WILDLIFE DISEASES IN ITALY

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In Italy wildlife diseases surveillance is guarantieed by an extensive system of veterinary diagnostic laboratories consituted by ten Regional Veterinary Laboratories and some of the thirteen Schools of Veterinary Medicine. All these laboratories accept wild animal specimens but the control of wild animal diseases is not organized on a national scale except for specific disease such as rabies. Furthermore there is no national reporting system for the diagnostic findings of these laboratories except for diseases for which national statistics are required by international agreements. Recently, veterinarians working on wildlife diseases and wildlife management personnel has been organized as the Italian Society for Wildlife Ecopathology to increase the aggregation of on-going research of these people. In Italy there are dense populations of wild animals, expecially chamois, ibex, red deer, roe deer, wild sheep (Ovis musimon), fallow deer and wild boar. Other wild animals of interest are the red fox, the commonest carnivore, the hare and the wild rabbit and recently the wolf.

In Italy the major problems for wild ruminants are: traumatisms, kerato-conjuctivitis, a multifactorial disease due to different pathogens, paratuberculosis, other bacterial diseases, broncopneumonia due to lungworms, large stomach and intestine parasitic infections, and liver fluke. Subjects seropositive for BHV-1, PI3, BVD, Chlamydia, and Toxoplasma were frequently observed, but the real importance of these diseases is not known. All the animal tested were always seronegative for brucellosis.

Since 1985 hog cholera was identified in wild boar, some outbreaks of tuberculosis due to Mycobacterium tuberculosis and M. bovis have been observed in the north-west part of the country. Trichinella infection has been rarely found, while sarcoptic mangue is more frequent. Rabies remains limited to the north-est part of the country, but the extensive control on red fox population allowed to identify several parasitic infections (Sarcoptic mangue, Dirofilariosis, Angiostrongilosis, etc), which frequently occur in red fox. The main diseases of lagomorphs are Rabbit Viral Hemorrhagic Disease, European Brown Hare Syndrome, Mixomatosis, Pasteurellosis and Coccidiosis. Recently the study on diseases of wild birds and cetaceans has been also intensified. Expecially for the latter the intensive study allowed to identify some cases of morbillivirus and Toxoplasma infections.

THE ROLE OF THE OFFICE INTERNATIONAL DES EPIZOOTIES (OIE) IN WILDLIFE DISEASES

The OIE is the world organisation for animal health, comprised of the official Veterinary Services of 140 Member Countries. Since its founding in 1924, the three principal aims of the organisation have been the provision of information on animal health world-wide, international coordination of research into and control of certain animal diseases, and the harmonisation of import and export regulations on animal and animal products internationally.

Wildlife susceptibility to most major livestock and poultry diseases has long been known. In the past government Veterinary Services were almost entirely concerned with protecting domestic animals and man from diseases of wildlife. There is now increasing involvement by these organisations in disease control in wildlife as a contribution to conservation. The OIE has dedicated several recent editions of its quarterly *Scientific and Technical Review* to the diseases of free ranging wild animals. A future edition will encompass the emerging field of wildlife husbandry and disease.

It is surprising that epizootic disease is so generally overlooked by conservation institutions as a threat to fauna, particularly endangered species. Rinderpest entered Africa at the turn of the century and severely reduced populations of wild and domestic ungulates alike. A repeat nowadays would cause the extinction of several presently threatened species which now exist only in vulnerable isolated pockets. Similar consequences with other diseases and other places could be foreseen. Disease prevention, control and eradication in domestic animals on an international scale, which is the OIE's main objective, prevents loss of both domestic and wild animal genetic resources from occurring.

The OIE *International Animal Health Code* specifies controls for the most important diseases of "domestic and wild" animals and their products in international commerce. Future updates of the also internationally agreed companion *OIE Manual of Standards for Diagnostic Tests and Vaccines* will increasingly include information on diagnosis in wildlife of those diseases of common concern for wild animals and their domestic relatives. A separate *Code & Manual for aquatic animals* is now being prepared.

The establishment in 1992 of an OIE Working Group on Wildlife Diseases, comprised of internationally reknown experts, has increased the organisation's contribution to the field. The Group reports to Member Countries on the occurrence and evolution of important diseases and on aspects of diagnosis, surveillance, reporting, prevention and control. Wild animal translocation and vaccination are topics of particular attention. An international survey of diseases of most concern has been produced, as has an overview of what is known of the involvement of wildlife in various livestock and poultry diseases. An OIE wildlife disease consultants list is now available for specialist assistance.

PATHOLOGICAL CONDITIONS IN BRITISH BATS

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The United Kingdom has remained free from rabies since 1922 apart from isolated cases associated with quarantined animals. The Ministry of Agriculture, Fisheries and Food, as part of its disease surveillance programme, encourages members of the public, and in particular bat conservation groups, to submit dead or dying bats for rabies screening. Between September 1990 and August 1994 a total of 245 bats were submitted for this purpose through Polwhele VI Unit in Cornwall. Although nationally the British bat population has diminished greatly in the last 50 years there are still good populations in south west England, and conservation bodies monitor these populations keenly. The bats submitted were identified and then subjected to a limited post mortem examination. There were 147 Pipistrellus pipistrellus, 60 Plecotus auritus, 15 Myotis mystacinus, and 12 M. natteri plus small numbers of Nyctalus noctula, M. brandtii, M. daubentonii, P. nathusii and Rhinolophus hipposideros. Most mortality occurred between May and October, and approximately 65% of the deaths were associated with traumatic injuries. Of these, approximately 60% had been caused by domestic cats.

Bacteriological examinations on fresh specimens revealed that approximately 25% had died of septicaemia caused by Pasteurella multocida. These were all bats which had lesions or histories consistent with having been caught by cats, and the organism is presumed to have originated from the cats mouths. The only other significant organism was Escherichia coli, which was mostly associated with enteric disorders. Cultures of intestines of 36 bats all proved negative for Salmonella spp.

Ectoparasites were commonly present, particularly in juvenile or sick bats. These included the mites Steatonyssus sp., Dermanyssina sp., larvae or 'chiggers' of the harvest mite Neotrombicula autumnalis and the soft tick Argas vespertilionis. Skin conditions diagnosed included ringworm, staphylococcal dermatitis and alopecia of unknown aetiology. Osteodystrophy was seen as a result of baby bats being weaned too soon onto a diet high in phosphate but low in calcium. Various hepatic conditions were seen, but the most striking was a white liver syndrome, seen in several hospitalised P. pipistrellus. In appearance the condition closely resembled the white liver syndrome seen in lambs on low cobalt diets, and it is considered that the condition in bats could be dietary in origin.

Splenomegaly was seen in 16 bats, and stained blood films showed severe anaemia associated with babesiosis in 2 cases. Babesia vesperuginis is believed to be transmitted by the soft tick A. vespertilionis and this piroplasm has previously been described in bats in Cambridgeshire.

