The meeting of the Group was held on 7-9 October 1997 at the OIE Central Bureau. It was opened by Dr J. Blancou, Director General of the OIE, who welcomed the participants (Appendix I). Dr M.H. Woodford was elected chairperson of the meeting and Drs V. Nettles and M. Artois were appointed rapporteurs. The agenda (Appendix II) was approved.

1. Epidemiological review of selected wildlife diseases 1996-1997

Rinderpest

Since 1994, a rinderpest epizootic has been reported in wild ruminants in East Africa. It was first diagnosed in Tsavo National Park (1994), Meru National Park (1995), Amboseli National Park (1995) and Nairobi National Park (1996). Buffalo (*Syncerus caffer*), greater kudu (*Tragelaphus strepsiceros*), lesser kudu (*Tragelaphus imberbis*), bushbuck (*Tragelaphus scriptus*), eland (*Taurotragus oryx*) and Giraffe (*Giraffa camelopardalis*) were the species in which clinical signs or mortality were recorded. Subsequently rinderpest is reported to still be smouldering in wildlife in certain areas of Kenya, but the cattle mass vaccination campaign appears to be having positive results in reducing the spread of infection.

In 1997, an epidemic disease affecting buffalo, bushbuck and dik dik (*Madoqua kirki*) was reported in Arusha National Park in Tanzania. On preliminary investigation the clinical appearance of this disease was found to be highly suggestive of rinderpest, but the diagnosis has not been confirmed in the laboratory. Negative serology from animals recently sampled in the Serengeti (Klein's camp) and Ngorongoro crater appears to indicate that westward spread of the disease has not occurred. A risk assessment and intensified monitoring action, with ongoing cattle vaccination, are all currently in progress.
Foot and mouth disease

A foot and mouth disease (FMD) outbreak in impala (*Aepyceros melampus*) that was reported in the southern region of the Kruger National Park (KNP) in South Africa last year appeared to reach its clinical endpoint in September 1996. The SAT2 virus strain involved in this outbreak in impala was also isolated from a buffalo herd in the same region of the KNP. This isolation demonstrated the epidemiological link with the buffalo maintenance host.

FMD virus could no longer be isolated from tonsils or pharyngeal epithelium of impala randomly sampled in the outbreak area 6-12 weeks after the outbreak, even though several of these animals had old hoof/lesions and 33% were seropositive. It therefore appears that impala are not important maintenance hosts during inter-epizootic periods.

In Zimbabwe, a FMD outbreak caused by a SAT2 virus occurred in cattle adjacent to the Save Wildlife Conservancy. Nucleotide sequencing of the virus strain demonstrated that this infection had originated from buffalo in the conservancy. Since there is a double barrier fence preventing cattle/buffalo contact, the possibility that another wildlife source may have been involved is currently being investigated.

Suspected (but unconfirmed) cases of FMD were also reported in impala in the Lake Mburo National Park in Uganda, and in giraffe calves at Laikipia in Kenya.

An outbreak of FMD in a semi-captive herd of Arabian oryx (*Oryx leucoryx*) has been reported in Qatar. This is the first reported occurrence of FMD in this species. The virus was of the Asian type.

Newcastle disease

A Newcastle disease virus was isolated from nestling double-crested cormorants (*Phalacrocorax auritus*) involved in a mortality event on the south-eastern end of the Salton Sea in California, United States of America (USA). Over 1,600 birds were found dead and many survivors exhibited neurologic signs, particularly wing or leg paralysis. The virus was identified as a mesogenic strain with moderate pathogenicity for chickens. Evidence of Newcastle disease also has been found in double-crested cormorants at two other locations in the USA, i.e., the Bear River Migratory Bird Refuge in Utah (June-July 1997), and the Columbia River in Clatsop County, Oregon. Evaluation of these viruses is underway.

Canadian wildlife veterinarians reported Newcastle disease in cormorants in August, 1996. The birds originated from the eastern end of Lake Ontario from a colony that was infected in 1995. Newcastle virus was isolated by Agriculture and Agri-Food Canada. A probable case was reported in a double-crested cormorant in New Brunswick, Canada, in October 1996. The bird had compatible lesions and an immunohistochemical test for viral antigens was positive, but virus was not isolated.

Newcastle disease was reported in Finland in pigeons (*Columba* sp.) and goosander (*Mergus merganser*).

In January 1997, Newcastle disease affected a commercial broiler farm in Hereford, United Kingdom. It was suspected but not proven, that migrating wild birds may have been the source of infection.

Preliminary results of an extensive serosurvey of wild and commensal birds in Switzerland have not revealed any exposure to Newcastle disease virus.

Classical swine fever

Classical swine fever (CSF) is still prevalent in several limited foci in wild boar (*Sus scrofa*), mainly in France, Germany and Italy (including Sardinia). No new cases were reported in Austria after an outbreak occurred there early in 1996, close to the border of Slovakia. In the Varese area, Italy, close to the border of Switzerland, a new outbreak has been recorded (three isolations of virus and 50/60 wild boars dead).
The relationship between domestic and wild swine reservoirs of the CSF virus is a matter of debate. Up to now, according to reports, no new focus in wild swine has been reported following the current huge epidemic on pig farms in Holland. Extensive serosurveillance carried out in France for several years has failed to show evidence of antibodies outside of the localised infected area in "Moselle" and "Bas-Rhin". On the other hand, at least some of the recent outbreaks did not regress spontaneously as had been expected. A local endemic situation is now feared. Appropriate management methods are being examined by European Union experts.

**List B diseases**

**Anthrax**

Anthrax has a world-wide distribution and has been documented in numerous ungulates, carnivores, perissodactyls and elephants.

