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Campylobacter jejuni
Transmission from Pet Animals: A New Zoonosis?

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Introduction
In recent years, Campylobacter jejuni has been recognized as an important enteric pathogen of human beings causing acute and subacute gastrointestinal illness. Recent reports have suggested that infected household pets may be vectors for the human infection.\(^1\) It has been theorized that as more research will be conducted, the zoonotic implications of C. jejuni will rival and probably exceed those of salmonellosis.\(^2,3\) Therefore, as veterinarians, it is important to be aware of the disease in animals, the zoonotic implications, and be able to advise our clientele.

Campylobacter species (formerly known as Vibrio) have been known to cause abortion in cattle since the initial isolation in 1909.\(^4\) In 1947, V. fetus was first cultured from a human being.\(^4\) However, it was not until 1969 that researchers using a selective medium were successful in isolating related vibrios from the stools of human patients with diarrhea.\(^4\)

In 1981, Skirrow reported the present human incidence of diarrheic disease caused by C. jejuni to be just less than 9,000 reported cases per annum.\(^5\) The symptoms and signs of campylobacter infection are not so distinctive that the human physician can differentiate it from illness caused by other enteric pathogens. Symptoms vary from those appearing as a 24-hour viral gastroenteritis to that of a relapsing colitis that mimics ulcerative colitis or Crohn's disease.\(^4\) Other differentials include salmonellosis and shigellosis. The typical course of the disease is a moderate to mild, self-limiting illness of one-week duration. Fever is a common symptom and is often accompanied by malaise, headache, backache, myalgia, and arthralgia. Abdominal pain generally precedes the onset of diarrhea. Feces are loose to watery and commonly contain mucus and frank blood.\(^2,4,5\) The disease appears to spread readily amongst children and immunosuppressed adults.\(^7\) The incubation period may be 2–5 days, with some as long as 10.\(^7\) People who become infected will show a rise in antibody titer against the organism which is very helpful in making the diagnosis.\(^4\)

The reservoir for C. jejuni is enormous. The organism has been isolated from healthy cattle, sheep, goats, swine, horses, poultry, rodents, dogs, cats, and monkeys.\(^1,2,3,4,8\) Infection with C. jejuni may cause diarrheal illness in calves, lambs, dogs, cats, and monkeys. Commercial pork, lamb, beef and poultry carcasses have been cultured positive for C. jejuni.\(^4\) It has also been isolated from fresh water and sea water, with a survival rate of up to five weeks in fresh water.\(^4\) Feces from infected animals or persons may contain viable organisms for up to four weeks and could be a source for contamination of the environment.\(^4\)

Pathogenesis
The pathogenicity of C. jejuni or other campylobacter species in the dog has not been established. Campylobacter jejuni has been isolated from the feces of clinically normal dogs as well as dogs with diarrhea.\(^2,9\) Campylobacter enteritis has been reproduced, using pure cultures of human or canine isolates of C. jejuni, in conventional as well as gnotobiotic puppies.\(^10\)

Clinically, the disease induced in gnotobiotic pups was mild, being associated with transient malaise and inappetence, mild diarrhea, and tenesmus. In conventional pups, the signs are soft to watery diarrhea with mu-
Adult dogs inoculated with a canine isolate of *C. jejuni* developed watery to mucoid diarrhea and small intestinal lesions characterized by blunted villi, a mixed inflammatory cell infiltration in the lamina propria, and enlarged Peyer's patches. There have been other short reports published which describe vomiting as a characteristic, with loose feces being produced for about 10 days; in some cases the feces have contained blood. *C. jejuni* has been implicated in cases of fatal hemorrhagic enteritis, but there is some doubt as to the reliability of these reports due to the failure to differentiate it from toxicoses or other intestinal infections. The organism is tissue invasive, causing acute enterocolitis and sometimes bacteremia. *Campylobacter* has been found as a secondary invader in dogs with canine parvovirus infection and salmonellosis.