There were several incidents of suspected poisoning, mostly due to the use of timber preservatives in roofs, and these were investigated under the Ministry's Wildlife Incident Investigation Scheme, or under the Wildlife and Countryside Act 1981. In one such case a pipistrelle bat was found to have died from dieldrin poisoning, with a liver concentration of 13.3 µg/g wet matter. The roof timber in the roost had been treated with a compound containing dieldrin, PCP and TBT.

The brains from these bats were all examined by the Rabies Unit, Central Veterinary Laboratory, Weybridge and all proved negative for rabies related virus.

HISTORIC RABIES IN IRELAND AND BRITAIN

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Rabies occurred in both Ireland and Britain but was successfully eradicated. The history of the disease is poorly understood. The apparent absence of the disease in wild mammals in the last epizootic is of interest, both in our understanding of that episode and in any planning for a control strategy, should a it be necessary. Contemporary data is available from government publications after the Diseases of Animals Acts (1905), which deals with domestic mammals, and from details for the people from both islands who travelled to Paris to be treated at the Pasteur Institute. These data suggest that the last epizootic was confined mainly to domestic dogs, with some overspill into other domestic mammals. The wild mammal populations at that time may not have provided suitable hosts. The lingering social and cultural aspects of the disease, almost one hundred years after eradication, are discussed.

WILDLIFE DISEASES AND SURVEILLANCE IN AUSTRIA

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Wildlife disease surveillance is carried out mainly by the Institute for Wildlife Research and Ecology of the Veterinary University, Vienna, but also by federal institutes for veterinary investigations situated in several provinces. Furthermore, the institutes for Parasitology and Pathology of the Veterinary University are involved in wildlife disease problems. Rabies diagnosis is restricted to the Bundesanstalt für Tierseuchenbekämpfung, the Bundesanstalt für Virusseuchenbekämpfung bei Haustieren is working on the spread of swine fever in wild boars. Most of those institutes inform each other about the findings once a year.

Wildlife disease surveillance is based mainly on necropsies of game animals and other free living animals found dead or shot because of signs of illness. Between 1985 and july 1994 the Institute for Wildlife Research and Ecology received 2240 wildlife carcasses or organs for routine diagnosis (excluding carcasses from projects), roe deer (Capreolus capreolus) (671) and brown hares (Lepus europaeus) (396) being most frequent. Endoparasitism remains still the main problem in roe deer, only in 1987 and 1988 intoxication by 00 rape was prevalent. Chamois (Rupicapra rupicapra) are still suffering from mange and keratoconjunctivits. Pseudotuberculosis and other bacterial diseases are most common in brown hares, followed by local outbreaks of EBHS. Every autumn cases of keratoconjunctivitis occur in brown hare, supposed to be due to chlamydia sp.. Pesticide poisonings could be diagnosed in pheasants (Phasianus colchicus), brown hares, mallards (Anas platyrhynchos) and birds of prey, outbreaks of botulism are registered almost every year in mallards. Some interesting individual cases (for example salmonellosis in roe deer, wild boars (Sus scrofa) and beaver (Castor fiber)) will be discussed in the paper.

In special projects the Institute for Wildlife Research and Ecology tries to analyze also the health status of "healthy" animals shot all over the year by means of pathomorphologic, parasitologic, microbiologic and serologic investigations, partly in cooperation with other institutes of the Veterinary University. Such screenings seem to be most important to get an objective information about the health status of wildlife, as in Austria the sending in of necropsy material depends only on the individual interest of hunters, which may be very different from person to person resulting in unrepresentative numbers of necropsies in several years and wildlife species. In consequence, false ideas about the wildlife disease situation may arise considering only the findings from investigation material "by chance".

WILDLIFE DISEASES IN NORWAY

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The norwegian nature is varied and partly unspoiled and the human population density is low. Thus habitats suitable for wildlife are abundant. The wild fauna comprise approximately 250 species of breeding birds and 80 species of mammals.
The zoosantary situation in Norway is generally very good. In livestock farming the situation is regarded unique in an international context. We also regard the wildlife health status to be good although this can not be as extensively documented as the livestock health situation.
In 1960 a Section for wildlife diseases was established at the Central Veterinary Institute in Oslo. Although some research activities had focused on wildlife diseases and sporadic diagnostic investigations had been carried out prior to the establishment of this diagnostic unit we do not have sufficient basis for overviewing the disease situation in wildlife before 1960.
Since 1960 the Section for wildlife diseases, established and headed by Dr. Gunnar Holt until his retirement in 1991, has been the most important element in a national wildlife disease surveillance program. Approximately 30.000 diagnostic examinations are on file.
A wide variety of infectious, parasitic and noninfectious diseases have been registered in Norwegian wildlife. However, none of the diseases listed on the OIE List A have been diagnosed in our wildlife. Of those diseases listed on the OIE List B we have sporadically recorded echinococcosis, malignant catarrhal fever, trichinellosis, avian tuberculosis, avian cholera, psittacosis and tularaemia. Rabies occur sporadically on Svalbard (Spitzbergen) but do not occur in mainland Norway.
The OIE ad hoc group on wildlife diseases listed 30 additional diseases to be considered for reporting. Of these diseases we have diagnosed canine distemper, contagious ecthyma, sarcoptic mange, meningeal worms of old world cervids, phocine distemper, salmonellosis, toxoplasmosis and heartworm of swans in Norwegian wildlife. Sarcoptic mange is endemic in the red fox population and has since 1976, when the disease was introduced, caused dissemination of the fox population.
Meningeal worms of cervids occur endemically in red deer, moose and reindeer.
Over the last 25 - 30 years several studies on environmental contamination with heavy metals and chlorinated hydrocarbons have been conducted using different wildlife species as indicators. Although detrimental effects have not been documented residues of chlorinated hydrocarbons in arctic wildlife is at present of special concern.
During the last 3 - 4 years osteoporosis have been registered an increasing problem in the regional moose population of the two southernmost counties of Norway. The cause have not been identified and thus constitutes a major challenge to the wildlife disease authorities.

CONTAMINATION OF WILDLIFE BY ENVIRONMENTAL POLLUTANTS IN AUSTRIA

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Heavy metal contamination of different Austrian wildlife species has been followed since 1978 by the Institute of Wildlife Research and Ecology. Most analyses are done on lead, cadmium and mercury levels. The results can be summarised briefly like the following:

Lead contamination is decreasing continuously due to the reduction resp. ban of lead additives in fuel. Highest lead concentrations are registered in the organs of brown hares, pheasants and partridges. By analyses of red deer antlers from the time from 1909 to the nineties it could be proved that the most remarkable reduction of environmental lead contamination had taken place in the seventies already.

Mercury levels in the organs of small game species show a downward trend as consequence of the legal ban of organomercurials as seed dressings in 1992. Mercury concentrations in organs of wild ruminants are very low, except roe deer's due to higher uptake of mushrooms.

Cadmium contamination shows significant regional differences; very high values were found in all wildlife species from the region of Vienna, but also in some other parts of Austria. Besides local sources a long distance transport of cadmium immissions from northern central Europe is discussed as the reason for the high contamination.