In 1996, the following outbreaks were reported in wildlife:

a) In the Kruger National Park in South Africa, four positive cases of anthrax were confirmed in the endemic far northern area of the Park. These included an elephant (Loxodonta africana), 2 impala (Aepyceros melampus) and a greater kudu (Tragelaphus strepsiceros).

b) In Namibia, predominantly in the Etosha National Park, anthrax was confirmed in 20 blue wildebeest (Connochaetes taurinus), 3 cheetahs (Acinonyx jubatus), 6 elephants, 2 gemsboks (Oryx gazella), 2 greater kudus, 1 black rhinoceros (Diceros bicornis), 1 sable antelope (Hippotragus niger), 1 springbok (Antidorcas marsupialis), and 25 zebras (Equus burchelli).

c) In Uganda, anthrax was diagnosed in kobs (Kobus kob) in the Queen Elizabeth National Park.

d) In the USA, anthrax has affected white-tailed deer (Odocoileus virginianus) and cattle in Texas.

**Aujeszky's disease**

Studies at three universities have revealed that pseudorabies viruses found in wild swine (Sus scrofa) in the USA are more often found in the genital tract than the nasal mucosa or tonsil. When infected, boars excrete large quantities of virus from the prepuce; sows tend to shed lower amounts. Although experimental infections of wild swine with wild swine-derived pseudorabies virus has shown that the virus can be transmitted by aerosol and cannibalism to a limited degree, field observations to date indicate that the natural means of spread is venereal. Wild swine seropositive for pseudorabies were reported from 10 States in the USA. Positive animals were found in 98 counties, and the overall prevalence rate was 27.7% (4,293 of 15,494 swine tested).

Exposure of wild boars to the Aujeszky's disease virus has been mentioned in publications (and unpublished reports) in France, Germany and Italy. Results were obtained from scattered research and are not representative of the whole population. However, the rate of seropositivity ranges from 5% to 60%. Recent results from German studies show that isolations of the virus from wild boar are not epidemiologically related to outbreaks in pig farms (not in time or in space). In addition, biomolecular studies have revealed significant differences in the strains involved.

**Echinococcosis**

*Echinococcus multilocularis* is a common parasite of red foxes (Vulpes vulpes) in Central Europe. Prevalence rates up to 30% or more are common. This disease (which is manifested by the presence of alveolar cysts in the intermediate host) can be transmitted to humans when they skin and handle infected foxes or eat vegetables or fruit contaminated by fox faeces. Rodents are the intermediate host of this small cestode.
Some members of the public maintain that vaccination of foxes against rabies will lead to an increase in the fox population and thus to an increase in the echinococcosis risk to humans. There is, however, no evidence to support these claims at present.

*Echinococcus granulosus* is enzootic in Italian wolves (*Canis lupus*). An infection rate of about 15% has been estimated with the frequency of infection increasing with age. Sheep or other ungulates are probably the intermediate host in this case.

**Brucella spp. in marine mammals**

Since 1990, scientists in Europe and the United States of America have isolated *Brucella* spp. from several species of marine mammals. Serological evidence of exposure to *Brucella* spp. was found in sea mammal strandings from England and Wales, hunted whales from Norway and during routine capture and marking operations in the USA.

Porpoises (*Phocoena phocoena*), various dolphins and whales, as well as seals were found to have been exposed. Isolates were obtained from serologically positive individuals and identified as *Brucella* species by culture methods. Typing of the strains is still underway. It is expected that the *Brucella* isolates from marine mammals will constitute a new species.

The bacterium has been isolated from lungworms from seals at the National Veterinary Services Laboratories (USA), which suggests that lungworms may be involved in *Brucella* transmission among seals.

**Brucellosis in Bison and Wapiti**

The eradication of bovine brucellosis from domestic cattle and ranch bison in the USA is anticipated by the end of 1998. Currently, there are 26 affected domestic herds in 5 States. The only known focus of brucellosis left in the USA in wild animals is in wild bison (*Bison bison*) and wapiti (*Cervus elaphus canadensis*) in the Greater Yellowstone Area (GYA) of Montana, Wyoming and Idaho. There has been concern about the presence of brucellosis in the Yellowstone National Park bison, but until 1988, the number of bison leaving Yellowstone was limited. This past winter, the herd was at record numbers and the limited forage in Yellowstone Park was covered with ice and snow. As a result, larger numbers of bison moved to areas outside the park looking for food.

To reduce the risk of brucellosis, 1,079 migrating bison were shot or sent to slaughter during the winter of 1997. Another 1,300 or more starved to death inside the park. Test results of straying bison that were killed this winter showed that 49 percent have antibodies against *Brucella abortus*. In the past, domestic bison were considered as the likely source of the disease in infected cattle herds found in Wyoming and North Dakota. In addition, wild elk or bison in the GYA have been identified as the most probable source of infection for five additional cattle herds. Most recently, infected elk were considered the most probable source of fistulous withers in horses in Wyoming. The bison and elk populations in the GYA are the only wildlife populations in the USA known to be infected with *B. abortus*. Canada has infection in wood bison in a National Park in Alberta and the Northwest Territories.

**Avian tuberculosis**

Avian tuberculosis has been reported in Finland in pheasants (*Phasianus colchicus*), lesser white-fronted geese (*Anser erythropus*), an eagle owl (*Bubo bubo*) and an Ural owl (*Strix uralensis*), in Norway in a goshawk (*Accipiter gentilis*) and a tawny owl (*Strix aluco*) and in Sweden in a goshawk, an Ural owl, a tawny owl, two red deer (*Cervus elaphus*), one fallow deer (*Dama dama*) and a merganser (*Mergus serrator*).

**Avian Cholera**

Avian cholera has been diagnosed in a variety of aquatic birds (ducks, geese, grebes, coots, swans) during the past year (April 1996-June 1997), in the USA. Infection was confirmed or suspected in 18 areas in 7 states (California, Iowa, Missouri, Nebraska, New Mexico, Oregon, Texas). Two thousand eider ducks (*Somateria mollissima*) have died of this disease in Denmark.
Viral haemorrhagic disease of rabbits

The Ministry of Agriculture in New Zealand has confirmed that viral haemorrhagic disease of rabbits has been detected in dead rabbits found on a property in the Cromwell area of the South Island and has now spread widely. The disease is believed to have been illegally introduced.

