Effectiveness and safety of cefovecin sodium, an extended-spectrum injectable cephalosporin, in the treatment of cats with abscesses and infected wounds

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Objective—To evaluate the effectiveness and safety of cefovecin sodium in the treatment of cats with naturally occurring skin infections (abscesses and infected wounds).

Design—Multicenter (26 sites), randomized, double-blind, controlled clinical trial.

Animals—Client-owned cats of any breed with naturally occurring skin infections with associated clinical signs and confirmatory bacteriologic culture results.

Procedures—Cats with clinical signs of skin and soft tissue infection were randomly allocated to receive a single dose of cefovecin (8 mg/kg [3.6 mg/lb], SC) followed by placebo drops administered orally once daily for 14 days or 1 SC placebo injection followed by cefadroxil (22 mg/kg [10 mg/lb], PO, once daily for 14 days). Only one 14-day treatment course was permitted.

Results—Effectiveness of cefovecin in the treatment of cats with abscesses and infected wounds was similar to that of cefadroxil. At the final assessment on day 28, 97% (86/89) of cefovecin-treated cats and 91% (80/88) of cefadroxil-treated cats were considered treatment successes. There were no serious adverse events or deaths related to treatment.

Conclusions and Clinical Relevance—1 SC injection of 8 mg of cefovecin/kg for the treatment of cats with naturally occurring skin infections (wounds and abscesses) was safe and as effective as cefadroxil administered orally at 22 mg/kg, once daily for 14 days. (J Am Vet Med Assoc 2009;234:81–87)

Subcutaneous abscesses and infected wounds caused by bites or scratches are the most common skin and soft tissue conditions in cats.1,2 Pasteurella multocida is the most common pathogen isolated from aerobic microbiologic cultures of lesion material, but Staphylococcus spp, Streptococcus spp, and members of the family Enterobacteriaceae are common as well. Anaerobes including Fusobacterium spp, Bacteroides spp, Porphyromonas spp, Prevotella spp, Peptostreptococcus spp, Clostridium spp, and Actinomyces spp are also commonly recovered.1,3,5

Treatment of cats with wounds and abscesses typically involves debridement, drainage, and administration of antimicrobials.1,4 Antimicrobial treatment should be based on results of microbiologic culture and antimicrobial susceptibility testing; however, penicillins, cephalosporins, and clindamycin are recommended for first-line treatment until results of antimicrobial susceptibility testing are available.6 In the United States, penicillins and cephalosporins approved for the treatment of cats with wounds and abscesses include amoxicillin-clavulanate, cefadroxil, orally administered amoxicillin, and injectable ampicillin. Although not approved, orally administered cephalaxin is also commonly used. Cephalosporins may be the preferred initial treatment because many (often 50%) Staphylococcus infections are refractory to treatment with penicillins.7,8 The penicillins and cephalosporins that are currently available for treatment require once- or twice-daily dosing to maintain therapeutic activity at the site of the infection, and it is recommended that treatment be continued for 7 to 14 days after resolution of clinical signs of infection.7,8

Cefovecin sodium is a new extended-spectrum cephalosporin. Pharmacokinetic data suggest that cefovecin is rapidly and completely absorbed and fully bioavailable following SC administration.9 After 1 SC injection of 8 mg of cefovecin/kg (3.6 mg of cefovecin/lb), a mean ± SD maximum plasma concentration of 141 ± 12 µg/mL is achieved within 2 hours after administration. Plasma concentration of

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From Pfizer Animal Health, 7000 Portage Rd, Kalamazoo, MI 49001. Supported by Pfizer Animal Health. Address correspondence to Dr. Six.
Cefovecin at 14 days after SC administration exceeds 13 µg/mL. The plasma elimination half-life is nearly 7 days in cats and thus makes the molecule suitable for administering only once in the treatment of cats with bacterial infections that would otherwise require treatment for up to 14 days in total. Cefovecin does not undergo hepatic metabolism, and most of a dose is excreted unchanged in the urine, suggesting cefovecin may be a suitable antimicrobial for the treatment of cats with urinary tract infections. Like other cephalosporins, cefovecin is bactericidal, inhibiting bacterial cell wall synthesis.

