



PARATUBERCULOSIS OR JOHNE'S DISEASE

ANIMAL GROUP AFFECTED	TRANSMISSION	CLINICAL SIGNS	FATAL DISEASE ?	TREATMENT	PREVENTION & CONTROL
Ruminants	Faecal-oral	Chronic or intermittent diarrhoea, wasting away	Yes	None available	<i>In houses</i> Good hygiene <i>in zoos</i> Quarantine and regular screening

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Susceptible animal groups Although most information from clinical and experimental infections concerns domestic animal species, presumably all domestic and wild ruminants are susceptible. Reports exist of infection in water buffalo, white-tailed deer, red deer, roe deer, elk, bison, bighorn sheep, Rocky Mountain goat, aoudad, mouflon sheep, camel, mountain goat, reindeer, antelopes, yak, moose. The tylopods llama and alpaca can also be affected by this disease. But also monogastric animals can be receptive. Horses and pigs can be infected experimentally with development of intestinal lesions. Rabbits, mice, hamsters and guinea pigs are used as laboratory animals. Wild rabbits in Scotland have been shown to harbour these mycobacteria in their lymph nodes and intestines. Other nonruminant wildlife species infected in Scotland include small carnivorous mammals as well as carrion-eating birds and rodents. Also, two reports of infection in nonhuman primates (mandrill and stump-tail macaque) exist.	
Causative organism The etiological agent of paratuberculosis is <i>Mycobacterium avium subspecies paratuberculosis</i> (MAP). In the past the organism was known as <i>Mycobacterium paratuberculosis</i> or <i>Mycobacterium johnei</i> . It is an acid-fast small bacillus that can appear gram-positive. It is closely related with, but distinctly different from <i>Mycobacterium avium</i> , which causes avian tuberculosis. MAP requires mycobactin for its growth, which is relatively slow in culture media. In the environment MAP is relatively resistant to adverse influences and can survive for many months in faeces, soil and water.	
Zoonotic potential The discussion about involvement of MAP in human Crohn's Disease is still going on. The isolation of MAP from Crohn's Disease patients is rare. Evidence to support an etiological role for MAP in Crohn's Disease is for the moment still lacking. It is clear that if MAP is involved in human disease it is only one of the factors and that genetic and immunological elements play a significant role.	
Distribution This disease has a worldwide distribution. It appears to be more prevalent in temperate and wetter areas than in hotter and drier ones and usually occurs in regions with high cattle density.	
Transmission Both vertical and horizontal transmission exists. Although intrauterine infection can occur either because of an infected mother or because of infected semen or male genitalia, the faecal-oral route is most important. Horizontal transmission by ingestion of contaminated feed and water by the faeces of an infected animal that is excreting MAP remains most important.	
Incubation period In cattle it can take up to 2 - 5 years for first symptoms to appear. However, in captive wild animals it can occur also in young animals in which the incubation period can be much shorter (4 - 5 months).	
Clinical symptoms Chronic or intermittent diarrhoea that is unresponsive to treatment is the main clinical symptom in cattle. When diarrhoea becomes less prominent the animal appears to recover. In the case of prolonged protein-losing enteropathy the animal loses weight and wastes away. Sheep, goats and many exotic ruminants may not show real diarrhoea, but only softer faeces. However, they can also appear unhealthy with chronic weight loss.	
Post mortem findings In advanced cases macroscopic thickening of the intestinal mucosa is present in the lower part of the small intestine (especially in ileum) along with enlargement of the associated mesenteric lymph nodes. The intestinal	



wall is diffusely thickened and the mucosa shows transverse folds or corrugations. These lesions can also be found in the jejunum, caecum or colon. Pathological changes of intestine and / or lymph nodes can vary between animal species and individuals.

Diagnosis

Anamnesis and clinical signs are only suggestive for paratuberculosis and differential diagnosis includes other chronic wasting diseases. A definitive diagnosis can be made by demonstrating MAP. Serology can also be very helpful.

1. Direct methods: detection of the organism.

a) Smears

Mucosal scrapings or faecal smears can be examined by Ziehl-Neelsen staining, but only in the case of heavy shedders clumps of organisms can be found.

b) Culture

MAP is a very slow grower and culturing can take up to six to eight months. A radiometric culture with BACTEC can detect infection in 4 - 8 weeks and has a sensitivity of about 50 %, but is 100 % specific.

c) Histology

Histopathological examination of intestine and lymph nodes can reveal acid-fast bacilli in macrophages or giant cells.

d) Polymerase Chain Reaction (PCR)

By far the most rapid test is the polymerase chain reaction to detect the specific insertion sequence IS900 of MAP. PCR diagnosis takes just a few days, but although 100 % specific, the test has a low 8 – 33 % sensitivity. Recently, IS900-like sequences have been reported in other mycobacteria. Therefore, a second assay on the f57 sequence was developed. The combination of the two PCR assays has proven to be useful for the identification of MAP, but validation on a large range of clinical samples still needs to be done.

2. Indirect methods: detection of reaction against the organism.

a) Serology

Different types of serological tests for the detection of antibodies are used with varying sensitivity and specificity, but they all score low in subclinical cases. Complement fixation (CF), agar gel immunodiffusion (AGID) and enzyme-linked immunosorbent assay (ELISA) are the most known techniques.

b) Cell Mediated Immunity

The delayed-type hypersensitivity skin test with intradermal Johnin is unreliable because of minimal skin reactivity in most animals. A gamma-interferon stimulation test is helpful for identification of animals with early infection, but becomes unreliable when animals progress towards an anergic state. A lymphocyte stimulation test in deer has a sensitivity of 95 % and a specificity of 92 %, but in other species these figures are unknown.

c) Histology

Localized or diffuse granulomatous changes with accumulation of macrophages in the intestinal lamina propria and submucosa or lymph node cortex are suggestive of infection with MAP.

Material required for laboratory analysis

Faeces, serum, lymph node, intestine (ileum).

OIE Reference Laboratories

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Relevant diagnostic laboratories

1. CODA, Groeselenberg 99, 1180 Brussel, Belgium
2. ID/DLO Lelystad, P.O. Box 65, 8200 AB Lelystad, the Netherlands

Treatment

Today an effective etiological treatment is not available. Only supportive and symptomatic treatment can be initiated.

Prevention and control in zoos

Routine screening of all susceptible animals with radiometric culture and an ameliorated PCR assay in the future will be important to assess the real prevalence in a zoo population. Identifying subclinical carriers before entering the population will be most important. Isolation of infected animals with strict hygienic and zotechnical measures is necessary to have a chance of eradication of this disease. Contaminated pastures should be kept free of susceptible animals for at least one year. Contaminated enclosures should have the topsoil replaced.

Suggested disinfectant for housing facilities

MAP is resistant to many disinfectants, but among those that are effective belong formaldehyde, phenol, cresylic disinfectants and calcium hypochlorite. Generally, any disinfectant with tuberculocidal activity can be used.

Notification

Guarantees required under EU Legislation

Guarantees required by EAZA Zoos

Measures required under the Animal Disease Surveillance Plan

Measures required for introducing animals from non-approved sources

Measures to be taken in case of disease outbreak or positive laboratory findings

Conditions for restoring disease-free status after an outbreak

Contacts for further information

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