of transmission of animal diseases to people. Los Angeles has the largest human population of any County in the nation with close to nine million residents.

Animal Control agencies process over 5,000,000 animals yearly. Most of the animals processed by these agencies are homeless cats and dogs and about sixty-five percent are euthanized.

To care for this expanding animal population, the number of veterinarians in Los Angeles County has more than doubled in the past twenty years. Most of the veterinarians are in private, companion animal practice. Today, of the licensed California veterinarians residing in the State, one in five live in Los Angeles County.

Exotic Pets

In August of 1997, a West Hills woman's dog was devoured by a twenty-five pound, seven and a half foot Boa. The snake, which slithered into an enclosed patio, nabbing the Chihuahua, raised community concerns about the hazards of exotic pets. In Los Angeles, over ninety percent of the exotic pets are reptiles. In 1995, it was estimated that 7.3 million pet reptiles were owned by approximately 3% of households in the United States. Reptiles include snakes, lizards, turtles, crocodiles and alligators.

Between 1994 and 1995, health departments in 13 states, including California, reported human infections with unusual Salmonella serotypes to the Centers for Disease Control. Many of the individuals had contact with reptiles (lizards, snakes or turtles). *Salmonella sp* were isolated from 36% of the reptiles cultured during surveillance activities in pet stores in Los Angeles County in 1993.

Changes in Animal Populations = Changes in Disease Patterns

As animal populations have shifted so have disease patterns. New diseases have been introduced into Los Angeles County. In 1992, the County experienced the worlds first epidemic of canine distemper virus in exotic cats with seventeen lions, tigers, leopards and jaguars dying. Half of the deaths occurred among African lions. Should the virus get into our domestic cat population, the direct cost of control for the first two years is estimated at over eighty-two million dollars.

Today, there are more than 100 cases of reptile-associated salmonellosis reported annually in Los Angeles County. Human salmonellosis associated with lizards was not seen ten years ago. This increase in salmonellosis is due to the massive influx of green iguanas being imported from Central America. Iguana farms and wholesalers often use antibiotics to prevent disease in the lizards, thus increasing antibiotic resistant strains of salmonella. Iguanas are flown to the southern United States and distributed to wholesalers. To prevent human outbreaks and associated health care costs, regulations regarding these reptiles may be warranted, similar to the current regulation of pet turtles. (Title 17, Section 2612.1).

Public/Private Partnership

A private/public partnership has existed for close to one hundred years in Los Angeles County, but in times of crisis or disease outbreak, only the government has the authority to act and regulate the movement of diseased individuals, impose quarantines and require testing to control and prevent disease spread.

In their role in the partnership, private practitioners have assisted with various vaccination programs. It was private veterinarians who donated their time to run the first Southern California Veterinary Medical Association public rabies vaccination clinics for dogs in 1956. Again, it was private veterinarians who came forward to assist in the massive emergency vaccination of horses in 1971 when Venezuelan sleeping sickness entered the United States from Mexico, killing thousands of horses and hundreds of people, creating a national disease emergency. Within five months, over ninety percent of the horses were vaccinated in Los Angeles County. A vaccination rate of seventy-five percent was needed to contain the epidemic.

Food borne Disease

More than 250 different diseases have been linked to contaminated food or drink in the United States. Tainted food causes an estimated 6.5 million to 33 million illnesses and 9,000 deaths annually in the United States. Many food borne illnesses are traced to poor animal husbandry and diseased animals. Veterinarians are the experts in animal health and it is logical they become involved with such outbreaks. The recent record-setting recall of twenty-five million pounds of Hudson Foods Inc.'s hamburger due to the deadly 0157 strain of *E. coli* illustrates the impact of food-borne zoonoses.

Food borne disease in the United States may increase with the expansion of free-trade agreements. In the past five years, food imports into the United States have doubled to 30 billion tons and are expected to keep rising. Mexico ships 90% of its \$4.5 billion in annual food exports to the United States. Argentine beef, banned for seventy years, is now entering the United States.

The 1992, the California Department of Health Services evaluation of Los Angeles County Department of Health Service's use of veterinarians advised that veterinarians should be utilized in the investigation and control of food borne illness traced to animals and animal products. This includes dairy and poultry products.