Cefovecin reportedly has good in vitro activity against several bacterial pathogens in cats such as P. multocida and Pseudomonas spp. In vitro activity against skin and soft tissue infections in cats. The safety of cefovecin for young cats has been evaluated in the laboratory, revealing that cefovecin is tolerated well when administered 5 times in weekly intervals at doses of up to 60 mg/kg (27.3 mg/lb). The objective of the study reported here was to evaluate the effectiveness and safety of cefovecin, compared with that of a positive control antimicrobial (cefadroxil) in the treatment of cats with skin infections (wounds and abscesses).

Materials and Methods

Animals—The study was conducted at 26 sites in the United States, in which client-owned cats were enrolled by the attending veterinarian with the written consent of the owner. Cats were eligible for enrollment if they had a clinically important skin and soft tissue infection resulting from a wound that was characterized by one or more of the following: purulent discharge, swelling, erythema, nodules, or furuncles. At least 1 clinical sign was required to be classified as moderate or severe on day 0 (day on which the animal was first treated). In addition, the presence of pathogenic bacteria had to be confirmed by microbiologic culture of a sample collected from the infected site prior to treatment.

Because antimicrobial susceptibility results were not available immediately, animals were enrolled irrespective of the susceptibility results for the pathogen before treatment commenced. Cats were excluded from enrollment if they had any of the following characteristics: ≤8 weeks old, intended for breeding during the study, known or suspected to be pregnant, lactating, allergic to penicillins or cephalosporins, treated for a skin or soft tissue infection within 7 days prior to enrollment, treated systemically or topically with corticosteroids within the previous 1 week (1 month for long-acting depot preparations), had an uncontrolled underlying disease such as FeLV or FIV infection, or known to have a foreign body not removed before the first treatment. Procedures typical of abscess or wound care were permitted, including anesthesia, clipping, and drainage and surgical debridement of wounds. Cleaning of the area with physiologic saline (0.9% NaCl) solution or water was also permitted, but the use of antiseptics or disinfectants (eg, iodine, chlorhexidine, or peroxide) was not permitted. No systemic or topical preparations of antimicrobials or corticosteroids were to be used at anytime during the study, nor was shampooing permitted. All other concomitant treatments were allowed.

Sample collection—The study was conducted in support of new drug registration in the United States and in accordance with guidelines for good clinical practice. For each enrolled cat, blood and urine samples were collected before treatment began and at final assessment for a CBC, serum biochemical analysis, and urinalysis. Samples from skin lesions were collected for isolation and identification of microorganisms and MIC testing. Samples for aerobic and anaerobic microbiologic culture were obtained by swabbing the active margin of a characteristic exudate of affected areas. Crusts could be lifted or pustules and abscesses could be opened to obtain samples. Samples were collected by staff at each practice and sent to a designated reference laboratory. Treatment was started before the results of microbiologic analysis were known, but cats could only continue in the study when the diagnosis was confirmed via the recovery of bacteria from the samples obtained before treatment began.

Results of bacterial identification and susceptibility testing were confirmed at a second designated laboratory. Identification was made at the species level when possible on the basis of morphology, Gram staining and growth characteristics and results of standard biochemical tests. When the identification of an isolate could not be determined, identification was reattempted by use of a microbiologic identification system. Susceptibility of isolates to cefovecin sodium, cefadroxil (aerobic pathogens), and cephalothin (anaerobic pathogens) was tested in accordance with applicable standards published by the Clinical and Laboratory Standards Institute. The MICs were determined via broth microdilution by means of customized microdilution plates provided by the study sponsor. The following quality-control organisms from the ATCC were tested daily for MIC determinations: Enterococcus faecalis ATCC 29212, Escherichia coli ATCC 25922 and ATCC 35218, Pseudomonas aeruginosa ATCC 27853, Staphylococcus aureus ATCC 29213, and Streptococcus pneumoniae ATCC 49619. The MIC results for cefovecin sodium and cefadroxil were consistently within established quality-control ranges.