Since 1986 also **cesium-137** levels in wildlife had been registered. Whereas the generally high levels decreased rapidly, cesium contamination of roe deer is still very high (in the range of levels from spring 1986) in some unbroken forest areas. Wild boars are showing an increase in radioactive contamination since about 1991. While the reason for the high levels in roe deer is found in preferred feeding plants, like mushrooms, blue berries (leaves and stems) and fern, an explanation for the increasing values in wild boar is still lacking.

MYCOBACTERIUM BOVIS INFECTION IN ZOO ANIMALS

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Two cases of infection in zoo animals are reported.

- **First case** : A captive population of baboons (*Papio hamadryas*) was built up in 1981.

Ten baboons were purchased from a German tradesman in 1981, they were adult animals of indeterminated ages. These animals reproduced, 4 births were recorded in 1985, 4 in 1988, 4 in 1989, 6 in 1990, 7 in 1991, so about 25 births in all. In relation with overpopulation, 9 animals were sold or exchanged with a circus in 1990 and 1991. At this time indeterminated etiology mortalities had already recorded. First deaths occured in 1989, then followed in 1991, 1992 and 1993. The first autopsy was performed the 9th of April 1993. Numerous pulmonary abcesses with pleuropericardite were observed. The second autopsy of a female was made the 3rd of May 1993 and gave the same observation, without analysis. The veterinarian did not know the situation of the zoo, i. e. the important mortality since 2 to 3 years. In September 1993, the veterinarian was called by a keeper to examine several ill monkeys (cough, wasting away...) Finally, in October 1993, an autopsy showed purulente pneumoniae lesions and Ziehl staining demonstrated the presence of acid fast bacilli. The culture was started in CNEVA/LCVR from these lesions. The cultures were negative. At this time, there were still 7 baboons. The veterinarian performed comparative intradermotuberculination with human tuberculin and avian tuberculin. These animals showed a strong reaction with the human tuberculin, oedeme with necrosis and no reaction with avian tuberculin. Some blood samples were send to the Centraal Diergeneeskundig Instituut (CDI), Dutchland, to test with ELISA. HIV tests were also performed. There was no longer any doubt about tuberculosis in these baboons. The baboons were euthanasied. Six of them showed purulent caseous pulmonary lesions. These lesions were sent to the CNEVA/LCRV to isolate and identify the mycobacteria. A lot of deaths in this zoo, without explanation in various kind of animals had been recorded. The investigations are in progress to look for the origin of the contamination.

-**Second case** : Tuberculosis in wild mammals, in October 1992 , a first animal dies. It was a 6 years old snow leopard (*Panthera uncia*). The autopsy showed deeply altered lungs with large cavity and the Ziehl staining the presence of a lot of acid fast bacilli. The culture was performed in the CNEVA/LCRV. *Mycobacterium bovis* was isolated and identified from the lung. In November 1993, an other animal was sick. It was a male snow leopard . It had been with a difficult breathing since a few days. Some swabbing in throat and nostril were performed, Ziehl staining was positive but the culture was negative. This animal was euthanasied. The autopsy showed large cavity in the lungs with a lot of acid fast bacilli in the smears. The culture was performed and *M. bovis* was isolated and identified from the lesions. In February 1994, a 7 years old Amur leopard (*Panthera pardus*) was killed as the result of an accident. This animal showed negative radiography, but a few acid fast bacilli on a throat swab. The autopsy showed lungs without caseous lesion, but spongy area grinding when you cut, and the Ziehl staining was negative. The culture was negative. In May 1994, a male leopard "Ming" (Amur leopard) with cough and expectoration showed an intradermoreaction positive. It died consequently to an intravenous tuberculination. The autopsy showed tubercles and small cavities specially at the periphery of the lobes with important densification. The cavities were very rich in acid fast bacilli. The culture is in progress. Some blood samples were also send to the CDI and to the Veterinary school in Nantes, France, to test with ELISA and immunoblotting.

Epizootic situation on some wildlife diseases in Russia.

Valery ZAKHAROV

SURVEILLANCE OF WILD ANIMAL DISEASES IN THE NETHERLANDS

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Diseases of wild animals do not rank high in the Dutch Governmental activities. The main aim of the Government is to prevent spread of anthropozoonoses (i.e. Rabies) and zoonotic diseases such as Swine Fever.
From 1960 on diseases of hunting game were examined on a weekly basis through a personal cooperation of Dr. J. van Haaften and myself, over a period of ± 15 years. Specimen, brought by hunters to the department for wild-life diseases from the Governmental Institute for Forestry and Nature Research (IFNR)(TNO) at Arnhem, were examined for gross pathology, bacterial and parasitic infections. The IFNR concentrated mainly on survey and regulation of the number of game animals per surface area of habitat. The occurrence of disease was one of the parameters. The results of the pathological examinations were combined with data from literature and edited as a booklet, distributed by the pharmaceutic industries to all Dutch Veterinarians (Zwart 1970). Interesting cases and a survey of seasonal variations in the occurrence of *Yersinia pseudotuberculosis* in game, were separately published. With changing organisations and reduction in money, this activity gradually diminished.

A quite successful activity was this of the multidisciplinary Working Committee on Wild Bird Mortality. This group was located at the State Veterinary Laboratory and active from 1988-1991. Special attention was given to effects of pesticides and wild bird mortality caused by industrial activities (Botulism as a consequence of thermal pollution and anaerobic waters). Results have lead to a revision of National regulations in the use of pesticides. Here again reorganisation and financial problems reduced activities to isolated problems.

Isolated cases were examined at the various provincial Veterinary Institutes for the Health of Animals. Originally there were 11 of these Institutes. At this moment there are four of these Institutes, to be reduced to three. These laboratories are very well equipped but their main task is health control of farmed animals. Diseases of wild animals are haphazardly examined, results are not centralised and there is almost no tradition of publishing results.

Overall, management of wildlife is an activity mainly of private organisations concerned about the conservation of nature in the Netherlands. The role of hunters is marginal and restricted to hunting game.

Reference:
Zwart, P.: Ziekten van hert en ree. (Diseases of red deer and roe) Diergeneeskundig Memorandum **17**, no 2, 55-85 (1970).

