In vitro susceptibility testing of ceftiofur against bovine mastitis pathogens isolated as part of an ongoing surveillance program (2002-2010)

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Introduction

Although many antimicrobial susceptibility reports have been published that include mastitis pathogens, few have compared susceptibility trends over time and geographical areas. In 2001, Pfizer Animal Health (PAH) initiated a pilot susceptibility surveillance program, and requested that six veterinary diagnostic laboratories submit bacterial pathogens isolated from naturally occurring mastitis infections for susceptibility testing at PAH. That year, 354 pathogens were tested. The program has grown and more than 1,200 isolates are tested each year. Results of ceftiofur activity against mastitis pathogens for the years 2002 to 2010 are reported here. SPECTRAMAST® was approved in 2005 for the treatment of clinical mastitis associated with coagulase-negative staphylococci (CNS), *Strep. dysgalactiae*, and *Escherichia coli* in lactating dairy cattle and for the treatment of subclinical mastitis associated with *Staphylococcus aureus*, *Strep. dysgalactiae*, and *Streptococcus uberis* in dairy cattle at the time of dry off.

Materials and Methods

From January 1, 2002 to December 31, 2010, mastitis pathogens were received from 24 laboratories in major dairy regions across the US and Canada. All strains were recovered from clinical or subclinical mastitis cases. Laboratories were discouraged from sending multiple isolates from the same outbreak and were limited to ≤ 25 strains of each pathogen, each year. Minimal inhibitory concentrations (MICs) are reported for *Staph. aureus*, CNS species, *Strep. dysgalactiae*, *Strep. uberis* and *E. coli*. Determinations of MICs for all isolates were made using a commercially available broth microdilution system and a method that conforms to the standards of the Clinical and Laboratory Standards Institute. Appropriate quality control strains were run each day of testing.

Results

Table 1 demonstrates the percentage of isolates that were susceptible to ceftiofur and the MIC_{50}, MIC_{70}, and MIC_{90} values for each pathogen group, each year. All parameters have remained consistent (+/- one doubling dilution) for ceftiofur over the nine years reported. The percentage of *Staph.aureus* and CNS strains that were susceptible to ceftiofur ranged from 98% to 100%. The *Strep. dysgalactiae* MIC_{90} results were all ≤ 0.06 µg/mL, and the percentage of isolates that were susceptible remained between 99% to 100%. Although there was more variability for *Strep. uberis*, the parameters for all years were all within +/- one doubling dilution and the percentage susceptible remained high at 92% to 99%. Parameters for *E. coli* also remained consistent over time with 94% to100% susceptible during the nine years tested.

Significance

Comparisons of susceptibility results over time should be done with care. Surveillance systems, by their very nature, cannot provide a complete picture of the whole population. But with a good sampling plan, including representative geographic locations, an appropriate sample size, and regular submissions, they can provide an overall estimate of the level of susceptibility that exists in the field, although regional differences may exist. These data show that there were no consistent trends toward a decrease in susceptibility to ceftiofur among mastitis pathogens collected from 2002-2010.

Table 1.

Pathogen	Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Staph. aureus	N	190	187	132	168	251	330	320	262	342
	%S	98	100	100	100	100	100	99	100	99
	MIC_{50}	1	1	1	1	1	1	1	1	1
	MIC_{70}	1	1	1	1	1	1	1	1	1
	MIC_{90}	1	1	1	1	1	1	2	2	1
CNS	N	162	132	119	136	194	203	227	188	265
	%S	99	99	99	98	99	100	99	98	100
	MIC_{50}	0.5	0.5	0.5	0.5	0.5	0.5	1	1	0.5
	MIC_{70}	1	1	0.5	1	1	1	1	1	1
	MIC_{90}	1	1	1	1	1	1	1	2	1
Strep. dysgalactiae	N	139	122	125	125	168	259	239	193	257
	%S	99	100	100	100	99	100	100	100	100
	MIC_{50}	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06
	MIC_{70}	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06
	MIC_{90}	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06	≤0.06
Strep. uberis	N	129	111	104	106	167	251	268	198	289
	%S	99	99	98	94	93	95	93	92	92
	MIC_{50}	0.5	0.5	1	0.5	1	1	1	1	1
	MIC_{70}	0.5	0.5	1	1	1	1	1	1	1
	MIC_{90}	1	1	2	2	2	2	2	2	2
E. coli	N =	184	162	147	163	229	275	301	225	309
	%S	98	96	100	97	98	97	97	94	98
	MIC_{50}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	MIC_{70}	0.25	0.25	0.25	0.25	0.25	0.25	0.5	0.5	0.5
	MIC_{90}	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5