Experimental protocol—Cats that met the inclusion criteria were allocated to treatment groups by use of a generalized random block schedule that had been produced in advance of the study. The block size was 4 with 2 cefovecin- and 2 cefadroxil-treated cats in each block. Cats were assigned to blocks by order of evaluation. Each cat received 1 injection of cefovecin (8 mg/kg, SC) plus placebo vehicle drops administered orally once daily for 14 days or 1 SC injection with a placebo vehicle followed by cefadroxil (22 mg/kg [10 mg/lb], PO, once daily) for 14 days. The use of placebo drops and placebo injections allowed for a double-blind study design in which the assessing veterinarians and owners were unaware of treatment allocations. All injections were administered by the veterinarian. Drops were administered by owners.
After initiation of treatment on day 0, cats were re-examined on days 7, 14, and 28. A clinical assessment of the lesion and evaluation of the injection site were completed at each of these visits. Any abnormal health events detected by veterinarians or reported by owners were also recorded. It was not permitted to prescribe a second course of a 14-day antimicrobial treatment on day 14. Final assessment of the effectiveness of the antimicrobials took place on day 28. Effectiveness was assessed on the basis of clinical signs (purulent discharge, swelling, erythema, nodules, or furuncles), which were scored by the examining veterinarian as nonexistent, mild, moderate, or severe. Treatment success was defined as all clinical signs reduced to mild or nonexistent at the final assessment. Cats with negative results for microbiologic cultures of samples obtained before treatment were withdrawn from the study as soon as the results were known and were not included in the analysis. Examining veterinarians could withdraw cats at any time when response to treatment was considered inadequate; these cats were considered treatment failures in the analysis of antimicrobial effectiveness.

As a secondary assessment, participating veterinarians were asked to assess the overall clinical outcome at the day of study completion (day 28) as cured (clinical signs subsided in a reasonable period with no evidence of an ongoing infection), improved (clinical signs subsided in a reasonable period but were not completely resolved), or failed (no apparent or inadequate response to treatment). These overall clinical outcomes were summarized to provide a clinical perspective of effectiveness.

**Statistical analysis**—The primary determinant of the effectiveness of each treatment was a binary response variable that was based on the number of cats that met the inclusion criteria for the effectiveness evaluation on day 28. A noninferiority test was conducted to determine whether the effectiveness of cefovecin at resolving infections was no worse (ie, was noninferior) to that of cefadroxil; a noninferiority margin of 15 percentage points was selected to represent a clinically acceptable difference. For the noninferiority test, the difference between the percentages of successfully treated cefovecin-treated cats and cefadroxil-treated cats was determined and the 90% CIs were calculated. When the lower confidence limit exceeded –15%, noninferiority was deemed to exist. Given that noninferiority is inherently a 1-sided hypothesis, a 90% CI was chosen because it results in a significance level of 5% for a 1-sided hypothesis test.

**Results**

**Animals**—Two hundred ninety-one cats were enrolled at 26 clinics in 13 different states within the United States. Of these, 147 were assigned to receive cefovecin and 144 were assigned to receive cefadroxil. The cefovecin group consisted of 4 pure- and 5 mixed breeds of cats (15 sexually intact males, 93 neutered males, 6 sexually intact females, and 33 spayed females). Range of ages in that group was 0.20 to 21 years, and range of body weights was 1.5 to 7.6 kg (3.3 to 16.8 lb). The cefadroxil group consisted of 5 pure- and 9 mixed breeds of cats (19 sexually intact males, 88 neutered males, 3 sexually intact females, and 34 spayed females). Range of ages in that group was 0.30 to 16 years, and range of body weights was 2.0 to 8.0 kg (4.3 to 17.7 lb).

Thirty-six concomitant medications were administered to 82 cats that received cefovecin, and 44 concomitant medications were administered to 79 cats that received cefadroxil (Table 1). These medications included sedatives or tranquilizers, anesthetic agents, heartworm preventatives, endo- and ectoparasiticides, and vaccines against infectious organisms.

Of the 291 cats enrolled in the study, only 89 of 147 (61%) cats treated with cefovecin and 88 of 144 (61%) cats treated with cefadroxil were included in the analysis of antimicrobial effectiveness. The main

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**Table 1**—Numbers and percentages of cats that were treated with cefovecin sodium (8 mg/kg [3.6 mg/lb], SC, once; n = 147) or cefadroxil (22 mg/kg [10 mg/lb], PO, once daily for 14 days; 144) and received concomitant medications during a multicenter study of the effectiveness of cefovecin in the treatment of cats with abscesses and wound infections. *