POSTERS

Name	***Title***
Agrimi, Dr Umberto, et al, ITALY	Strandings of cetaceans on the Tyrrenian coasts of Italy: Possible relationships between pathology and tissue levels of contaminants
Alvaro, Gajón, SPAIN	Blood parasites of the lesser kestrel Falco naumanni: Preliminary results
Barrat, Dr Jacques, FRANCE	*Not specified*
Calvete, Carlos, et al, SPAIN	First results of sanitary managements for to recover wild rabbits populations in Spain
	Helminth parasites of wild red partridge (Alectoris rufa) in Spain. Preliminary results
Dedek, Dr Justus, GERMANY	Serologische Screenings als Überwachungs-methode
Durand, Dr Thierry & Gauthier, Dr Dominique, et al, FRANCE	Epidemiology of Brucellosis on Chamois (Rupicapra rupicapra)
Ferté, Dr Hubert, et al, FRANCE	Ashworthius sp. (Nematoda: Trichostrongyloidea) in autochtonous Cervidae in France
Henttonen, Dr Heikki, et al, FINLAND	Bordetella bronchiseptica in Microtus rodents during cyclic population declines
Laakkonen, Juha, et al, FINLAND	Pneumcystis carinii in wild small mammals in Finland
Marco-Sanchez, Ignasi, et al, SPAIN	Effects of capture and transport on some blood parameters in free-ranging mouflon (Ovis ammon)
Müller, Dr Thomas, et al, GERMANY	Prevalence of orthopox-specific antibodies in red foxes - A seroepidemiological survey in Brandenburg
Osácar-Jiménez, Juan José, et al, SPAIN	Ecology of rabbit fleas (Siphonaptera) as myxomatosis vectors in Ebro Middle Valley
Patigny, Dr Xavier, BELGIUM	Wild boar (Sus scrofa) epidemiological control

Trap, Danièle, et al, FRANCE	Leptospiral antibodies in wildlife mammals: Coypus, field mice, bank voles, wild boars, red foxes and red deers from different regions in France
Vaheri, Prof Antti, et al, FINLAND	Coevolution of hantaviruses with their primary rodent hosts

Additional posters

Baradel, Dr Jean-Marie, et al., FRANCE	Serological survey of brucellosis in free-living wild boars in France
Camin, A.M. et al., FRANCE	Fungal flora involved in medical or veterinary pathology and Salmonella carried by starlings (Sturnus vulgaris)
Gilot, Bruno et al., FRANCE	Potential role of the roe-deer in the ecology of the Lyme disease in France

STRANDINGS OF CETACEANS ON THE TYRRENIAN COASTS OF ITALY: POSSIBLE RELATIONSHIPS BETWEEN PATHOLOGY AND TISSUE LEVELS OF CONTAMINANTS.

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Stranding of cetaceans is a frequent phenomenon along the Italian coasts. Nevertheless, few investigations have been carried out both on the causes of such strandings and on the disease conditions observed in beached animals. An epidemic of Morbillivirus infection involving hundreds of striped dolphins (Stenella coeruleoalba) on the coasts of Italy in 1991, after a similar epizootic was recorded on the Spanish coasts in 1990, was recognized as the likely cause of these strandings. In order to investigate the role, if any, of certain contaminants in causing or conditioning the occurrence of disease in cetaceans, pathological examinations were carried out, along with tissue measurement of organochlorinated compounds (PCBs, 4-4'DDE) and heavy metals (Hg,Pb,Cd), on 14 cetaceans (11 striped dolphins, 2 bottlenose dolphins, 1 minke whale) found stranded, from 1991 to 1993, on the coasts of Latium (7) and Tuscany (7). Concentrations of PCBs, 4-4'DDE, and Hg ranged from 1.2 to 180 mg/kg, from 0.7 to 251 mg/kg, and from 68 to 4,900 mg/kg, respectively. Furthermore, morbilliviral encephalitis was immunocytochemically diagnosed in two striped dolphins found stranded on the coast of Tuscany in 1993 and which had high tissue levels of PCBs and 4-4'DDE. Interestingly, the one of these two animals which showed the highest levels of organochlorinated contaminants also had concomitant cerebral disseminated toxoplasmosis. Another notable case was an adult male minke whale (Balaenoptera acutorostrata) found stranded on the coast of Tuscany in 1993. An extraordinarily high level of Hg in the liver (4,900 mg/kg) was accompanied by the simultaneous occurrence of specific anti-morbilliviral neutralizing antibodies in the blood serum of this cetacean.
Finally, specific attempts were made to relate a peculiar type of intrahepatocytic inclusion observed in some of our investigated striped dolphins to the tissue levels of organochlorinated compounds in such animals. However, no apparent correlations were found between such substances and the above liver structures, which have been previously recognized in striped dolphins found stranded on the Spanish coasts during the 1990 morbilliviral epidemic.

BLOOD PARASITES OF THE LESSER KESTREL *Falco naumanni*: PRELIMINARY RESULTS

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The role that blood parasites can play in the sexual selection of birds and in their reproductive success is currently discussed. Parasite infections apparently do not cause any alterations in the normal life of the host, but situations of stress caused, e.g., on migrations or on reproductive effort provoke an inmunological fall that can either allow or facilitate infections.

Lesser Kestrel *Falco naumanni* is currently a world threatened species. As apart of a study on the reproductive and behavioural ecology of this species, we examined blood smears in search of parasites.

During 1993 and 1994, a total of 407 blood samples corresponding to 341 individual were analized, by means of routine techniques, for the accomplishment of this study. For this purpose all of them were captured in Los Monegros, NE Spain.

The first results show a low prevalence (less than 5%) since only parasites of the genus *Haemoproteus* were found.

Lacking only that these results are completed and compared with plumage coloration, body condition, reproductive status and reproductive effort of birds, everything seems to point at the little influence of these parasites on the reproductive cycle of the Lesser Kestrel.

SEROLOGICAL SURVEY OF BRUCELLOSIS IN FREE LIVING WILD BOARS IN FRANCE

Jean-Marie BARADEL [1], Jacques BARRAT [2], Bruno GARIN BASTUJI [3] and Yves GERARD [1]

In 1991, a serological survey was initiated in wild boars for classical swine fever and Aujeszky's disease. Most of the free living wild boars were also tested for the presence of antibodies to brucellosis.

Three techniques were used during this study:

complement fixation (CF) was positive with a 50% lysis for a dilution of 1 in 4
rose bengale test (RBT)
Wright agglutination test (WAT) was considered as positive over 30 IU

A specimen is considered positive either when the 3 tests are positive or when CF and WAT are positive or when RBT is positive and WAT is over 80 IU.

951 specimens collected in hunted wild boars were analysed between 1991 and 1993. 252 of them (i.e. 26.5%) were positive.

A similar study was published in 1988 concerning 217 specimens collected between 1979 and 1987 in a more restricted area. Only 8 (i.e. 4%) of these animals showed a positive result in the same tests, 6 of these 8 came from the same place and were sampled during the same year. So this phenomenon seems to be quite recent (at least since 1987).

The geographical correlation with *Yersinia enterocolitica* O9 serological reactions in cattle is presented.

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SURVEY OF TRICHINELLOSIS IN RED FOX IN FRANCE

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Since 1952, 15 outbreaks of human trichinellosis have been recorded in France involving 1875 persons. Most of these human cases (1769) were due to horse meat consumptionduring 5 outbreaks. The others had a wildlife origin (9 from wild boar and one from fox via a swine). These involved 106 persons.

MATERIAL AND METHODS

5457 red foxes which were submitted for rabies diagnosis between 1977 and 1993 were also tested for trichinellosis. The survey area comprised mainly rabies infected parts of France i.e. few specimens were analysed from the western part of France.*Trichinella sp.* were isolated by artificial digestion technique. It was experimentally established for the 2 species identified in France that the sensitiviy of isolation in temporal muscle was equivalent to that of the masseter muscle under our working conditions. Isolates were passaged in mice (200 larvae per os) and typed by the reference centre.