Tularemia

Tularemia occurs regularly in rodent and hare populations in Europe, northern Asia and North America. In 1996, tularemia was reported to occur in European brown hares (Lepus europaeus) and varying/mountain hares (Lepus timidus) in Austria (n=24), France (n=57), Finland (n=24), Sweden (n=5) and Russia (Astrakhan Region). An outbreak in humans was reported from Estonia. In Italy several brown hares were imported from tularemia-free areas in Romania, but 18% of these were found to have antibodies to the agent.

Duck virus enteritis

In the USA, duck plague virus was isolated in ducks from two sites in Virginia in April and May 1997. Duck plague was suspected in one area in California in May 1996, and confirmed in Pennsylvania, Virginia, and Wisconsin in May 1996.

Non listed diseases

Epizootic Haemorrhagic Disease Virus in Wild Ruminants

Outbreaks of epizootic haemorrhagic disease (EHD) in deer occurred in several states in 1996 (USA). Epizootic haemorrhagic disease virus serotypes 1 (EHDV-1) and 2 (EHDV-2) were isolated from white-tailed deer (Odocoileus virginianus) during 1996. A single EHDV-1 was isolated from samples submitted from a deer from Tennessee. EHDV-2 was isolated from deer from Alabama, Arkansas, Indiana, Kentuck, Maryland, Missouri, Virginia, and West Virginia. The 1996 Haemorrhagic Disease Questionnaire Survey revealed that chronic HD was seen at moderate levels in Alabama, Arkansas, Georgia, Mississippi, North Carolina, and South Carolina. Outbreaks were noted in Illinois, Indiana, Kentuck, Maryland, Missouri, Montana, Pennsylvania, and South Dakota.

Sarcoptic mange

Mange caused by Sarcoptes scabei is a primary mortality factor in many wild animal populations worldwide. A good example of this is the occurrence of sarcoptic mange in red foxes (Vulpes vulpes) in Europe where numerous deaths are reported annually from Austria, Finland, France, Italy, Scandinavia and United Kingdom. The disease is also believed to be the reason for the extinction of red foxes on the Danish island of Bornholm in the southern Baltic sea.

Sarcoptic mange continues to be a severe disease in chamois (Rupicapra rupicapra) and ibex (Capra sp.) in mountainous areas of southern Europe. While a large epizootic is unlikely to lead to extermination of these species, such an event could have a severe limiting effect. However, in isolated areas, such as some sierras in Spain, domestic sheep or goats with mange can transmit the parasite to their wild counterparts. In these situations sarcoptic mange could result in the extinction of a single, isolated population. Several sierra ibex populations are the only representatives of a rare subspecies.

Mange in Europe occasionally occurs in several other mammal species, namely in carnivores such as stone and pine martens (Martes sp.), wolves (Canis lupus) and the exotic raccoon-dog (Nyctereutes procyonoides). In northern Scandinavia and Finland, the endemic situation of fox mange causes a special threat to lynx (Felix lynx). As the fox is a prey of the lynx, fatal mange infections often are acquired from the infected foxes.
In the Kruger National Park in South Africa, cases of sarcoptic mange were seen in black-backed (*Canis mesomelas*) and side-striped jackal (*Canis adustus*), impala (*Aepyceros melampus*), lions and a leopard (*Panthera pardus*). Notoedric mange was diagnosed in three cheetahs.

In the Bwindi Impenetrable Forest National Park in Uganda, sarcoptic mange was diagnosed in a mountain gorilla (*Gorilla gorilla berengei*). The disease is also suspected in chimpanzees (*Pan troglodytes*) in Gombe Stream National Park, Tanzania. The importance of taxonomically pin-pointing the type of mite in these cases is clear. In addition to the risk of transmission of infectious diseases from people to great apes in highly touristed areas, the transmission of endo- and ectoparasites is a real possibility if appropriate visitor guidelines are not developed and enforced.

**Trichinella - like infection in farmed crocodiles**

A *Trichinella*- like parasite has been found in farmed crocodiles (*Crocodylus niloticus*) in Zimbabwe. It has been diagnosed in 11/19 crocodile farms surveyed. Information regarding clinical signs noted in the crocodiles (if any) was not obtained, although the parasite is infectious to rats, baboons and other crocodiles. It is inactivated by freezing at -18°C for 7 days. A specific taxonomic description of the organism is needed, and its zoonotic potential should be taken seriously.

**Botulism**

Botulism type C was diagnosed in waterfowl in four states in the USA (California, Nevada, South Dakota, and Minnesota) from April 1996-June 1997. Estimated mortality ranged from 25 to 870 birds depending on the site. In contrast, Canadian authorities reported an estimated mortality of about 230,000 birds in prairie Canada (Alberta, Saskatchewan, and Manitoba).

In late summer and early autumn of 1996, a large mortality event in birds was found to be caused by avian botulism. This outbreak resulted in the death of more than 14,000 fish-eating birds including 1,400 endangered California brown pelicans (*Pelecanus occidentalis*) and 10-12% of the west coast population of American white pelicans (*Pelecanus erythrorhynchos*). At the same time, a die-off also occurred in a common fish, tilapia (*Tilapia* sp.), and the decomposing fish were suspected to be the source of the botulism toxin. In August 1997, another outbreak of botulism occurred in fish-eating birds (gulls, brown and white pelicans, herons, and egrets). Again, sick and dead tilapia were observed.