<table>
<thead>
<tr>
<th>Medication</th>
<th>Cefovecin No. of cats</th>
<th>Percentage of cats</th>
<th>Cefadroxil No. of cats</th>
<th>Percentage of cats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluids (electrolytes or sodium chloride solution)</td>
<td>46</td>
<td>31.3</td>
<td>36</td>
<td>25.0</td>
</tr>
<tr>
<td>Ketamine</td>
<td>23</td>
<td>16.9</td>
<td>25</td>
<td>17.4</td>
</tr>
<tr>
<td>Endo- and ectoparasiticide†</td>
<td>25</td>
<td>17.0</td>
<td>37</td>
<td>25.7</td>
</tr>
<tr>
<td>Vaccine (for the prevention of infectious diseases)</td>
<td>16</td>
<td>10.9</td>
<td>22</td>
<td>15.3</td>
</tr>
<tr>
<td>Acepromazine</td>
<td>14</td>
<td>9.5</td>
<td>11</td>
<td>7.6</td>
</tr>
<tr>
<td>Isofuran</td>
<td>14</td>
<td>9.5</td>
<td>9</td>
<td>6.3</td>
</tr>
<tr>
<td>Diazepam</td>
<td>13</td>
<td>8.8</td>
<td>8</td>
<td>5.6</td>
</tr>
<tr>
<td>Butorphanol</td>
<td>11</td>
<td>7.5</td>
<td>12</td>
<td>8.3</td>
</tr>
<tr>
<td>Medetomidine</td>
<td>7</td>
<td>4.8</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Atropine</td>
<td>7</td>
<td>4.8</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Thiopental sodium</td>
<td>5</td>
<td>3.4</td>
<td>6</td>
<td>4.2</td>
</tr>
<tr>
<td>Atipamezole</td>
<td>5</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Only medications that were used in 5 or more animals are listed. †Parasiticides include fipronil, imidacloprid, ivermectin, lufenuron, praziquantel, pyrantel, nitpyrimer, and selamectin.
reason for exclusion of cats was failure to isolate a bacterial pathogen from the infected site before treatment was administered (21 cefovecin-treated cats and 11 cefadroxil-treated cats). An additional 36 cats (18 cefovecin-treated and 18 cefadroxil-treated) were excluded because bacteria cultured from the abscesses or wounds were no longer viable when antimicrobial susceptibility testing was performed. Seventeen cats (6 cefovecin-treated and 11 cefadroxil-treated) were excluded because of owner noncompliance (ie, failure to return for required follow-up visits), and 9 cats (7 cefovecin-treated and 2 cefadroxil-treated) were excluded on the basis of scheduling deviations for the date of final assessment. Another 20 cats (5 cefovecin-treated and 15 cefadroxil-treated) were excluded because of development of unrelated medical conditions, lack of fulfillment of all inclusion criteria, matching of some of the exclusion criteria, or other reasons. Data for 1 cefadroxil-treated cat that had been withdrawn from the study because of inadequate improvement and was therefore considered a treatment failure were included in the analysis of antimicrobial effectiveness.

The predominant type of infection among the 177 cats included in the analysis of antimicrobial effectiveness was abscess, which was diagnosed in 125 (71%) cats (64 cefovecin-treated and 61 cefadroxil-treated). Forty-seven (27%) cats (25 cefovecin-treated and 20 cefadroxil-treated) had infected wounds. The remaining 5 cats received cefadroxil for acne, dermatitis, folliculitis, ingrown nail, and pyoderma.

On day 14, each clinical sign of skin infection (abscesses and infected wounds) had decreased to mild or nonexistent in 87 of 89 (98%) cefovecin-treated cats and 84 of 88 (95%) cefadroxil-treated cats. At final assessment on day 28, each clinical sign had decreased to mild or nonexistent in 86 of 89 (97%) cefovecin-treated cats and 80 of 88 (91%) cefadroxil-treated cats (Table 2). There were no cats that missed ≥3 doses of cefadroxil in a treatment period. When data from the sample of cats that met all the inclusion criteria and none of the exclusion criteria were used and a noninferiority margin of 15% was allowed, results of statistical analysis indicated that cefovecin was noninferior to cefadroxil for the treatment of skin infections 28 days after injectable treatment was administered, independent of clinical diagnosis, and for both diagnostic categories (abscess or infected wounds) separately. On the basis of results from veterinarians’ assessments of the overall clinical outcome on day 28, 85 (96%), 2 (2%), and 2 (2%) of the cefovecin-treated cats and 77 (88%), 3 (3%), and 8 (9%) of the cefadroxil-treated cats were deemed to be cured, improved, or failed, respectively.

