ANTIMICROBIAL RESISTANCE AMONG IMPORTANT BOVINE PATHOGENS ISOLATED AT THE KSU VETERINARY DIAGNOSTIC LABORATORY OVER TWO AND A HALF YEARS

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Summary

A retrospective study was conducted to determine the prevalence of antimicrobial resistance among six important bacterial pathogens of bovine origin. The study extended from June 1990 through December 1992 and included a review of the microbiology records of bovine submissions to the KSU Veterinary Diagnostic Laboratory. Antimicrobial susceptibility results for *Pasteurella haemolytica*, *Pasteurella multocida*, *Actinomyces pyogenes*, *Hemophilus somnus*, *Escherichia coli*, and *Salmonella* spp. are summarized. Pathogens were recovered primarily from cases of pneumonia and/or diarrhea. Each isolate was tested for susceptibility to 14 different antimicrobial agents. A high prevalence of resistance (> 70%) was noticed for respiratory pathogens to sulfachloropyridazine. In addition, *Pasteurella* spp. were very resistant (> 71%) to sulfadimethoxine. Most of the *H. somnus* isolates showed little resistance (< 35%) to 12 of the 14 drugs tested. *A. pyogenes* isolates were generally susceptible to most antimicrobials except sulfa drugs. As expected, a high prevalence of resistance (> 70%) was noticed for enteric pathogens (*Salmonella* and *E. coli*) to most of the antimicrobials tested.

(Key Words: Resistance, Disease, Bacteria, Treatment, Cattle.)

Introduction

Pneumonia and diarrhea in cattle of all ages can be initiated by a variety of microbial agents, but only the bacteria involved in these conditions are the major targets of antimicrobial therapy. Antimicrobial susceptibility profiles are important in determining appropriate therapy against those bacterial pathogens. A major problem facing veterinarians is deciding quickly what drug and dosage will be effective in treating cattle affected with these conditions. This is increasingly difficult, because drug resistance appears to be increasing steadily.

Because many bacteria develop resistance to antimicrobial agents, isolation of an infectious agent from an animal is often not sufficient to determine proper treatment. Susceptibility profiles of bacteria are constantly changing; thus, a veterinarian must know the antimicrobial sensitivity profile of bacteria in question before treatment. This retrospective study determined the prevalence of antimicrobial resistance among important cattle pathogens recovered from cases of pneumonia and diarrhea.

Experimental Procedures

Bacterial pathogens were recovered from cattle that had died from pneumonia and/or

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diarrhea and had been evaluated at the KSU Veterinary Diagnostic Laboratory between June 1990 and December 1992. The pathogens were isolated and identified biochemically and serologically using standard procedures. Susceptibility testing of bacteria was performed with the automated Sensititre System (Sensititre Microbiology System, Westlake, OH). The antimicrobial agents and their concentrations are presented in Table 1.

Results and Discussion

Enteric pathogens such as *Salmonella* and *E. coli* were more resistant to antimicrobials than pneumonic pathogens such as *Pasteurella*, *Haemophilus*, and *Actinobacillus* (Table 1). This agrees with recent findings of other researchers. Ceftiofur (Naxcel®) still appeared to be very effective against all respiratory and enteric pathogens tested. However, these *in vitro* observations should be used only as a guide to antimicrobial selection. Resistance to these drugs may develop through increased use, so continued surveillance is warranted. In the present study, the animals or tissues evaluated tended to be from herds where treatment response was nil and death losses were heavy. Thus, these data represent the high prevalence of drug resistance among bacteria associated with cases of pneumonia and diarrhea. Specimens collected prior to death, during early course of disease, or prior to treatment also might show antimicrobial resistance.

Table 1. Percentage of Resistant Bacteria Recovered from Bovine Pneumonic and Diarrheic Cases

Antimicrobial	P. haemolytica		P. multocida		H. somnus		A. pyogenes		Salmonella		E. coli	
agents[a]	Total	% Res.	Total	% Res.	Total	% Res.	Total	% Res.	Total	% Res.	Total	% Res.
Ampicillin (2,4,8)	297	49	216	32	49	45	95	30	174	66	828	60
Ceftiofur (1,2)[b]	106	2	126	15	21	19	55	11	66	6	343	7
Cephalothin (8,16)	297	9	216	10	49	31	95	14	174	28	828	26
Enrofloxacin (1,4)	297	8	216	8	49	18	95	16	174	8	828	5
Erythromycin (0.5,4)	297	27	216	30	49	21	95	24	174	99	828	99
Gentamicin (4,8)	297	6	216	10	49	13	95	14	174	29	828	20
Neomycin (8)	297	34	216	49	49	27	95	49	174	66	828	58
Penicillin G (0.12,2)	297	51	216	35	49	27	95	18	174	99	828	99
Spectinomycin (8,16)	297	82	215	79	49	35	91	34	171	97	827	58
Sulfa-chloropyridazine (20,40)	106	68	126	79	21	39	55	80	66	90	343	87
Sulphadi-methoxine (20,40)	106	72	126	71	21	25	55	69	66	99	343	94
Tetracycline (4,8)	297	52	216	36	49	17	95	26	174	78	828	79
Tribrissen (1/19,2/38)	106	11	126	13	21	20	55	44	66	15	343	34
Tylosin (5,10)	297	88	215	83	49	21	91	22	167	99	825	99

[a]Number in paretheses indicates concentration of drugs in µg/ml.
[b]Ceftiofur (Naxcel®) concentration was increased from .2 and .4 to 1 and 2 µg/ml on October 1, 1991.