In France, botulism type C was recorded 10 times in different waterfowl species during the summer of 1996 (June to August). The number of affected birds ranged from few to several hundred. It was wondered if the increase of the recorded number of C botulism episodes was linked to an improved reporting system or to a real increase of intoxication. A retrospective study was carried out recently by sending questionnaires to veterinary officers and diagnostic laboratories. Results suggest that the second possibility is the most probable. According to the number of recorded outbreaks in 1997, avian botulism appears to be on the decline in France. It is noticeable that type E botulism occurred on the shore of the North Sea in August and then in November 1996. More than 16 000 birds died. Dead fish discarded on garbage dumps were suspected but not proven to be the cause of the die-off.

**Salmonellosis in birds**

Several outbreaks of salmonellosis were reported in wild birds in the USA. An estimated 100 black-crowned night herons (*Nycticorax nycticorax hoactli*) died in southern California in May 1996. About 300 songbirds (finches, grosbeaks, pine siskins) died in Utah in late winter 1997. In a separate outbreak, 30 brown-headed cowbirds (*Molothrus ater*) had salmonellosis in Georgia in early spring 1997. Low numbers of cardinals died of the infection in Iowa.

Mortality in 'garden' birds occurred in several counties in England. The majority of incidents occurred between December 1996 and May 1997. Green finches (*Carduelis chloris*) mortality was principally associated with *Salmonella typhimurium* phage type 40, and 'large numbers' were reported dead or dying in different locations in Scotland.
During a two weeks period in July 1997, more than two thousand sea-gulls (*Larus argentatus*, *canus* and *ridibundus*) and ducks (*Anas* sp.) died in Alsace (France). *S. typhimurium* was isolated from some of the birds.

*Salmonella* infection in hedgehogs (*Erinaceus erinaceus*) has also been commonly recorded in Finland, Sweden and the United Kingdom.

**European brown hare syndrome**

European brown hare syndrome (EBHS) is a calicivirus infection, specific for the genus *Lepus* in Europe. EBHS is present in all parts of Europe, but is not found outside. The disease is found in both European brown hare (*Lepus europaeus*) and varying/mountain hares (*Lepus timidus*). EBHS is reported to be on the decline in Austria and is enzootically stable in Italy. An important epizootic was recorded from September up to December 1996 in the Western/Western Central part of France. There, in some "departments" (administrative units), several hundred dead hares were observed. Nevertheless, subsequent counts failed to show that the mortality induced by the infection had a long-lasting effect on the hare populations.

EBHS is related to rabbit haemorrhagic disease, but does not affect rabbits (*Oryctolagus cuniculis*).

**Trichomonosis**

Several reports mention that Trichomoniasis could have been the cause of mortality in wood pigeons, feral pigeons (*Columba* sp.) and collared doves (*Streptopelia decaocto*) in the United Kingdom (Cornwall, Buckinghamshire) and France (possibly more than 10,000 deaths in January/February 1996 in a territory of about a quarter of the country).

**Parasitic disease of fish and birds**

The massive die-offs of fish and water birds at California's Salton Sea have been attributed to a dinoflagellate parasite *Amyloodinium ocellatum*. Gills from fish were infested with moderate to high levels of parasite. The parasite causes serious mortalities in fish-farming facilities and public or home marine aquaria.

The suspected parasite is found worldwide and infects more than 100 species of marine fish in North America alone. In wild fish, the number of parasites per fish is typically very low, and they do not usually die from the infestation. When present at levels as high as those detected in tilapia from the Salton Sea, the parasite impairs respiratory function and can suffocate the fish. Because the life cycle of *Amyloodinium* can be completed in less than one week at high temperatures and in high saline conditions like those currently present at the Salton Sea, it is expected that massive and lethal infestations can develop repeatedly.

**Conjunctivitis in house finches**

Since 1994, the rapid spread of conjunctivitis in house finches (*Carpodacus mexicanus*) has continued, and affected birds have been observed throughout nearly the entire eastern range of this species in the USA and Canada. Now, 33 States and 3 Canadian provinces have reported affected birds, and the disease has been confirmed on numerous occasions by the isolation of *Mycoplasma gallisepticum*. Studies have established that mycoplasmal conjunctivitis is a highly transmissible and debilitating disease in house finches. Because house finches are commonly associated with poultry-producing facilities, several experiments were conducted to determine if the house finch strain of *M. gallisepticum* is transmissible between chickens and house finches. Results indicate that chickens can be infected with the finch strain of *M. gallisepticum* through direct contact with naturally infected house finches; however, transmission required an extended period (10 weeks). No evidence of *M. gallisepticum* infection was detected in chickens indirectly exposed to infected finches across wire or across the room. It appears that restricting direct contact between chickens and house finches should be adequate to prevent *M. gallisepticum* transmission between these species.
Mysterious Eagle Mortality

Between mid-November 1996 and March 1997, a total of 26 dead or dying bald eagles (Haliaeëtus leucocephalus) were found in southwest Arkansas (USA) at De Gray Lake, Lake Ouachita, and Lake Hamilton. This scenario is nearly identical to a mortality event that occurred during the winter of 1994-95 when 28 bald eagles were found sick or dead at DeGray Lake. American coots (Fulica americana) with clinical signs similar to those of eagles were observed on DeGray Lake beginning in early November 1996. Affected birds showed loss of coordination and flight ability that progressed to tremors, seizures, and death. Similar postmortem lesions were present in brain and spinal cord white matter of the eagles and the coots, but the cause of these lesions remains undetermined. Extensive diagnostic testing has failed to implicate any infectious agents, and suspicion is focused on possible toxicologic agents that may occur naturally, such as poisonous plants and algae, or man-made toxins and environmental contaminants.

