also available; most of the positivity in these assays probably relates to previous infection with *Y. enterocolitica*.

TREATMENT YERSINIOSIS

Most cases of diarrhea caused by enteropathogenic *Yersinia* are self-limiting. Data from clinical trials do not support antimicrobial treatment for adults or children with *Y. enterocolitica* diarrhea. Systemic infections with bacteremia or focal infections outside the gastrointestinal tract generally require antimicrobial therapy. Infants <3 months of age with documented *Y. enterocolitica* infection may require antimicrobial treatment because of the increased likelihood of bacteremia in this age group. *Y. enterocolitica* strains nearly always express β-lactamases. Because of the relative rarity of systemic *Y. enterocolitica* infection, there are no clinical trial data to guide antimicrobial choice or to suggest the optimal dose and duration of therapy. On the basis of retrospective case series and in vitro sensitivity data, fluoroquinolone therapy is effective for bacteremia in adults; for example, ciprofloxacin is given at a typical dose of 500 mg twice daily by mouth or 400 mg twice daily IV for at least 2 weeks (longer if positive blood cultures persist). A third-generation cephalosporin is an alternative—e.g., cefotaxime (typical dose, 6–8 g/d in three or four divided doses). In children, third-generation cephalosporins are effective; for example, cefotaxime is given to children ≥1 month of age at a typical dose of 75–100 mg/kg per day in three or four divided doses, with an increase to 150–200 mg/kg per day in severe cases (maximal daily dose, 8–10 g). Amoxicillin and amoxicillin/clavulanate have shown poor efficacy in case series. Trimethoprim-sulfamethoxazole, gentamicin, and imipenem are all active in vitro. *Y. pseudotuberculosis* strains do not express β-lactamase but are intrinsically resistant to polymyxin. Because human infection with *Y. pseudotuberculosis* is less common than that with *Y. enterocolitica*, less case information is available; however, studies in mice suggest that ampicillin is ineffective. Drugs similar to those used against *Y. enterocolitica* should be used. The best results have been obtained with a quinolone.

Some trials of treatment for reactive arthritis (with a large proportion of cases due to *Yersinia*) found that 3 months of oral ciprofloxacin therapy did not affect outcome. One trial in which the same therapy was given specifically for *Y. enterocolitica*–reactive arthritis found that, while outcome indeed was not affected, there was a trend toward faster remission of symptoms in the treated group. Follow-up 4–7 years after initial antibiotic treatment of reactive arthritis (predominantly following *Salmonella* and *Yersinia* infections) demonstrated apparent efficacy in the prevention of chronic arthritis in HLA-B27-positive individuals. A trial showing that azithromycin therapy did not affect outcome in reactive arthritis included cases believed to follow yersiniosis, although no breakdown of cases was provided. A Cochrane review evaluating the use of antibiotics for reactive arthritis is in progress.

PREVENTION AND CONTROL

Current control measures are similar to those used against other enteric pathogens like *Salmonella* and *Campylobacter*, which colonize the intestine of food animals. The focus is on safe handling and processing of food. No vaccine is effective in preventing intestinal colonization of food animals by enteropathogenic *Yersinia*. Consumption of food made from raw pork (which is popular in Germany and Belgium) should be discouraged at present because it is not possible to eliminate contamination with the enteropathogenic *Yersinia* strains found worldwide in pigs. Exposure of infants to raw pig intestine during domestic preparation of chitterlings is inadvisable. Modification of abattoir technique in Scandinavian countries from the 1990s onward included the removal of pig intestines in a closed plastic bag; levels of carcass contamination with *Y. enterocolitica* were reduced, but such contamination was not eliminated. Experimental pig herds free of pathogenic *Y. enterocolitica* O:3 (and also of *Salmonella, Toxoplasma*, and *Trichinella*) have been established in Norway and may be commercialized in the future because of their enhanced safety. In the food industry, vigilance is required because of the potential for large outbreaks if small numbers of enteropathogenic yersiniae contaminate any ready-to-eat food whose safe preservation is based on refrigeration before consumption.

The rare phenomenon of contamination of blood for transfusion has proved impossible to eradicate. However, leukodepletion is now practiced in most blood transfusion centers, primarily to prevent nonhemolytic febrile transfusion reactions and alloimmunization against HLA antigens. This measure reduces but does not eliminate the risk of *Yersinia* blood contamination.

Notification of yersiniosis is now obligatory in some countries.

197 *Bartonella* Infections, Including Cat-Scratch Disease

Michael Giladi, Moshe Ephros

Bartonella species are fastidious, facultative intracellular, slow-growing, gram-negative bacteria that cause a broad spectrum of diseases in humans. This genus includes more than 30 distinct species or subspecies, of which at least 16 have been recognized as confirmed or potential human pathogens; *Bartonella bacilliformis*, *Bartonella quintana*, and *Bartonella henselae* are most commonly identified (Table 197-1). Most *Bartonella* species have successfully adapted to survival in specific domestic or wild mammals. Prolonged intraerythrocytic infection in these animals creates a niche where the bacteria are protected from both innate and adaptive immunity and which serves as a reservoir for human infections. *Bartonella* characteristically evades the host immune system by modification of its virulence factors (e.g., lipopolysaccharides or flagella) and by attenuation of the immune response. *B. bacilliformis* and *B. quintana*, which are not zoonotic, are exceptions. Arthropod vectors are often involved. Isolation and characterization of *Bartonella* species are difficult and require special techniques. Clinical presentation generally depends on both the infecting *Bartonella* species and the immune status of the infected individual. *Bartonella* species are susceptible to many antibiotics in vitro; however, clinical responses to therapy and studies in animal models suggest that the minimal inhibitory concentrations of many antimicrobial agents correlate poorly with the drugs' in vivo efficacies in patients with *Bartonella* infections.

CAT-SCRATCH DISEASE

DEFINITION AND ETIOLOGY

Usually a self-limited illness, cat-scratch disease (CSD) has two general clinical presentations. *Typical* CSD, the more common, is characterized by subacute regional lymphadenopathy; *atypical* CSD is the collective designation for numerous extranodal manifestations involving various organs. *B. henselae* is the principal etiologic agent of CSD. Rare cases have been associated with *Afipia felis* and other *Bartonella* species.

EPIDEMIOLOGY

CSD occurs worldwide, favoring warm and humid climates. In temperate climates, incidence peaks during fall and winter; in the tropics, disease occurs year-round. Adults are affected nearly as frequently as children. Intrafamilial clustering is rare, and person-to-person transmission does not occur. Apparently healthy cats constitute the major reservoir of *B. henselae*, and cat fleas (*Ctenocephalides felis*) may be responsible for cat-to-cat transmission. CSD usually follows contact with cats (especially kittens), but other animals (e.g., dogs) have been implicated as possible reservoirs in rare instances. In the United States, the estimated disease incidence is ~10 cases per 100,000 population. About 10% of patients are hospitalized.