RESULTS - DISCUSSION

54 isolates were obtained, mainly from mountainous area (Alpes, Massif Central and Jura) between 260 to 1200 m. The prevalence in foxes was 1 to 10 %. Two species were identified: *Trichinella spirallis* and *Trichinella britovi.*

An experimental infection carried out in red foxes using *Trichinella spirallis* and *Trichinella britovi* showed that the parasite remains alive and infective for at least three years in the muscle. As 96% of free living red foxes are less then three years old, it can be assumed that once a fox is contaminated by Trichinella, it remains infective until his death.

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FIRST RESULTS OF SANITARY MANAGEMENTS FOR TO RECOVER WILD RABBITS POPULATIONS IN SPAIN.

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The wild rabbit (Oryctolagus cuniculus) is a basic prey in the Mediterranean ecosystem and a important small game piece, but since the occurrence of Myxomatosis and more recently the RHD (Rabbit Haemorrhagic Disease) their numbers have decreased significantly in Spain.

Because of this reason since 1991 the Veterinary Faculty of Zaragoza in collaboration with Regional Government is working in studies of management of wild rabbit populations as reintroductions and vaccination trials of myxomatosis and RHD.

For testing the efficacy of vaccination of RHD and Myxomatosis the technique of radiotracking was used. The adult wild rabbits were captured by ferreting and then marked with radiocollars. Half of these animals radiotagged were vaccinated with vaccine of myxomatosis (virus of Sanarelli) and inactivated vaccine of RHD. This permitted us to value the efficiency of the vaccination to increase the survival rate of the rabbits. Until the moment it has been able to test the high efficiency of the vaccine of RHD to reduce the mortality produced by this disease in adult rabbits. The vaccine of myxomatosis has not been effective to increase the survival rate of the adult rabbits during the myxomatosis outbreaks.

The study of reintroductions has been based on the most common restocking model followed in our country, destined to reinforce autochthonous existent populations by releasing of wild rabbits. Rabbits were caught with a large wire mesh, but all of animals suffered corneal erosions caused by rubbings and impacts with the mesh. These erosions were superficial and the damaged ephitelium regenerated itself (in a few hours); However, if the corneal ephitelium was seriously damaged, it suffered a keratinization, losing its transparency in a few days, and therefore the visual capacity of rabbits decreased.

A protocol of quarantine, before the release, was tried. This quarantine period (over 15 days) permitted the realisation of an hygienic and sanitary control of diseased rabbits (specially rabbits infected with mixomatosis and R.H.D.) and also allowed rabbits to recover their physiological condition. The rabbits released after have stayed in quarantine had a survival rate, to 7 months after of their release, four times upper to the survival rate of the animals released without quarantine.

HELMINTH PARASITES OF WILD RED PARTRIDGE (ALECTORIS RUFA) IN SPAIN. PRELIMINARY RESULTS.

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The red partridge (Alectoris rufa) is the most important small game piece in Spain. In the last years the wild populations of this bird have decreased in some localities of this country, and local and high mortalities are reported by hunters every year in spring and summer, specially in the centre and south of Spain.

Although true causes of this decreasing are unknown, some veterinarians have detected high infestations of helminths of genus Tetrameres in carcasses of dead found partridges and dying ones. These veterinarians suggest that intense infestations by this parasite and others genus of helminths can be the cause of high mortalities of young red partridges and the populations decreasing.

Because of this reason, since 1993 the Veterinary Faculty (University of Zaragoza) is working in a study about distribution and prevalence of helminth parasite species of red partridge in Spain.

At this moment 293 carcasses or digestive tracts (140 adults, 132 youngs and 21 undetermined) proceeding from several localities have been examined, and the estimated prevalence of Tetrameres spp. has been only about 0,46% . Other parasite species found in this study have been Acuaria hamulosa, Subulura suctoria, Heterakis gallinarum, Heterakis tenuicaudata, Capillaria contorta, Capillaria anatis, Trichostrongylus tenuis, Rhabdometra nigropunctata, Raillietina tetragona, Raillietina bolivari, Choanotaenia spp and a unidentified hepatic parasite (Class: Trematoda).

Only a few birds with intense infestations of Rhabdometra nigropunctata, Subulura suctoria and hepatic trematodes have been found.

It is necessary to continue with this study and to increase the sample size for to know the importance of helminth parasites in populations dynamic of red partridge in Spain.

FUNGAL FLORA INVOLVED IN MEDICAL OR VETERINARY PATHOLOGY AND SALMONELLA CARRIED BY STARLINGS (*STURNUS VULGARIS*).

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Interest about starlings (*Sturnus vulgaris*) raised with their increasing number in France during the winter and their trend to settle in cities. Farmers fear that they may transmit illnesses (especially salmonellosis) to cattle, and in cities, people worry about the pathogenic agents they may carry. These are the reasons why a multidisciplinary research program was conceived in order to study pathogenic agents carried by starlings.

The study was performed with one hundred birds from a country roost in Britany and a few birds living in the city of Rennes (Britany, France).

A first approach concerned digestive tract *fungi*. Two samples were taken from each starling : one in cloaca, the other in gizzard. We listed the 650 yeasts colonies isolated and identified them by their ability to assimilate carbon sources (ID 32 C system, bioMérieux SA, 69280 Marcy-l'Etoile, France).

Candida albicans was the main isolated species, present in 62 of the 108 starlings. A typing study by multilocus enzyme electrophoresis showed that birds generally carry the same *C. albicans* strain in the two digestive levels studied.

Candida lambica was frequently identified too, but is not considered as a pathogen.

Various other yeasts, such as *Candida krusei*, *C. glabrata* were represented in lower rates.

No *Cryptococcus neoformans* was found in any bird.

We also looked for keratinophilic *fungi* in feathers. 29 starlings provided 37 isolates : 13 *Chrysosporium keratinophilum*, 5 *C. pannorum*, 2 *C. aspartum*, 1 *C. tropicum*, 2 *C.* anamorph of *Arthroderma tuberculatum*, 1 *A. cuniculi*, 11 *Scopulariopsis brevicaulis* and 4 real dermatophytes, *Trichophyton terrestre*.

These yeasts and keratinophilic *fungi* can be pathogen for mammals and birds but we do not know their impact on starlings health.

Salmonella were also looked for and 8 starlings were found to carry *S. enterica*. Serotypes were : Heidelberg (2), Montevideo (2), Bredeney (1), Infantis (1), Rechovot (1) and Tshiongwe (1).

Serologische Screenings als Uberwachungsmethode.

Justus **DEDEK**

(Poster)

Serological Screenings as a Monitoring Method

(J. Dedek)[1)]

Within the framework of systematic and regular health monitoring of wild game, serological screening is of great importance as a method for checking and determining risk factors, especially the causes of infections. The number of the random samples is to be set so as to guarantee the certainty of the result, which depends on the epidemiological meaning and the expected diffusion of the tested infection.

