

Rodent *Helicobacter* Infection

Agent, Species: *Helicobacter hepaticus*, *H. bilis*, *H. rodentium* and *H. "typhlonius"* are species of *Helicobacter* that cause disease in laboratory mice. Helicobacters are Gram-negative, microaerophilic spiral motile bacteria.

Host: Mouse.

Transmission: Fecal-oral route. Helicobacter in rodents normally colonize the lower intestinal tract, and can be transmitted to naive mice through contact with feces-laden bedding. *H. hepaticus* and *H. bilis* are also capable of colonizing bile canaliculi in susceptible mouse strains. Other rodents, including rats and hamsters, can be colonized by these helicobacters, but do not develop disease. However, these infected rodents may act as reservoirs of bacteria in animal facilities.

Clinical Signs: Most mice colonized with helicobacters remain asymptomatic for long periods of time. Certain strains of mice will develop a proliferative, inflammatory typhlitis and/or colitis that may result in rectal prolapse.

Pathology: Mouse genotype, age, gender, and the bacterial species all influence development of lesions. *Helicobacter hepaticus* and *H. bilis* induce a chronic active hepatitis often with necrosis, portal lymphocytic infiltrates and oval cell hyperplasia (A.) in susceptible strains including A/J, BALB/c, C3H and immunodeficient mice (SCID and those with genetically engineered immune defects). Disease develops in susceptible mice over 6 months of age. Of the immunocompetent susceptible strains, male mice develop liver disease which may progress to hepatic carcinoma. *Helicobacter hepaticus* can be visualized as small helical organisms in bile canaliculi on silver stained sections (arrowheads). *Helicobacter bilis* is less often observed in silver stained liver sections. Female mice colonized with *H. hepaticus*, *H. bilis*, and *H. "typhlonius"* often develop an inflammatory bowel disease characterized by mucosal hyperplasia with erosions/ulcers, mixed inflammatory infiltrate and rectal prolapse. Immunodeficient mice of either gender can develop both liver and intestinal disease.

Diagnosis: Helicobacters can be detected by culture, PCR testing, serology (although no test is commercially available) and histopathology. Culture provides a standard for documenting infection, but the filtration methods and microaerophilic incubation conditions for isolation make culture a laborious option. PCR is a more sensitive and rapid diagnostic method that is most widely used for screening rodents for infection. Histopathologic examination of the liver with visualization of characteristic bacteria is diagnostic; however, not all mice infected with pathogenic helicobacters develop liver disease.

Control/Eradication: With the data presently available, embryo transfer appears to be superior to any other form of eradication in immunocompetent mice and is the only option in immunosuppressed mice.

Although antibiotic treatment, cross-fostering and iodine immersion (or some combination of these) has shown some efficacy, enough information is not available on these methods to support using any of these as the basis of a large scale eradication program. The following treatment regimens have been used for helicobacter eradication: A three drug antibiotic regimen that include Amoxicillin , Bismuth, Metronidazole, as well as a four drug combination (Amoxicillin, Clarithromycin, Metronidazole, and Omeprazole).

Research complication: Increase in hepatocellular tumors in certain strains of infected mice. Can promote experimental chemical hepatic carcinogenesis. Causes typhlocolitis and can complicate gastrointestinal studies.

References

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