Adenovirus in California Black-tailed Deer

An adenovirus has been identified as the cause of mortality in black-tailed deer (Odocoileus hemionus columbianus) and mule deer (Odocoileus hemionus hemionus) in northern and central California (USA) in 1993 and to a lesser extent in 1994. The adenovirus that was isolated reacts with a bovine adenovirus type 5 conjugate. Two disease manifestations were seen during the outbreak: (1) a systemic vasculitis with pulmonary edema and hemorrhagic enteropathy; and (2) a localized vasculitis with ulceration and abscessation in the upper alimentary tract. Experimental infection of deer reproduced the disease. Both black-tailed deer and white-tailed deer (Odocoileus virginianus) were susceptible. Transmission is by direct contact and the route of inoculation does not affect the outcome. The virus attacks endothelial cells. Molecular studies are underway to determine the relationship with adenoviruses of livestock.

Mysterious Hairloss/Emaciation Syndrome in Black-tailed Deer

A investigation is underway in the State of Washington (USA) on an unusual disease syndrome in black-tailed deer. Affected deer are weak, emaciated, and have bilateral, symmetrical alopecia. Diarrhea is a common finding. Gross lesions include emaciation, patchy alopecia, leukoderma, enlarged tonsils, and generalized lymphadenopathy. Accumulations of lymphocytes are seen in the intestinal tract, liver, heart, brain, and kidney. Most serologic and virologic tests have been negative; however, there was a positive polymerase chain reaction test for a pestivirus in one deer. Additional diagnostic procedures are in progress.

Ebola/Reston virus

In January 1997, 645 Philippines macaques (Cynomolgus sp.) were destroyed at the Ferlite Scientific Research Breeding Centre in the Philippines after Ebola/Reston virus was found to exist on the monkey breeding farm and was spreading amongst the monkeys.

Ebola virus - The hunt for the wild reservoir

In June 1996, a red colobus monkey (Colobus sp.) was found dead in the Tai Forest, Côte d'Ivoire and was said to have tested positive for Ebola virus. Researchers have been searching the Tai Forest for the reservoir of Ebola virus which killed a number of chimpanzees there in 1995. Results of experimental infection show that some species of fructivorous and insectivorous bats have been able to replicate the virus and to support high viral titres without becoming sick. Ebola virus was present in lung tissue, which implies that respiratory or oral spread of infection could occur where bats roost in confined spaces and isolation of virus from faeces suggests that transmission to other animals is possible.

This study does not provide conclusive evidence that bats are the definitive reservoir hosts for filoviruses. Further studies are needed.
Yellow fever in howler monkeys in Trinidad and Panama

After an outbreak of yellow fever in howler monkeys (*Alouatta seniculus*) in Trinidad in 1995-96 in which there was no spread to the largely vaccinated human population, a suggestion has been made that the monkeys should be vaccinated. Ecotourism is developing in Trinidad and the monkeys are considered to be a potential source of infection for unvaccinated tourists.

Howlers have been used as sentinels for yellow fever in Panamanian areas close to the Colombian border. Thus, the Panama health authorities obtain forewarning of the approach of each epizootic wave, which comes every 6-7 years, and are able to respond with mass vaccination of the human population. As result, there have been no human cases of yellow fever in Panama since 1973. This surveillance system shows that over the years, yellow fever epizootics among the primates are related to the population density of the cohort of susceptible howlers, born after each outbreak has subsided.

Lassa fever in Sierra Leone

Many human cases of Lassa fever have occurred in Kene ma in eastern Sierra Leone. Transmission of the Lassa virus in the community is mainly due to contact with rats of the genus *Mastomys*. Infected rats continually shed virus in their urine and humans are infected by ingestion of food contaminated by rat urine or by inhalation of virus-containing aerosols.

Dermatophytosis in free-ranging ungulates in Tsavo East National Park

An epizootic of dermatophytosis was noticed in free-ranging Grant's gazelle (*Gazella granti*) in Tsavo East National Park in August 1996. The disease spread to involve other areas and species within the Park within two months. Other species involved were impala and giraffe. All age groups of both sexes were equally affected. One hundred percent of skin scrapings examined had ectothrix fungal spores on microscopic examination, and 90% were positive for *Microsporum gypseum* on culture. *Trichophyton schonienii* was also isolated from some Grant's gazelle near a wildlife camp.

The source of infection appears to be soils and camels in the Park, with spread by contact; prolonged drought (nutritional stress) was a predisposing factor.

Feline immunodeficiency virus in Africa

Subpopulations of large felids in Africa exhibit a wide range of lentivirus prevalence, with some subpopulations showing no evidence of infection. There are different specificities and sensitivities among the lentivirus assays being applied to nondomestic felids, suggesting that assay choice is important and that caution is warranted in comparing and interpreting data. Adoption of more uniform testing procedures is encouraged.

Canine parvovirus

A single case of parvovirus infection in a wild dog (*Lycaon pictus*) was reported from Namibia this year, although the location of this animal and whether it was captive, semi-free ranging, or wild was not reported.

Encephalomyocarditis in elephants

A few sporadic unaccountable deaths in elephants were reported in the Kruger National Park (South Africa). Unfortunately, the carcasses were decomposed when found, but anthrax and poaching were eliminated as possible causes of death, making encephalomyocarditis (EMC) the most likely diagnosis. EMC-related mortality in female and juvenile elephants was rare during the 1993-95 outbreak in the Kruger National Park, but many of these herd animals that were sampled had significant antibody titres. Recently analysed serum samples collected from Botswana elephants in 1992 and 1993 as well as from elephants from the Northern Province of South Africa (total n=21) were all negative for EMC.
Floppy trunk syndrome

Several more cases of this syndrome were seen in adult bull elephants in Kruger National Park in South Africa this year. Two animals in the early stages of the disease have been radio collared to monitor the rate of progression of the ascending paralysis of the trunk. An aetiological diagnosis has not yet been elucidated.