Purulent discharge, swelling, and erythema were the most common clinical signs in cats with skin infections. Improvement in all clinical signs was evident on day 7, and additional improvement was evident on day 14 and day 28 (the day of final assessment; Table 3). On day 28, complete resolution of clinical signs was evident in 86 of 89 (96.6%) cefovecin-treated and 79 of 88 (90%) cefadroxil-treated cats.

Aerobic and anaerobic microbiologic culture of samples from skin infections yielded 282 and 103 distinct bacterial pathogens, respectively. Pasteurella multocida was the most common pathogen isolated from samples obtained before treatment began (n = 126), followed by Prevotella spp (68), Streptococcus canis (19), coagulase-negative Staphylococcus spp (19), Staphylococcus intermedius (14), Fusobacterium spp (13), E coli (9), and Porphyromonas spp (8). Several isolates were no longer viable at the time antimicrobial susceptibility testing was performed. The MIC<sub>90</sub> of cefovecin for all isolates of P multocida and S canis recovered before treatment was ≤0.06 µg/mL. The MIC<sub>90</sub> of cefovecin for Fusobacterium spp was 0.12 µg/mL, that for Prevotella spp was 0.5 µg/mL, and that for S intermedius and coag-

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**Table 2**—Success rates at final assessment (day 28) as determined via noninferiority analysis, according to clinical diagnosis in cats with abscesses and wounds that were treated with cefovecin (8 mg/kg, SC, once) or cefadroxil (22 mg/kg, PO, once daily for 14 days).

<table>
<thead>
<tr>
<th>Clinical diagnosis</th>
<th>No. (%) of cats treated with cefovecin</th>
<th>No. (%) of cats treated with cefadroxil</th>
<th>Difference between groups (%)</th>
<th>SE of the difference (%)</th>
<th>90% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All clinical diagnoses</td>
<td>86 (96.6%)</td>
<td>80 (89.9%)</td>
<td>5.72</td>
<td>3.61</td>
<td>-0.22 to 11.66</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Abscess</td>
<td>62 (96.6%)</td>
<td>56 (91.8%)</td>
<td>5.07</td>
<td>4.13</td>
<td>-1.72 to 11.87</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Wound</td>
<td>24 (96.0%)</td>
<td>20 (80.0%)</td>
<td>5.09</td>
<td>7.28</td>
<td>-6.88 to 17.06</td>
<td>0.003</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>4 (80.0%)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA = Not applicable. A P value ≤ 0.05 was considered significant.
Table 4—Minimal inhibitory concentrations (µg/mL)* of cefovecin, cefadroxil (active against aerobic pathogens), and cephalothin (active against anaerobic pathogens) for the most common bacterial isolates cultured from abscesses and infected wounds in cats.

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Cefovecin</th>
<th>Cefadroxil</th>
<th>Cephalothin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of cats with isolate</td>
<td>MIC range</td>
<td>MIC&lt;sub&gt;90&lt;/sub&gt;</td>
</tr>
<tr>
<td>Anaerobes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pasteurella multocida</em></td>
<td>105</td>
<td>0.06–0.12</td>
<td>≤ 0.06</td>
</tr>
<tr>
<td>Coagulase-negative</td>
<td>19</td>
<td>0.06–4</td>
<td>0.25</td>
</tr>
<tr>
<td>Anaerobes</td>
<td>68</td>
<td>0.06–4</td>
<td>0.25</td>
</tr>
</tbody>
</table>

*Cats may have experienced more than 1 adverse effect during the study.

Table 5—Distributions of cats with clinical signs of illness during the course of treatment with cefovecin (8 mg/kg, SC, once; n = 147) or cefadroxil (22 mg/kg, PO, once daily for 14 days; 144).