Infection in human beings after contact with sick animals, especially puppies and kittens, has been well-documented. Pet birds have also been suspected as sources of human infections. However, most zoonotic outbreaks have appeared to be associated with ingestion of infected or contaminated poultry or untreated milk. Skirrow estimated in 1981 the number of human cases associated with canine and feline campylobacter infections to represent about 5%. A typical history is the acquisition of a young pup by a household, the development of diarrhea by the animal, and the subsequent development of diarrhea in the owner of the pup. In contrast to the situation in dogs, there have been few reports of transmission of *C. jejuni* from diarrheic kittens to their owners, which suggests that naturally occurring *C. jejuni* diarrhea in kittens is uncommon.

**Diagnosis**

The isolation of *C. jejuni* from the feces can be challenging. For optimal recovery, feces or swabs of feces should be refrigerated at 4°C. Swabs should be kept in Cary-Blair medium with 0.16% agar. Culturing should be performed on the day of collection. Feces can be examined by dark-field microscopy for darting, motile, corkscrew-shaped bacteria. The use of a selective medium designated "Campy-BAP" has given better recovery after 48 hours incubation than other direct-plating selective media. This medium is available commercially. Optimal microaerophilic incubation conditions for isolation are 5% oxygen, 10% carbon dioxide, and 85% nitrogen. Plates are incubated at 42°C and examined after 48 hours. *Campylobacter* spp. are gram-negative, curved-shaped rods with single polar flagellae. *Campylobacter jejuni* is microaerophilic, catalase-positive, and cytochrome-C positive. It will grow at 42°C, but not 25°C, and most strains are hippurate hydrolysis positive. It will grow in 1% glycine. Most strains are sensitive to nalidixic acid (30 ug), but resistant to cephalothin (30 ug).

**Prevention**

In countries with high standards of public health, lower animals are perceived as the major reservoirs of *C. jejuni* responsible for human disease. Almost always where conditions of poor hygiene exist, human infections are contracted from animals with diarrhea rather than from clinically normal infected animals. A common example would be a person becoming infected after sharing a bed with a puppy with diarrhea.

Since the available evidence has shown that household animals constitute a reservoir for *C. jejuni*, the interruption of transmission to human beings from these sources should have high priority. A high standard of personal hygiene, including thorough handwashing between examination of patients, and sterilization of all diagnostic equipment, is recommended for all veterinarians. Hospitalized animals with diarrhea should be isolated. Client education is essential, based on practicing simple hygienic preventive measures. The risk of acquiring campylobacter infections from pet animals is remote and can probably be abolished by frequent handwashing and the isolation of dogs and cats with diarrhea from young children.

**Treatment**

Since the duration of campylobacter excretion following clinical recovery is unknown and the possibility exists for continuing zoonotic spread, dogs and cats from which campylobacters have been isolated should be treated. Erythromycin is the drug of choice for human patients. In dogs, an oral erythromycin dose of 40 mg/kg body weight for five days appears to eliminate the infection. In animals which vomit after oral erythromycin therapy, oral tylosin at a dose of 45 mg/kg daily may be given for five days. The efficacy
of treatment should be confirmed by fecal bacterial cultures one week and one month later. Since there is no information regarding carrier states in dogs and cats, fecal examination for campylobacters should always be repeated in diarrheic animals with previous positive isolations. As is the case with Salmonella, it appears that C. jejuni can be carried by lower animals without ill effect. Presumably, immunity or resistance to infection can develop, and the animals remain as carriers of as yet undetermined duration. Epidemiological evidences of human infections transmitted from pet animals have been from diarrheic, not carrier animals.

Conclusion
As a zoonotic disease, Campylobacter jejuni has become well-recognized in the last 15 years. With improved culturing techniques, it is being diagnosed both in human patients and in animals much more frequently. It is important to be able to diagnose infected animals and to be able to make proper recommendations to our clients. We need to work with physicians in recognizing the source of the problem and in controlling the zoonotic disease caused by Campylobacter jejuni.

REFERENCES