*Escherichia coli* O157 H7 in Deer

A recent report in the USA identified dried meat from a black-tailed deer (*Odocoileus hemionus*) as the source of *E. coli* O157:H7 infection in a cluster of eleven human cases. Isolates of *E. coli* O157:H7 were obtained from the deer meat and from deer fecal pellets collected in the area where the deer was killed. In order to evaluate *E. coli* O157:H7 infection, young deer were experimentally inoculated with *E. coli* O157:H7. Results indicated that deer could carry and shed the bacterium, although they did not develop diarrhea or other signs of disease. These results demonstrated that deer can carry and shed *E. coli* O157:H7 similarly to other ruminants such as cattle and sheep; however, over 400 fecal samples from free-ranging deer have tested negative.

*Ehrlichia chaffeensis* in Deer

In the USA, human monocytic ehrlichiosis (HME), caused by *Ehrlichia chaffeensis*, has been diagnosed in 30 States. Over 400 human cases have been confirmed since 1986, including occasional fatal infections. Research projects have confirmed that *E. chaffeensis*, the causative agent of human monocytic ehrlichiosis, is maintained in nature primarily by the lone star tick (*Amblyomma americanum*) and white-tailed deer (*Odocoileus virginianus*). Experimentally, white-tailed deer can carry *E. chaffeensis* for as long as 123 days. Another human ehrlichiosis, caused by the human granulocytic ehrlichiosis (HGE) agent (an un-named *Ehrlichia*), also is found in deer. However, there is mounting evidence that the HGE agent is transmitted by the black-legged tick, *Ixodes scapularis*, which also is the vector of Lyme disease.

Studies on ehrlichiosis have confirmed that many deer populations in the Southeast USA are infected with a third, novel *Ehrlichia*-like organism that is closely related to the group that contains the causative agent of HGE. This deer *Ehrlichia*-like organism also occurs in lone star ticks. Furthermore, survey work has demonstrated that *E. chaffeensis*, the deer *Ehrlichia*-like organism, and the HGE agent can all occur in a single deer population.

Parapox virus

There is some concern that the introduced, exotic grey squirrel (*Sciurus carolinensis*) could transmit a parapox virus to the native red squirrel (*Sciurus vulgaris*) in the British Isles, although at present there is no evidence that this has occurred. However, seven confirmed cases of parapox virus infection in red squirrels have been recently observed in East Anglia following a translocation of these animals during an experimental conservation exercise.

2. Spongiform encephalopathies in wildlife

2.1 Spongiform encephalopathy in Deer and Wapiti

A fall 1996 survey of brain tissue from hunter-harvested mule deer in Colorado (USA) revealed the presence of chronic wasting disease (CWD) in mule deer (*Odocoileus hemionus*) and wapiti (*Cervus elaphus canadensis*). About 6% of the male mule deer, but fewer than 1% of the wapiti were affected in six hunt management units in Larimer County, Colorado. Data from 1992-1994 surveys had initially estimated about 1% of mule deer and far fewer elk had CWD. The wildlife authorities are advising people that as a precaution they should not eat the meat of animals that show signs of any disease, including CWD. They also recommend that hunters continue to follow common sanitary practices when field dressing an animal, such as trying not to puncture internal organs, and washing hands and/or wearing gloves. State and federal officials have found no increase in incidence of Creutzfeldt-Jakob disease (CJD) anywhere in North America and no cases of new variant CJD.
2.2 Recommendation on spongiform encephalopathy

The Working Group made the following recommendations on spongiform encephalopathy:

1. There should be no movement of potentially exposed cervids from the area known to contain CWD-infected cervids.

2. There should be increased awareness of CWD and spongiform encephalopathies and surveillance through diagnostic tests in any animals with compatible clinical signs.

3. All nations should review the ingredients of feeds for captive ungulates in regard to the use of animal proteins or animal derived by-products.

3. Tuberculosis in wildlife

Bovine tuberculosis continues to increase dramatically and is one of the most important bacterial diseases of free ranging wildlife populations in many regions of the globe. In most cases, this disease appears to have originated from an infected domestic cattle population, but now appears to be self-maintaining in certain free ranging wildlife populations. This is of great concern to conservationists and veterinary regulatory authorities alike.

Last year, it was reported that bovine tuberculosis was endemic in:

- Cape Buffalo and warthogs (*Phacochoerus aethiopicus*) in the Queen Elizabeth National Park in Uganda.

- Cape buffalo in the southern region of the Kruger National Park and Hluhluwe/Umfolosi Game Reserves in South Africa. ‘Spillover’ of infection into greater kudu, lion, chacma baboons (*Papio ursinus*) and cheetah has also been documented in the Kruger National Park.

- Red Lechwe (*Kobus leche*) on the Kafue flats in Zambia.

- Hybrids, (wood bison/plains bison) (*Bison bison*) in the vicinity of Wood Buffalo National Park in Canada.

- Brush-tailed possums (*Trichosurus vulpecula*), and to a lesser extent in feral ferrets and feral domestic cats in New Zealand.

- Wild boar (*Sus scrofa*) in parts of Italy and Eastern Europe.

- Badgers (*Meles meles*) in the United Kingdom and Ireland.

- Feral water-buffalo (*Bubalus arnee*) and cattle in the Northern Territories of Australia.

- Farmed cervids in the People's Republic of China, New Zealand, Sweden, United Kingdom and USA.

Bovine tuberculosis is still commonly found in badgers in England and Ireland. It is not known if infection with *Mycobacterium bovis* occurs in badgers in Continental Europe and further surveillance is needed. This disease is also still reported to occur in deer (*Cervus elaphus, Dama dama*) on deer farms in Europe as well as in farmed and wild deer in New Zealand. The prevalence of *M. bovis* infections of wild boar in Europe is still unknown.
In the current reporting year the following incidents and trends have been noted:

- In the Kruger National Park in South Africa, it was found that as the tuberculosis prevalence increases in buffalo herds, the disease was diagnosed with increasing frequency in both calves and yearlings; a situation which was not documented in low prevalence herds. An increasing number of terminally ill buffalo as well as tuberculosis associated mortality are being encountered.