For measuring the random samples, the so-called **"Rostocker Random Sample Key"** has proved a succes. To determine the size of the sample, the following formula is used:

$$n = p \cdot \sqrt{N}$$

Here **n** is the size of the sample, **N** is planned annual kill of the animal being tested and **p** is the factor for the exactness of the test. P is relative to the size of the kill as follows:

3 - 50	animals	2
51 - 100	animals	1,5
more than 100	animals	1

An example for calulating the size of the sample test:

N = 60

p = 1,5

n = 1,5 60 = 12

In the case of exceptional epidemiological questions, which require a high degree of certainty, the factor p can lie above 2 (e.g. to check the epidemic status of hog cholera in wild boar, the oral vaccination of fox for rabies, the echinococcosis of the fox). This key, with all the weaknesses of a set formula, has as priorit, the estimation of various species populations with enough accuracy, but reasonable expenditures. The following points are to be considered:

1. The determined test group size applies to material fitting for examination as far as possible adult animals (over 6 months old). The degree to which the serum is fitting for examination is an expression of the serums quality. The feasibility of complement fixation test can be used as criterion. With the proper attitude and organisation, enough material fitting for examination can be collected within a relatively short time and modest cost.

2. The principle of complete coverage is to be followed. Through negligence, hidden nosoareas take away from the clarification.

3. The factor p is determined, for the most part, by two subelements:

- the size of the basis
- the epizootic situation.

Both of these subelements are to be considered separate from each other. If a hunting club has planned to shoot for example 60 wild boars, then a yearly test group of 60 is possible. Because this annual kill is over 50, the factor p 1,5 is to be used.

This results in a sample group of 12. Under the presumption that the epizootic situation is well enough know and there are no characteristics do to possible risks, this sample size is sufficient for a yearly survey, particulary since in about three years a test group will be achieved, which corresponds to the spring population required for reproduction. Should epidemiological characteristics reveal themselves, which must be considered as risk factors (high domestic animal concentrations, suspicious cases or the identification of epidemies in domestic populations, risk areas, the appearance of zoonosis, the discovery of perish wild animals, which cant be sufficiently explained, etc.), then the factor p must be raised irrespective of the number of the sample group originally calculated, if required, even to the number of the entire kill.

In principle, with the help of the "Rostocker Random Sample key", it is possible to carry out pathomorphological, parasitological, chemical and field examinations of toxicological-analytical residues as well as direct proof of infection causing microbial exciters on the organs and tissues of the animals of hunting kills.

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Epidemiology of brucellosis on chamois (Rupicapra rupicapra)

Thierry **DURAND, Dominique GAUTHIER et al.**

(poster)

Ashworthius sp. (Nematoda: Trichostrongyloïdea) in autochtonous Cervidae in France.

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Ashworthius spp. belong to the Haemonchinae and so often obviously misidentified as *Haemonchus contortus* wich belongs to the same subfamily.

In order to avoid such a confusion we give some differential characters of the two genera.

Studying the helminthofaune of roe deer (*Capreolus capreolus* L.) and red deer (*Cervus elaphus* L.) in different parts of France, we identified *Ashworthius sp.* not only in *Cervus elaphus* but also in *Capreolus capreolus* (first report). Two species were identified in both hosts:

- *Ashworthius sidemi* Schulz, 1933, described from Sika nippon (Pseudaxis hortulorum) in Mont Altaï and latter report in the same host introduced to Czechoslovakia,
- *Ashworthius gagarini* Kostyaev, 1969, described in the same locality from *Cervus elaphus sibericus*.

The question is: Where the *Ashworthius* of french deers are coming from? We suggest that this parasitism is a consequence of introduction of sika deer in France in 1890.

POTENTIAL ROLE OF THE ROE-DEER IN THE ECOLOGY OF THE LYME DISEASE IN FRANCE

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Several authors recently tried, in different european countries, to determine whether the roe-deer (*Capreolus capreolus*) or other wild ungulates may act as reservoirs for the Lyme disease spirochete, *Borrelia burgdorferi*. They all concluded that these mammals do not serve as major reservoirs for the bacterium. But these large hosts feed adult female ticks as well as immature stage. This fact may have an epidemiological incidence. The aim of the study was to precise the role of this host in supporting and overspreading tick vectors on the French territory.

The tick fauna was studied, during the hunting periode (september-october) by two ways: whole examinations of 100 roe-deers, killed in 15 departments of Southern France, examinations of some body parts of the cervid which favour the fixation of the tick-vector ; only immature stages were collected on 400 pairs of feet ; only adults were picked up from 103 heads of roe-deers. This research took place in 3 departments representative of the various climatological conditions of the study area (Dordogne, Tarn: subatlantic climate ; Loire : more continental climate). Seven tick species parasitized roe-deer : *Ixodes ricinus, I. hexagonus, Dermacentor reticulatus, D. marginatus, Haemaphysalis punctata, H. inermis, H. concinna*. Comparative data were obtained for 6 other species of large game mammals inhabiting the forests. *Cervus elaphus* and *Capreolus capreolus* harboured the same tick-fauna. Among these ticks 4 have been discovered to be naturally infected by *B. burgdorferi* in Western Europe : *I. ricinus, I. hexagonus, D. reticulatus, H. inermis*. The ability of ticks to acquire, maintain and transmit *B. burgdorferi* was determined experimentally for 2 of these ticks only : *I. ricinus, I. hexagonus*. For *I. hexagonus, C. capreolus* seems to be only an accidental host, without epidemiological signifiance. *I. ricinus* was the commonest tick infesting roe-deer in the Southern France (except in the Mediterrenean area), representing 93 % of the adult tick picked up during thorough examinations of this host.

Tick limited samplings showed that an important fraction of the roe-deer populations was infested by the species. In Loire, 58 % of the roe-deer heads were parasitized by adult ticks. Each of the 7 ecological units we have distinguished was infested by *I.ricinus*. In Dordogne, 2 ecological units have been studied (hind feet). The rates of infestation by *I. ricinus* are 32 % and 56 %. Only a part of the host was examined ; the season of the study was not the most propitious (autumn is less favourable to the tick development than spring): one can presume that the percentages of infested animals are underestimed.

These results allow us to postulate that large populations of *I. ricinus* can be spread in the French forests by this particular host which is the more common large game ungulate in our country, even if the different plant groupings are favourable to the tick development. A recent study (Gilot *et al* 1994) has evidenced that most of French vegetation series are propitious to the tick. Game management in the last decades had induced a large increase of roe-deer populations in most of French regions. Consequent risk infection can increase as well.