Animal Importations

Los Angeles County is the nation's largest port. Over 99 percent of the live animals imported into Los Angeles County come through the Los Angeles International Airport. Los Angeles imports more exotic animals for the pet and zoological trade than any other port in the United States. Foreign animal importation presents the County with potential disease problems. If diseased animals entering Los Angeles County present a threat to the animal population, the Department of Health Services is to make recommendations to the Board of Supervisors regarding control of the situation.

Importation of animals led to the massive foot and mouth disease outbreak in 1924 and the second outbreak in 1929. A Newcastle disease epidemic was imported into Los Angeles County during 1972 in which over four million animals died. Los Angeles's last rabid cat was imported through Los Angeles International Airport.

Types of exotic animals imported vary depending on popularity and fads. For example, reptiles are now the most popular exotic pet in Los Angeles. Since most fashionable species will not breed in close confinement, they are captured in the wild and imported. In the United States, poachers steal reptiles from protected areas such as National parks. The number of reptiles imported into the United States has increased dramatically in the past ten years, due mainly to a 100 fold increase in the number of iguanas imported into the United States. Over 200,000 iguanas, generally the green iguana, were imported into Los Angeles County from 1990 to 1993.

People smuggle animals into Los Angeles County. It is highly profitable and there is little risk of being caught. If you are caught, the fines are small. Smuggled animals present disease problems to our human and animal populations. About 500 parrots are smuggled into Los Angeles yearly. This August, authorities in Lima, Peru, alerted by barking police dogs, found 1,000 reptiles packed in crates marked "ornamental fish" which were to be smuggled into Los Angeles. The reptiles were valued at \$500,000.

Animal Shelters in Los Angeles County

Animal control agencies in Los Angeles County process over 500,000 animals every year. Most of these animals are stray or abandoned pet animals found in the community or turned in to shelters by citizens. Roughly nine out of ten of the stray animals processed by the three largest animal control agencies were cats and dogs. About one animal out of four was placed or purchased. Puppies and kittens were the easiest animals to place. The top three agencies process over 300,000 animals (dogs, cats, livestock, birds, exotics) yearly and have a total of 13 animal shelters (Table 7).

Table 7. **10 Animal agencies handling the most animals in Los Angeles county.**

Animal Control Agencies	No. of Shelters
Los Angeles County Department of Animal Care and Control	6
City of Los Angeles Department of Animal Regulation	6
Los Angeles Society for the Prevention of Cruelty to Animals	1
Burbank Animal Shelter	1
Southeast Area Animal Control Authority	1
Santa Monica Shelter	1
Long Beach Animal Shelter	1
Pasadena Humane Society	1
Pomona Humane Society	1
San Gabriel Humane Society	1

The City and the County of Los Angeles, along with Humane Societies and other animal control agencies, competitively bid for contracts from incorporated cities to handle their

animal control problems. The County of Los Angeles presently contracts with over 35 cities. Contracts generally cover five years and may include full or partial services.

Animal control agencies also deal with wildlife. During 1996, in the San Fernando Valley alone, Los Angeles City Animal Regulation officers trapped 2,076 opossums, 192 raccoons, 103 coyotes, 85 skunks, 3 bobcats, and 3 foxes. Mountain lions have been sighted in the northern foothills of the San Fernando Valley.

Rabies Control

Rabies was first confirmed in the City of Los Angeles in 1898 when an English gentleman living close to the intersection of Third and Flower Streets informed the health officer that his dog, who seemed unexplainably nervous and uncontrollable, might have rabies. The next year, a Pasadena man was bitten on the nose by his cocker spaniel and became the City's first resident to die of rabies. Prior to 1900, the western states were practically free of rabies. Coyotes frequented the local dumps and were thought to be responsible for the rabid dogs. In 1995, Texas declared a state wide quarantine in response to an uncontrolled outbreak of rabies in coyotes which spread to dogs.

Eight hundred and forty-seven rabid animals, mainly dogs, were detected in Los Angeles County in 1937. This prompted the formation of the County Pound Department. In 1955, seventy rabid dogs were diagnosed in the County and fifty-two people were bitten by known rabid dogs. That year, rabid dogs accounted for one out of every three hundred dog bites. The following year, Los Angeles County required all dogs within the County be vaccinated against rabies as a prerequisite for licensing.