  Increasing numbers of greater kudu (*Tragelaphus strepsiceros*) with tubercular abscesses of the head lymph nodes are being reported. It appears that the tonsils and head nodes of the kudu are the sites of the primary complex, with secondary spread to the lungs and other organs. Abscessed parotid lymph nodes were frequently found to fistulate to the exterior, and the purulent exudate may then contaminate the environment. This may be the mechanism of horizontal spread between kudu. There thus appears to be a real danger that kudu, as a species, may have long-term maintenance host potential.

  Also in the Kruger National Park, a total of five confirmed cases of bovine tuberculosis have been diagnosed in lions. The lesions observed were predominantly pulmonary, and it is important to note that the lung lesions in lions do not have the normal pyogranulomatous appearance with caseation and calcification. Glistening mucoid exudate was found on section of small cavitated lesions and numerous acid fast organisms were present in exudate smears. The gross appearance of the lesions is atypical and could easily be misdiagnosed without laboratory investigation.

  No more bovine tuberculosis cases were found in the previously infected baboon troop in the Kruger National Park. Depopulation, as well as the fulminating nature of this disease in baboons probably contributed to the disappearance of tuberculosis in this incidental host.

  In South Africa, buffalo sourced from a known infected area were allowed to be translocated after two negative comparative skin tests, three months apart. A further quarantine at destination with retesting was required. Two buffalo tested positive during this enforced quarantine and early tuberculosis lesions were found and confirmed in one of these animals. This once again illustrates the dangers associated with sourcing of animals from known infected areas, as well as the value of enforced quarantine and multiple testing.

- In the USA the following developments have occurred:

  In November 1994, bovine tuberculosis was discovered in a white-tailed deer in Michigan. Surveillance in 1995 and 1996 clearly demonstrated that the bacterium, *Mycobacterium bovis*, is self-maintaining in the deer population in a 4-county area on the northeastern lower peninsula. A report released by Michigan authorities in January 1997, was not encouraging. For 1996, approximately 1.4% of over 4,000 deer tested were positive for bovine tuberculosis in the 4-county area. Furthermore, 4 infected deer were discovered outside what was considered the "core" area, one of which was in a new, fifth county. Telemetry studies are showing that deer are moving from one artificial feeding station to another over distances as great as 9 miles. On the positive side, results of extensive surveillance of cattle, goats, swine, llamas, and captive cervids in the area have been negative. Over 800 white-tailed deer were tested in a broader state-wide survey in 1996 with no positives among over 70 free-ranging elk and approximately 45 wild carnivores tested.

  In the USA, thirty-two captive cervid herds have been confirmed positive for infection with bovine tuberculosis since 1991. Twenty two were depopulated by their owners, 7 were tested, culled, and released from quarantine, and 3 remain under test and slaughter programs. Only two new herds were found in 1995, none in 1996, and one in 1997. Several major developments have enhanced the control of bovine tuberculosis in captive cervids. The State/Federal Bovine Tuberculosis Eradication Program now includes Uniform Methods and Rules for Tuberculosis Eradication to cover farm- and
ranch-raised Cervidae (deer, elk, and moose), and there are program standards for herds to be designated as Accredited, Qualified, or Monitored herds. Another development was the initiation of federal indemnity provisions to partially pay owners for cervids that are destroyed to control bovine tuberculosis.

- In Uganda, 42 buffaloes were sampled in the Queen Elizabeth National Park. A 21.4% bovine tuberculosis infection rate was diagnosed by gamma interferon test. *Mycobacterium bovis* was also isolated from a buffalo carcass with advanced lesions and from an emaciated warthog.

4. **Canine distemper**

Canine distemper in lions and other carnivores in the Masaï Mara/Serengeti complex appears to have disappeared, and no further clinical cases have been reported. A trial vaccination of Masaï dogs has resulted in a slight but significant increase in domestic dog numbers. A cost/benefit analysis of such a vaccination programme, including an assessment of overall sustainability, is in order. It is suggested that surveillance efforts be intensified where canine distemper is an issue, and that modelling exercises be developed to try to assess optimal approaches, i.e. vaccinating Masaï dogs vs. no intervention vs. developing vaccination strategies for wild carnivores. The complexity of any selected strategy or strategies and the potential sequelae should not be underestimated.

Canine distemper was diagnosed in two wild dogs and two jackals in Namibia, although the location of these animals and whether they were captive, semi-free ranging, or wild was not reported.

No diagnosis for last year's mortalities in Botswana wild dog packs, associated with the Moremi Game Reserve, has been received.

5. **Rabies in wildlife**

Apart from the Antarctic, rabies or rabies related lyssaviruses are reported to affect various wild, or feral species of mammals in all continents. (Birds are not known to carry the virus in natural conditions).

Following the death of an Israeli soldier after having been bitten while camping and, on the assumption that the bite was from a rabid rat, the possibility that "rats" (or small mammals) could be vectors of rabies is again considered.

Fluorescent antibody test (FAT) positive bats have been found in Thailand. Bat rabies is known to be present in the region. A total of three cases of infection by a "pteropid lyssavirus" was recorded in Australia. Two black flying foxes (*Pteropus alecto*) and one little red (*Pteropus scapulatus*) from North Queensland were found infected between January 1995 and August 1996. Typing of the virus is still underway but preliminary information tends to show that the involved virus is closely related to the rabies virus. One woman died of pteropid lyssavirus infection in October 1996 in Brisbane. She had been caring for a number of captive fruit bats for some time.

Rabies is endemic in many African countries in both domestic animals and wildlife. In many areas, domestic and feral dogs appear to be the main reservoir of the virus which can spill over to wild species. In addition to the health risks associated with the disease for humans, it is of concern that rabies can threaten some isolated small populations of social carnivores such as wild dogs and Ethiopian wolves (*Canis simiensis*).

Black backed jackals (*Canis mesomelas*) and bat eared foxes (*Otocyon megalotis*) are often infected with rabies virus.