COEVOLUTION OF HANTAVIRUSES WITH THEIR PRIMARY RODENT HOSTS

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Hantaviruses are enveloped, negative-stranded RNA viruses with a tripartite genome belonging to the family *Bunyaviridae*. Each hantavirus is carried primarily by a different, persistently infected rodent or insectivore host which can also transmit the virus to humans. To date the following hantaviruses have been characterized [carrier host given in square brackets]: Hantaan (HTN) [*Apodemus agrarius*], Dobrava [*Apodemus flavicollis*]. Seoul (SEO) [*Rattus rattus* and *Rattus norvegicus*], Thailand [*Bandicota indica*], Puumala (PUU) [*Clethrionomys glareolus*], Prospect Hill (PH) [*Microtus pennsylvanicus*], Sin Nombre (SN) [*Peromyscus maniculatus*] and Thottapalayam (TPM) [*Suncus murinus*] viruses. When transmitted to man, HTN, SEO and PUU are known to cause the different forms of hemorrhagic fever with renal syndrome (HFRS) with approximately 200 000 cases worldwide occurring annually. Puumala virus, which we found 15 years ago, and its host are widely spread in most of Europe causing nephropathia epidemica (NE) in man characterized by fever, headache, backache, diarrhea, vomiting and acute renal failure and occasionally myopia with low mortality (≈ 0.2%). Also HTN and SEO viruses and the more severe forms of HFRS caused by them have been reported especially from southeast Europe. SN is widely spread with its host in North America and is the etiologic agent of a deadly disease (mortality 53%) hantavirus pulmonary syndrome (HPS). Serologically and genetically HTN, SEO and DOB carried by *Murinae* rodents, are closely related to each other, while PUU, PH and SN, carried by *Arvicolinae* rodents, form another closely related group.

With a polymerase chain reaction approach, we have recently found a new hantavirus from Tula, south of Moscow, designated as Tula virus, in *Microtus arvalis* and *Microtus rossiameridionalis*, which according to sequencing data and phylogeny most closely resembles PH, an isolate from another Microtus species, *Microtus pennsylvanicus* from North America. These data suggest that the ancestor of all hantaviruses infected already the early ancestor of all rodent species and coevolved with its host without the virus being able to cross permanently the species barrier. The data available for an insectivore hantavirus TPM showing that this virus is distant from all rodent hantaviruses as well as reports of phylogeny of *Cricetinae* rodents from North America are in line with this theory.

We have also sequenced the small RNA segment of Puumala viruses from various locations in Finland and Russia. The sequence analyses show two different, more recent ancestors of these groups of viruses and a correlation of genetic variation with the geographical origin of the strains.

Many rodent and insectivore species have not yet been studied for the presence of hantaviruses. We have preliminary evidence that also *Lemmus lemmus* and *Microtus agrestis* are carriers of hantaviruses.

BORDETELLA BRONCHISEPTICA IN MICROTUS RODENTS DURING CYCLIC POPULATION DECLINES

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Microtine (arvicoline) rodents undergo strong population fluctuations in northern Europe. Due to several reason it is obvious that these fluctuations (cycles) are caused by extrinsic factors. Predation and food have primarily been in focus.

We have studied diseases and parasites in small mammal fluctuations over several cycles. This enables us too see if there is something general being repeated from population decline to another. Here we report results on the bacterium Bordetella bronchiseptica which is the most common bacterial pathogen in the peak - declining Microtus agrestis populations. Next in prevalence, although sporadic, is Listeria monocytogenes which also could cause mortality.

In the autumn - winter periods during the peak - decline phases the prevalence of Bordetella varied from 0 to 79%. Two declines in the same region at three year interval were different. In the first time, early winter was characterized by high prevalence, but later in the winter prevalence was quite low. In most samples voles (16-90%) showed signs of increase of pulmonary lymphoid tissue. Some voles brought into lab during the late decline died rapidly because of Bordetella infection. In another population at the same time, the last voles during the decline were dying mostly because of Bordetella. During the following population peak, prevalence of Bordetella remained quite constant (40-50%) through the winter, but we did not observe mortality caused by it.

Our results show that diseases can contribute to the population declines of cyclic microtine rodents, but obviously the role of diseases or the role of a single disease agent can considerably vary from one cycle to another. This may be related to food situation, severity of the winter and quality of snow.

PNEUMOCYSTIS CARINII IN WILD SMALL MAMMALS IN FINLAND

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Pneumocystis carinii is a pulmonary pathogen causing a fatal pneumonia in immunocompromised hosts. Subclinical P. carinii infection occurs in apparently healthy laboratory rats. We summarize here the results of our studies of the prevalence of P. carinii in wild small mammals in Finland. The results indicate notable differences between small mammal species in susceptibility to P. carinii. In shrews of the genus Sorex, the interspecific differences in prevalence seem to be related to the size of the hosts. We found the prevalence to be exceptionally high (40 to 70%) in S. araneus (n=227) compared to the smaller shrews (S. caecutiens 17%, n=60; S. minutus 0%, n=46) and wild mammals in general. In microtines, we observed seasonal changes in the prevalence of P. carinii in Microtus agrestis (n=428), the peak in prevalence occurring in November (10% to 30%). In contrast, we found only two P. carinii positive Microtus oeconomus (n=167), and no sign of P. carinii infection in Clethrionomys glareolus (n=37 in southern Finland and n=406 in northern part of the country), in Myopus schisticolor (n=31) nor in Lemmus lemmus (n=35, trapped in Norway). We detected interspecific differences in prevalence of P. carinii also in mice (21% in Micromys minutus; n=62 and <6% in Apodemus flavicollis; n= 54). We suspect that the species specificity of P. carinii is the main cause for the interspecific differences in prevalence of P. carinii detected in wild small mammals.

EFFECTS OF CAPTURE AND TRANSPORT ON SOME BLOOD PARAMETERS IN FREE-RANGING MOUFLON (*Ovis ammon*)

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Blood parameters (hematological and biochemical) are indicators of alteration on animal homeostasis during capture in wild ungulates. However, limited data are available in the literature on blood parameters and on the influence of capture and transport in mouflon (*Ovis ammon*).
This study deals with the incidence of capture and transport on some blood parameters in 12 free-ranging mouflons, 4 young between two and three months and 8 adult, captured in the National Hunting Reserve of Freser-Setcases (NE Spain). An enclosure-trap was used for capture, baited with salt. Blood samples were taken immobilizing the animals by physical restraint. After 9 hours of transport, blood samples were taken again by physical restraint at the Wildlife Rescue Centre of Lleida, 300 km south from the capture site.
Significant differences were observed between the young and adult group in some of the hematologic and serum biochemistry values. The erythrocyte count, hematocrit, hemoglobin and alkaline phosphatase (AP) in the young group were significantly higher than in the adult one, while total protein was lower.
Significant differences on some of the hematological parameters were observed after transport in the adult group, but not in the young one. Differences were observed in the erythrocyte count, hematocrit, hemoglobin, lymphocite count and total platelet count, which were significantly lower after transport than at capture. However, the mature neutrophil count was significantly higher after transport.
Also, some biochemical parameters showed significant differences after transport in the adult group. Aspartate amino transferase (AST), alanin amino transferase (ALT), creatine phosphokinase (CK), lactic dehydrogenase (LDH) and total bilirrubine were significantly higher after transport than at capture, while glucose, cholesterol, creatinine and alkaline phosphatase (AP), were lower.
The variations observed in the young group were similar to the ones of the adult group, however they were not significant, may be because of the small size of the group.