<table>
<thead>
<tr>
<th>Clinical signs*</th>
<th>Cefovecin</th>
<th>Cefadroxil</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cats</td>
<td>Percentage of cats</td>
<td>No. of cats</td>
</tr>
<tr>
<td>Vomiting</td>
<td>10</td>
<td>6.8%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>7</td>
<td>4.8%</td>
</tr>
<tr>
<td>Anorexia or decreased appetite</td>
<td>6</td>
<td>4.1%</td>
</tr>
<tr>
<td>Lethargy</td>
<td>6</td>
<td>4.1%</td>
</tr>
<tr>
<td>Hyperactive or acting strange</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Inappropriate urination</td>
<td>1</td>
<td>0.7%</td>
</tr>
<tr>
<td>Salivation</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Increased thirst</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Cats may have experienced more than 1 adverse effect during the study.

ulase negative *Staphylococcus* spp was 2 µg/mL. Values for cefadroxil were considerably higher (Table 4).

Medical conditions of cats that attending veterinarians considered unrelated to antimicrobial treatment were reported for 20 cefovecin-treated cats and 27 cefadroxil-treated cats (Table 5). Six cats treated with cefovecin and 16 cats treated with cefadroxil had signs that were considered clinically important and possibly related to treatment. Gastrointestinal problem (ie, diarrhea or soft feces, vomiting, and inappetence) was the most commonly reported adverse effect of treatment, although antimicrobial treatment was not discontinued for any cats in the cefovecin group as a result of that gastrointestinal problem. Four cats in the cefadroxil group were withdrawn from the study; 3 of these cats were removed after bouts of diarrhea, and the fourth was withdrawn because it salivated excessively and the owner was unable to continue administering cefadroxil. There were no reported injection-site reactions in cats treated with cefovecin. None of the cats in either group died during the study period.

There were no apparent differences between mean values for results of serum biochemical analyses for cefovecin- and cefadroxil-treated cats. Serum activity of alanine aminotransferase was slightly higher than the upper reference limit in 4 cefovecin-treated and 8 cefadroxil-treated cats. Of those cats, 1 cefovecin-treated and 2 cefadroxil-treated cats had high values before the study began. Twenty-four cefovecin-treated and 19 cefadroxil-treated cats had values for BUN (10 to 30 mg/dL) that were within the reference range before the study began but that increased after treatment with antimicrobials (37 to 39 mg/dL). Prior to treatment, mean serum creatine kinase activities for cats in the cefovecin and cefadroxil groups were higher than the upper reference limit. Although values decreased in both groups by the final assessment on day 28, they remained above the reference range. Six cefovecin-treated and 3 cefadroxil-treated cats had serum creatine kinase activities that were within the reference range before treatment was administered but mildly to moderately increased at day 28. Two cefovecin-treated cats also had high BUN values after treatment concluded. No clinical abnormalities were associated with any of these findings. Results of urinalyses performed before and after the trial were similar between the treatment groups.

Discussion

Cephalosporins administered according to label instructions are attributed with having a large margin of safety. In the study reported here, treatment of cats with cefovecin was associated with minimal adverse effects; gastrointestinal problems were the most common finding. Cats treated with cefovecin had fewer clinical signs of illness than did cats treated with cefadroxil. The increase in serum creatine kinase activity detected in the cats in our study may have been attributable to hemolyzed RBCs or interstitial fluid in blood samples, which is a common cause of increased serum creatinine kinase activity in cats. Muscle inflammation, secondary to the bacterial infections for which the cats were enrolled, may also have contributed to the high pretreatment values and the subsequent decrease as the bacterial infections resolved following antimicrobial treatment.

Abscess was the predominant type of infection diagnosed in cats enrolled during the present study, con-
stuting 126 of the cats included in the efficacy analysis (65 cefovecin-treated and 61 cefadroxil-treated). The bacteria isolated from samples obtained from infected tissues of cats before treatment was administered were those typically associated with skin infections, including \( P.\) multocida, Prevotella spp, Fusobacterium spp, S. canis (group G, \( \beta\)-hemolytic), coagulase-negative \( Staphylococcus\) spp, S. intermedia, and E. coli.1,2,3 The high success rates achieved at the interim and final assessment supported the clinical effectiveness of cefovecin against these bacteria. Healthy mouths of cats contain obligate and facultative anaerobes, which are the source of bacteria recovered from abscesses resulting from fight wounds in cats.21 The introduction of typical oral flora into the subcutis disrupts the existing microenvironment. The polymicrobial nature of most cat bite abscesses suggests that microbial synergy contributes to the pathogenesis of abscesses. Although the facultative species \( P.\) multocida was the most common microorganism isolated in our study, other researchers found that anaerobic Porphyromonas spp represented up to 99.8% of cultivated species of microorganisms in 13 feline abscesses.3 They hypothesized that Porphyromonas spp play a synergistic role in the pathogenesis of feline abscesses. Given the polymicrobial nature of these infections, antimicrobial treatment must be effective against aerobes and facultative and obligate anaerobes.

