GV-SOLAS
Gesellschaft für Versuchstierkunde
Society for Laboratory Animal Science

Expert Information

from the Working Group on Hygiene

Implication of infectious agents on results of animal experiments

Clostridium piliforme

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Contents

Clostridium piliforme
(formerly *Bacillus piliformis*)

Background

- Disease first time was observed in waltzing mice; description of the infectious agent as *Bacillus piliformis*.[1]
- Renamed on the basis of 16S rRNA sequence analysis to *Clostridium* (*C.*) *piliforme* by Duncan et al.[2]

Prevalence

- During the period 2000-2003, the prevalence of antibodies to *C. piliforme* in laboratory rats in Western Europe was still high (65% of samplings), whereas it was low (4% of samplings) in mice.[3]
- Seroprevalence in wild rats from the Island of St. Kitts, West India could be found in 18.2% of tested sera.[4]

Host species

- A broad range of laboratory, domestic, wild mammalian species, and birds[1,5-12]

Properties

- Obligate intracellular spore-forming bacterium
- Spores have been found to survive in bedding for at least one year.[1]
- Spores can survive multiple cycles of freezing and thawing.[13,14]
- Spores are highly resistant to formaline.[15]
- Relatively sensitive to heat and certain chemical disinfectants[15,16]

Susceptibility

- Depending on genetic factors of the host[17,18,19], e.g., DBA/2 mice are susceptible and C57BL/6 mice are resistant to Tyzzer's disease[18]; the Mongolian gerbil is susceptible to different strains of *C. piliforme*.[20,21]
- Other factors predisposing to the disease include young age, immunosuppression, overcrowding, poor sanitation, and experimental procedures that may compromise the immune response.
- Isolates of different origin show heterogenicity (e.g., protein and antigenic differences) and host specificity.[22-24]

Organotropism

- Liver
- Heart
- Intestine
- Rarely in central nervous system

Clinical disease

- Ruffled hair coat, anorexia and watery diarrhea of different severity[14]
- Distended abdomen (megaloileitis) in affected rats[25]

Pathology

- Inflammation of the ileum and large intestine[7], ulcerative colitis in rats[26]
- Focal necrosis in the intestine, liver and/or heart[8]
- Mesenteric lymphadenopathy
- In rabbits, most common findings are patchy mucosal necrosis in the caecum and proximal colon, oedema and subperitoneal haemorrhages at the ileocaecalcolic junction.[14]
- Brain lesions in experimentally infected *Mystromys albicaudatus*[27]
- Brain lesions in a newborn marmoset[9]
- Development of encephalitis in a weaver bird[11]

Morbidity and mortality

- Up to 50% mortality of weanlings in rabbit colonies[5], up to 85% weanlings in gerbil colonies and up to 18% of adult gerbils[6]
- Some isolates produce cytotoxins which may contribute to the severity of the disease.[28,29]
- One mortality event of a muskrat (*Ondrata zibethicus*)[30]

Zoonotic potential

- Unclear; one case of infection in a human patient with immune suppression has been reported.[31]

Interference with research

- Natural infection of laboratory mice and rats could severely alter the findings of studies involving the cardiovascular, enterohepatic, and lymphoreticular systems as well as studies requiring immunosuppression (e.g., transplantation studies)[32]
- Alters serum level of hepatic enzymes[33]
- *C. piliforme* can cause mortality in breeding colonies[1,5]

Oncology

- Tyzzer's disease was observed for the first time during tumor transplantation studies in mice[1]

Teratology

- No data

Infectiology

- Lower susceptibility to experimental arthritis caused by *Yersinia enterocolitica*[34]

Immunology

- Elevations in serum levels of IL-6, IL-12, TNF-α, and IFN-γ[18,35,36]

- Elevation of hepatic IL-12 p40 mRNA level[18]
- Depletion of either neutrophils or macrophages in juvenile DBA/2 mice (naturally susceptible) or C57BL/6 mice (naturally resistant) increased severity of infection with *C. piliforme*. In adult mice depletion of natural killer cells significantly increased severity of Tyzzer's disease in the resistant (C57BL/6) but not in the susceptible DBA/2 strain.[37]

Interactions with other infectious agents

- In kitten, *C. piliforme* and *Felid Herpesvirus 1* seem to concure.[10]

Toxicology

- Alteration of the pharmacokinetics of warfarin and trimethoprim[38]
- Cortisone and irradiation have activating effect on the disease.[14,32]

Physiology

- Alteration of the activity of hepatic transaminases[33]

Cell biology

- No data

Assisted reproductive technology

- No data

Special considerations

- *Clostridium piliforme* is an obligate intracellular parasite forming spores. It does not grow on cell-free media. Cultivation in cell lines and embryonated eggs is possible.[24,39]

Actualized by Brunhilde Illgen-Wilcke, Liestal Schweiz, July 2021

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