California followed the County's lead the next year and required that all dogs be vaccinated to protect community citizens from the fatal disease. Today, the State of California requires all Counties which have rabies to maintain an active rabies surveillance system. Animal bite reporting by physicians and other health professionals is mandatory. Animal shelters contribute to the enforcement of California rabies control requirements by providing animal pounds, stray animal control, and rabies vaccination of animals at their facilities. Rabies investigations and rabies surveillance is done by the health officer.

California averages over one rabid animal a day, with the vast majority of cases occurring in wildlife. In 1995, Los Angeles County drastically reduced its rabies surveillance and animal bite reporting, but still detects rabid animals (bats) during the year.

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Appendix

Table 4. **ZOONOSIS OF WILDLIFE**

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Alphaviruses:			
Eastern encephalitis	Small birds, ducks, horses (mosquitoes)	No apparent disease; encephalitis	Encephalomyelitis
Western encephalitis	Birds, squirrels, snakes, horses (mosquitoes)	No apparent disease; horses die	Encephalomyelitis
Venezuelan encephalitis	Rodents, horses (mosquitoes)	No apparent disease; horses die	Encephalitis
Flaviviruses:			
St. Louis encephalitis	Birds (mosquitoes)	No apparent disease	Encephalomyelitis
Japanese B encephalitis	Birds, pigs, horses, cattle (mosquitoes)	No apparent disease; domestic animals may die	Encephalitis
Murray Valley encephalitis	Birds (mosquitoes)	No apparent disease	Encephalomyelitis
Tick-born encephalitis	Rodents, birds, goats, cattle (ticks)	No known apparent disease	Encephalitis
Yellow fever virus	Nonhuman primates (mosquitoes)	No apparent disease; death	Yellow fever

Dengue viruses	Nonhuman primates (mosquitoes)	No apparent disease	Dengue fever
Bunyavirus:			
California encephalitis	Rabbits, hares, squirrels, deer, horses, cows (mosquitoes)	No apparent disease	Encephalitis
Arenaviruses	Rodents, nonhuman primates	No apparent disease; death	No clinical disease; malaise, fever, shock, meningitis, encephalitis
Rabies virus	Weasel-skunk, civet-ferret, families with bats, foxes, skunks most important; also dogs, cats, cattle	No apparent disease; death with paralysis	Excitation, paralysis, death
Colorado tick fever virus	Squirrels, chipmunks, mice, porcupines (ticks)	No apparent disease	Fever, malaise, leukopenia, rash
Chlamydia psittaci	Psittacine birds, pigeons, poultry	No apparent disease; death	Fever, cough, pneumonia
Rickettsia typhi	Rats (fleas)	No apparent disease	Murine typhus
Rickettsia rickettsii	Rabbits, squirrels, rats, mice, groundhogs, dogs (ticks)	No apparent disease; dogs may die	Rocky Mountain spotted fever
Rickettsia akari	Mice (mites)	No apparent disease	Rickettsialpox
Coxiella burnetii	Wild ungulates	No apparent disease	Q fever
Brucella spp	Wild ungulates, dogs	No apparent disease; abortion	Brucellosis
Francisella tularensis	Rabbits, squirrels, rats, skunks, bears, muskrats, coyotes, cats, dogs, swine, sheep, cattle (ticks, deerflies, mosquitoes)	No apparent disease; lymphadenitis, septicemia	Tularemia
Yersinia pestis	Rats, mice, prairie dogs, squirrels, marmots, rabbits, gerbils, chipmunks (fleas)	No apparent disease; death	Bubonic, pneumonic, septicemic plague