Progress with oral vaccination of rabies vectors has been recorded in Europe and North America. The oral vaccination of foxes (*Vulpes vulpes*) started 10 years ago in Western Europe leading to a dramatic decrease of the infection rate in terrestrial mammals. Belgium, France, Italy, Luxembourg, Netherlands and Switzerland have recorded very few isolated cases during recent years and some of these countries
have recorded none at all. France has been free of recorded cases of rabies for the last 12 months (October 1996 - October 1997). The infection is now limited to parts of some "Länder" (administrative unit) of Germany. In Central and Eastern Europe oral vaccination programmes for foxes are underway with encouraging results.

In February 1997, the Texas Department of Health (USA) completed the third year of a 5 to 7 year project designated to eliminate two rabies epizootics in coyotes (Canis latrans) and gray foxes (Urocyon cinereoargenteus). Aerial distribution of 2,600,000 doses of vaccine Raboral V-RG was carried out over 42,000 square miles. This effort has halted the spread of the epizootic in the area and has reduced the number of coyote and gray fox cases of rabies in the vaccinated population.

6. Emerging diseases

Definition

'Emerging diseases are infections that have newly appeared in a population or have existed but are rapidly increasing in incidence, host range and or geographic distribution'.

The Group considers that the following infections or diseases in wildlife appear to fulfil the criteria in the above definition (which is modified from a definition by Dr S. Morse).

Virus diseases

Calicivirus: rabbit haemorrhagic disease.
Morbilliviruses: rinderpest, canine distemper and marine mammal morbillivirus infection.
Lyssa viruses: pteropid lyssavirus and European bat rabies virus.
Picornoviruses: encephalomyocarditis.
Paranyxoviruses: Newcastle disease.

Bacterial diseases: bovine tuberculosis, brucellosis of marine mammals and brucellosis in other wild mammals.

Parasitic diseases: sarcoptic mange, old world screwworm (SW Asia).

Nonconventional transmissible agents: transmissible spongiform encephalopathies/chronic wasting disease

7. Wildlife translocation

Definition

"Translocation of wildlife, defined in the broadest manner, includes relocation and release of animals for a variety of purposes such as restocking, population augmentation, moving of problem animals, release of rehabilitated animals, release of animals for hunting and preservation of rare species."

This subject was discussed at length during the previous meeting in 1996. The Group wished to clarify what they considered wildlife translocation: in order to emphasise the numerous ways that diseases could be transported and the importance of screening and quarantine whenever the movement of wild animals for whatever purpose is considered.


The Group discussed and forwarded to the Standards Commission recommendations on certain diseases for which there may be special need for specialists to address their diagnosis in wildlife.

9. Improvement of regional representation and reporting

Ways to improve reporting of significant wildlife disease events from geographic areas now inadequately covered were proposed. New contacts will be made by Group members.
10. Recommendation on bovine tuberculosis

The Working Group on Wildlife Diseases revised its recommendation from 1996 and recommends that:

a) Measures should be implemented by national authorities to prevent the introduction of bovine tuberculosis into free-ranging wild animal populations. The Working Group recommends that all non-domestic ungulates be rigorously screened by repeated pre-shipment tests (2-3 times) and held under post-entry quarantine for 3 months, including a retest. It should be emphasised that, once bovine tuberculosis becomes established in a free-ranging species, the process is probably irreversible with current diagnostic, therapeutic and logistical options. Depopulation of infected foci, where possible, although is the only solution costly and unpopular. This disease in wildlife appears to be progressive in individuals, and progressive in spreading within and between herds. At high prevalence rates, it may result in significant morbidity and mortality which may affect population dynamics. Conservation efforts in general and both consumptive and non-consumptive wildlife utilisation may be affected. Furthermore, the presence of tuberculosis in a wild population has important consequences for wildlife conservation and management when translocation projects for reintroduction or restocking are planned.

Finally, the implications of the presence of a feral or sylvatic maintenance cycle of this disease for tuberculosis eradication programmes in domestic cattle are highly significant.

b) Where possible, tuberculosis surveillance in wildlife should be carried out whenever wild animal carcasses become available, e.g. road kills, hunter kills, population management culls and any incidental mortality. The carcass examiners should be instructed to intensively examine all lymph nodes (multiple incisions) lungs (palpation), as well as all visceral organs. All suspect pyogranulomatous lesions should be sampled and tested in accordance with the OIE Manual of Standards for Diagnostic Tests and Vaccines. Frozen tissue should also be collected for later culture if necessary. Where mycobacteriosis is confirmed, it is essential to culture and identify the causative organism.

c) The currently available ante-mortem tests should be considered to be herd tests, and where possible, animals for translocation should not be sourced from known infected herds, even if the individuals tested appear negative. Any animal which shows a suspicious or positive reaction to an appropriate bovine tuberculosis diagnostic test should be isolated for further investigation or presented for necropsy to confirm infection.

d) Full support should be given to research on the development of sensitive and specific ante-mortem tests for bovine tuberculosis in wildlife, as well as the development of a safe and effective vaccine. Currently there are no reliable ante-mortem tests available for pachyderms and carnivores.

e) All confirmed cases of bovine tuberculosis in wildlife should be reported to the members (regional coordinators) of the OIE Working Group on Wildlife Diseases or directly to the OIE Central Bureau.

.../Appendices
REPORT OF THE MEETING OF THE OIE WORKING GROUP
ON WILDLIFE DISEASES

Paris, 7-9 October 1997

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MEETING OF THE OIE WORKING GROUP ON WILDLIFE DISEASES

Paris, 7 - 9 October 1997

Agenda

1. Epidemiological review of selected wildlife diseases 1996-1997
2. Spongiform encephalopathies in wildlife
3. Tuberculosis in wildlife
4. Canine distemper
5. Rabies in wildlife
6. Emerging
7. Wildlife translocation
9. Improvement of regional representation and reporting
10. Recommendation on bovine tuberculosis