PREVALENCE OF ORTHOPOX-SPECIFIC ANTIBODIES IN RED FOXES - A SERO-EPIDEMIOLOGICAL SURVEY IN BRANDENBURG

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Orthopox viruses are widespread in domestic and free-living animals. Domestic animals like cats and dogs as well as zoo animals would be final hosts in the chain of transmission. Using molecularbiological technics, these viruses were identified to be cowpox virus. Their natural reservoir has already been postulated in small rodents. This hypothesis has been supported by several serological surveys and by virus isolation. However, epidemiological aspects in wildlife are until now poorly understood. Because of its special nourishment the red fox (Vulpes vulpes) might to be a possible member of this infectious cycle knowing that its preferred food consists of rodents.

First circumstantial evidence was yield in a preliminary study carried out in a 5,000 sq.km covering investigation area in the north of Germany. Fox serum samples were obtained from a serum bank established at the Institute for Epidemiological Diagnostics Wusterhausen of the Federal Research Centre for Virus Diseases of Animals and were exactly registered in view of their spatial and temporal origin. Screening of serum samples for orthopox-specific antibodies was performed in a blocking-ELISA using a genus-specific mAb. Out of the 703 fox serum samples orthopox-specific antibodies were found in 6.5% on average. Specificity was proofed by plaque reduction test(PRT) and Western Blot. In order to verify these results and to get more information concerning the spatial distribution of possible natural foci investigations were extended to neighbouring areas on a large scale. Serum sample size was statistically based on the prevalence found previously for populations with unknown density. The spatial distribution pattern of communities involved in the screening and of findings within the area under investigation is analysed. The etiology is not clear, because there exist three possible hypotheses. It is however the first time showing an immune response to orthopox viruses in free living red foxes (Vulpes vulpes), which is not related to oral vaccination campaigns with vaccinia rabies recombinant virus. The work will continue with increased attemps in view of virus isolation from red foxes as well as from small rodent populations in predestined areas.

ECOLOGY OF RABBIT FLEAS (SIPHONAPTERA) AS MYXOMATOSIS VECTORS IN EBRO MIDDLE VALLEY.

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Fleas have been often considered important myxomatosis vectors in many wild rabbit populations. In Zaragoza's Veterinary Faculty some researches on rabbit fleas are being carried out. The ecology of all these species has been studied in two locations at Ebro Middle Valley. Besides, some of them are being bred in laboratory to know more on their ecology and to test their resistance and susceptibility to several insecticides in vitro. On the other hand, some insecticide field tests are being performed in order to determine the efficacy of some products in the rabbit burrows.

2.669 fleas collected in two locations have been classified into 5 species: *Spilopsyllus cuniculi* (35,96 %) and *Xenopsylla cunicularis* (34,09 %) are the commonest, whereas *Caenopsylla laptevi* (15,17 %) and *Echidnophaga gallinacea* (14,68 %) have been found regularly, and only a few specimens of *Pulex irritans* were picked up.

We have noticed differences among the relative abundance of flea species in every sampling location. Because of the semiarid climate, *S.cuniculi* (12,68 %) is not the predominant one in Finca Arpal where *X. cunicularis* (29,68 %), *E. gallinacea* (29,76 %) and *C. laptevi i*(27,77 %) -more adapted to dryness and high temperatures- are the main species. Equally, *X. cunicularis* (72,94 %) is nearly three times more common than *S. cuniculi* (26,30 %) in Almudévar. Not only climate, but also soil texture in burrows may explain these differences. So, Almudévar, a more humid and colder location, occupies a lime soil, whereas in Finca Arpal, where relative humidity in the burrows may fall below 60 %, the substratum is constituted by terrace soil.

*C. laptevi i*shows a strong seasonality. Absent during summer months, it is first collected in Septemeber-October when rabbits are found carrying up to 19 fleas each (mean). Numbers fall slowly from these months to March, and in following months practically no fleas are picked up.

S. cuniculi, another winter species, depends completely on rabbits breeding season. So, pregnant female rabbits (since December) usually hold up large numbers of fleas.

E. gallinacea and *X. cunicularis* - the commonest one in burrows- are summer species, but they do not show such a pronounced seasonality.

WILD BOAR (SUS SCROFA) EPIDEMIOLOGICAL CONTROL

IN THE BELGIAN LUXEMBOURG.

(Dr. PATIGNY X. A.C.S.A., rue Victor Libert 32 - 6900 MARCHE, BELGIQUE)

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S U M M A R Y O F T H E P O S T E R

In 1993, in a Hog cholera context, 152 wild boars have been sampled in the province of Luxembourg in Belgium.

Animals have been tested to investigate the Hog cholera, the visicular disease, the Aujeszky disease, the Brucellosis and the Trichinellosis.

For each disease, the results of each tests are showed in extenso.

LEPTOSPIRAL ANTIBODIES IN WILDLIFE MAMMALS : COYPUS, FIELD MICE, BANK VOLES, WILD BOARS, RED FOXES AND RED DEERS FROM DIFFERENT REGIONS IN FRANCE.

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Leptospirosis is a worldwide distributed zoonosis which may take on a variety of forms and degrees of intensity. It affects most domestic and wild animals, mainly mammals, as well as human beings. Two chiefs factors are involved in the epidemiology of leptospirosis : Firstly, many wild species have long been recognised as potential reservoirs of infection. Pathogenic leptospires usually occur in the kidneys of the infected hosts which serve as carriers and persistently excrete leptospires in their urine, thereby contaminating the environment. Secondly, survival and dissemination of the organisms are facilitated by water when conditions are favourable. But, if universal role of field rodents is well known, comparatively little is known about the importance of other wild species in these two process, transmission of the organism and contamination of the environment.
The study reported was carried out to investigate the extent of leptospiral infection in some wild species, the serovars involved and eventually to assess their role in epidemiology.
Serum samples from 95 coypus (Myocastor coypus), 96 field mice (Apodemus sylvaticus), 73 bank voles (Clethrionomys glareolus), 98 wild boars (Sus scrofa), 52 red foxes (Vulpes vulpes) and 33 red deers (Cervus elaphus) from various regions, were tested by microagglutination test (MAT) using representative strains in France. All species, excepted coypus, were studied against L. icterohaemorrhagiae, grippotyphosa, australis, pomona, tarassovi, canicola, sejroe, hardjo, autumnalis and ballum. For coypus, L. hebdomadis, pyrogenes and panama were put in place of pomona and tarassovi. All sera causing agglutination of 50 percent or more organisms at a final dilution of 1:100 were considered as positive.
Antibodies were present in 47,3% of coypus, 34,4% of field mice, 9,6% of bank voles, 67,3% of wild boars, 28,9% of red foxes and 21,2% of red deers. L. icterohaemorrhagiae is mainly involved in coypus and wild boars. For other species, any serovar was predominant. When possible, the role of sex and age was studied. But, there is not always a direct correlation between antibodies level and the role as vector in the epidemiology of leptospirosis because many chronic infected animals are seronegative but excrete leptospires. It must not be overlooked that the close proximity to other wild or domestic animals (and humans), the life in wet and damp place and the abundance of the wildlife reservoir are important factors. The role of wild species studied here is discussed.

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