Yersinia enterocolitica	Rodents, rabbits, pigs, sheep, cattle, horses	No apparent disease	Enterocolitis, reactive polyarthritis
Campylobacter jejuni	Birds, cattle, sheep, pigs, goats	No apparent disease, death	Gastroenteritis
Pseudomonas pseudomallei	Rats, mice, rabbits, ruminants, dogs, cats, nonhuman primates	No apparent disease; death	Pulmonary abscesses, septicemia
Streptobacillus moniliformis	Rats, squirrels, weasels, turkeys	No apparent disease	Fever, rash
Listeria monocytogenes	Wild mammals, birds	No apparent disease; death	Meningitis, abortion, septicemia
Borrelia burgdorferi	Deer, mice, raccoons (ticks)	No known apparent disease	Lyme disease
Spirillum minor	Rats, mice, cats	No apparent disease	Fever, rash
Cryptosporidium spp	Rodents, snakes, birds	No apparent disease; enteritis, respiratory disease	Enteritis, dysentery
Blastocystis hominis	Pigs, guinea pigs, fowl, nonhuman primates	No apparent disease; diarrhea	Diarrhea
Leishmania spp	Rodents, canines, rodents, other carnivores (sandflies)	No apparent disease; skin ulcers	Chronic skin ulcerations, mucocutaneous lesions, kalaazar syndrome
Trypanosoma cruzi	Armadillos, bats, rodents, opossums, nonhuman primates, dogs, cats (triatomes)	No known apparent disease; neurologic dysfunctions	Skin rash, myocarditis, conjunctivitis, myositis (Chagas disease)
Trypanosoma brucei var. gambiense and var. rhodesiense	Wild ungulates (tsetse flies)	No apparent disease; death in coma	Meningoencephalitis
Pneumocystis carinii	Rodents, foxes, nonhuman primates, sheep, goats, dogs, cats	No known apparent disease	Pneumonitis
Diphyllobothrium latum	Fresh-water fish, bears, dogs, cats	No known apparent disease	Tapeworm infection, megaloblastic anemia

Hymenolepis nana and diminuta	Mice, rats	Tapeworm infection	Tapeworm infection
Trichinella spiralis	Wild carnivores, wild pigs	No known apparent disease	No apparent disease; muscle invasion death
Fasciola hepatica	Snails, fish, cattle, sheep, goats, camel, deer, rabbits	No apparent disease; death	Acute hepatitis, cholecystitis, cirrhosis
Schistosoma spp	Snails, rodents, baboons	No apparent disease; death	Colitis, hepatitis, cystitis
Dracunculus medinensis	Wild carnivores, nonhuman primates (water fleas)	No known apparent disease	Skin ulcers
Brugia spp	Nonhuman primates, wild carnivores, rodents (mosquitoes)	No known apparent disease	Lymphadenopathy, lymphedema

Table 5. **ZOONOSES OF DOMESTIC ANIMALS**

INFECTIOUS AGENT	PRIMARY HOST(S)	DISEASES IN ANIMALS	DISEASES IN PEOPLE
Prions			
Bovine spongiform encephalopathy	Cattle	Fatal degeneration of CNS	Atypical Creutzfeldt-Jakob disease
Vaccinia virus (cowpox)	Cattle, horses	Papulovesiculopustular lesions of skin of udder and teats	Papulovesiculopustular skin lesions
Newcastle disease	Poultry	Respiratory, GI, CNS	Conjunctivitis
Paravaccinia virus (milker's modules)	Cattle	Vesicles, ulcers, and granulomas of udder	Papulovesiculogranulomatous skin lesions
Bovine pustular stomatitis virus (orf, contagious ecthyma)	Sheep, goats	Pustular lesions of mouth, vulva, eye	Papulovesiculogranulomatous skin lesions
Vesicular stomatitis virus	Cattle, swine, horses	Ulceration of oral mucosa, feet, and teats	Fever, chills, headache, myalgia

Rabies virus	Dogs, cats, cattle, horses, sheep	No apparent disease; death with paralysis	Excitation, paralysis, death
Chlamydia psittaci	Pigeons, poultry	No apparent disease; death	Fever, cough, pneumonia
Coxiella burnetii	Sheep, cattle, goats (?ticks)	No disease; rickettsemia	Q fever
Ehrlichia canis	Dogs (ticks)	Hemorrhagic disease, death	Ehrlichiosis
Afipia felis	Cats, dogs	No known disease	Cat-scratch disease
Rochalimea henselae	Cats, dogs	No known disease	Cat-scratch disease, peliosis hepatis, bacillary angiomatosis
Bacillus anthracis	Cattle, horses, sheep, goats, swine, dogs, cats	Sudden death, systemic disease, GI affliction	Malignant pustule, gastroenteritis, pneumonitis
Erysipelothrix rhusiopathiae	Swine, fowl, sheep, fish	Porcine erysipelas, polyarthritis, septicemia, endocarditis	Erysipeloid
Listeria monocytogenes	Sheep, cattle, rabbits, goats, guinea pigs, chickens, horses, rodents, birds	Meningoencephalitis, abortion, myocarditis, septicemia, ophthalmitis	Leptomeningitis, fetal listeriosis, septicemia, oculoglandular infection
Mycobacterium bovis	Cattle, horses, swine, cats, dogs	Pulmonary, lymph nodes, udder, GI tuberculosis, spondylitis	Primarily GI, lymph node, bone, pulmonary tuberculosis
Streptobacillus moniliformis	Fowl	No apparent disease	Fever, rash
Pseudomonas mallei	Horses, mules, asses, cats, dogs, sheep, goats	Nodular pneumonia, farcy, lymphadenopathy	Granulomatous to pustular lesions, skin and subcutaneous; septicemia
Pasteurella multocida	Fowl, cattle, sheep, swine,	Hemorrhagic septicemia, pneumonia	Skin ulcer, osteomyelitis, sinusitis, pleuritis,