Because of the involvement of anaerobic pathogens (isolated from most cats enrolled in the study reported here) in the development of abscesses or infected wounds, the literature suggests that treatment of cats with abscesses or infected wounds might require up to 3 weeks of antimicrobial treatment.4 However, it should be stressed that the duration of antimicrobial treatment needed will vary substantially from cat to cat, and therefore, veterinary use of antimicrobial agents, including cefovecin, should be in line with guidelines for appropriate use.22

Despite wide use of antimicrobials for the treatment of cats with skin and soft tissue infections, there is a dearth of published information regarding clinical success rates of those treatments. In the study reported here, cefadroxil was used as a positive control treatment to allow direct comparison of results within the same class of antimicrobials (ie, cephalosporins). A European study23 revealed that amoxicillin-clavulanic acid and cefovecin are 100% effective for treatment of cats with skin and soft tissue infections. The only difference between that study and the one reported here is that 2 courses of treatment were permitted in the European study.

Cephalosporins are believed to be a good first-choice antimicrobial for the treatment of feline skin infections.23 The Guidelines of Judicious Therapeutic Use of Antimicrobials24 in cats and dogs are intended to assist veterinarians in the selection of appropriate antimicrobials that will treat their patients while minimizing the development of antimicrobial-resistant pathogens. Most findings regarding the development of antimicrobial resistance in companion animal pathogens are for canine pathogens.24 A number of working groups have reported that the use of cephalosporins has not caused a meaningful reduction of antimicrobial susceptibility for \( S.\) intermedius recovered from dogs.23,36 In a small survey of cats from 3 different sources (healthy domestic cats, domestic cats with skin lesions, and feral cats), coagulase-negative and coagulase-positive staphylococci were evaluated for patterns of antimicrobial resistance. Whereas all pathogens in that survey were susceptible to amoxicillin-clavulanic acid, bacitracin, and cephalixin, pathogens were also resistant to other antimicrobials tested (cotrimoxazole, lincomycin, enrofloxacin, and oxytetracycline) to varying degrees.

Although the potential for \( P.\) multocida to develop resistance against cephalosporins has not been well researched, it seems reasonable to believe that, like staphylococci, such resistance in \( P.\) multocida would be an uncommon occurrence. In a study11 conducted to characterize the in vitro activity of cefovecin against pathogens collected from dogs and cats in Europe and North America, very few \( P.\) multocida isolates were resistant to cephalosporins. However, because any use of antimicrobials may lead to the development of resistance, veterinarians should be reminded to use antimicrobials prudently when treating bacterial infections in animals.21

By delivering a full course of antimicrobial treatment with 1 injection, cefovecin not only offers convenience but also eliminates the concerns of owner noncompliance. In the study reported here, owners were trained and monitored to ensure they were compliant in the administration of the daily oral product to their cat. However, 1 cat was withdrawn from this study because the owner was unable to administer the oral product at home. To our knowledge, there are no reports of owner compliance with oral administration of medication to cats as prescribed. Given that owner compliance with recommended treatment of dogs is typically low,26–30 it is reasonable to presume that compliance of owners with administering medications orally to cats is as low, if not lower. All 3 compliance studies identified owner noncompliance with dosing interval as a significant issue. One of these studies28 revealed that owners were significantly more compliant with once- or twice-daily administration over 3-times daily administration. Another study29 revealed compliance was best in the dog owner group that received an information sheet on bacterial infections and antimicrobial therapy along with a once-daily administration regimen, compared with compliance in the groups that had either a once- or twice-daily regimen but were not provided the information sheet.30 In the study reported here, a single injection of cefovecin (8 mg/kg, SC) for the treatment of cats with naturally occurring skin infections (abscesses and infected wounds) was safe and as effective as cefadroxil administered orally once daily for 14 days.

References

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