	goats, horses, mice, rats, rabbits		leptomeningitis
Brucella spp	Cattle, goats, swine, sheep, horses, mules, dogs, cats, fowl, deer, buffalo, rabbits	Abortion, lameness, mastitis, granulomas, abscesses	Fever, malaise, lymphadenopathy, bacteremia, splenomegaly, osteomyelitis
Capnocytophagia canimorsus	Dogs	No apparent disease	Fever, gangrene, meningitis, septicemia
Salmonella spp (nontyphoidal)	Fowl, swine, cattle, sheep, horses, dogs, cats, rodents, reptiles, birds, cattle	No apparent disease; enteritis, septicemia, puerperal fever	Gastroenteritis, focal infection, septicemia
Yersinia enterocolitica	Dogs, cats	No known disease	Diarrhea, reactive arthritis
Campylobacter fetus	Sheep, cattle	Metritis, infertility, placentitis, abortion	Placentitis with abortion, endocarditis, bacteremia, meningitis
Sporothrix schenckii	Horses, mules, dogs, cats, mice, rats	Granulomas of extremities	Ulcerative, lymph-vascular, skin, subcutaneous lesions, pneumonia
Microsporium spp	Dogs, cats, horses, cattle	Alopecia, dermatitis	Alopecia, dermatitis
Trichophyton spp			
Cryptosporidium spp	Farm animals, cats, dogs	No apparent disease; enteritis, respiratory disease	Enteritis, dysentery
Trypanosoma cruzi	Dogs, cats (triatomes)	No known apparent disease	Skin rash, myocarditis, conjunctivitis, myositis, neurologic dysfunctions (Chagas disease)
Balantidium coli	Pigs, monkeys	No apparent disease in swine; colitis in monkeys	Colitis
Toxoplasma gondii	Cats, dogs, sheep, cattle,	Stillbirth, congenital defects, CNS lesions	Stillbirth, congenital defects, retinochoroiditis, encephalitis

	swine		
Ancylostoma canium (Uncinaria stenocephala)	Dogs, cats	Anemia, dysentery, hypoproteinemia, edema, stunted growth, death of pups	Itching, erythema of skin, Loeffler syndrome
Toxocara canis and cati	Dogs, cats	Diarrhea, granulomas in kidneys and other viscera, weight loss and stunted growth of young	Granulomas in liver, skeletal muscle, lungs, brain, and eye
Dipylidium caninum	Dogs, cats	No apparent or known disease; chronic enteritis	Abdominal discomfort, diarrhea, anal pruritus
Trichinella spiralis	Swine, cattle, horses, dogs, cats, rabbits, rats, mice	No apparent or known disease	Chemosis, conjunctivitis, myositis, skin rash
Taenia saginata	Cattle	No apparent or known disease	Abdominal pain, diarrhea, weight loss
Taenia solium	Swine	No apparent or known disease	Abdominal pain, diarrhea, weight loss, cysticercosis
Diphyllobothrium latum	Dogs, cats	No apparent or known disease	Tapeworm infection, megaloblastic anemia
Dirofilaria immitis, D tenuis	Dogs, raccoons, cats (mosquitoes)	Cardiopulmonary granulomata, subcutaneous nodules	Pulmonary nodules, subcutaneous granulomata of face, trunk, or arms
Echinococcus granulosus	Dogs	No apparent or known disease	Space-occupying cysts in liver, lungs; anaphylaxis
Echinococcus multilocularis and vogeli	Dogs, wild canines	No apparent disease	Noncapsulated, extensive cysts, of liver, lungs