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CAUSES OF DIARRHEA, PNEUMONIA, AND ABORTION IN 1991 CATTLE SUBMISSIONS TO THE KSU VETERINARY DIAGNOSTIC LABORATORY

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Summary

Causes of diarrhea, pneumonia, and abortion in Kansas cattle submissions to the Kansas State University Veterinary Diagnostic Laboratory during 1991 were summarized. Antimicrobial susceptibility results for *Pasteurella haemolytica*, *Pasteurella multocida*, *Hemophilus somnus*, and *Salmonella* spp., the common causes of pneumonia and/or diarrhea in cattle with increasing antibiotic resistance patterns, were also summarized. The most commonly diagnosed causes of diarrhea in young calves (under 1 month of age) were coronavirus, *Escherichia coli*, and *Salmonella*. The three most common causes of diarrhea in 1 to 18 month-old cattle were BVD virus, coccidia, and *Salmonella*. Most respiratory submissions were 7- to 18-month-old cattle. *P. haemolytica* and *P. multocida* were the most commonly identified pathogens from these cattle. In 20% of the cases, more than one pathogen was identified. The most commonly diagnosed cause of abortion was bacterial infection (20%), but a cause was not identified in nearly 70% of abortion submissions.

(Key Words: Disease, Diagnosis, Diarrhea, Pneumonia, Abortion.)

Introduction

Enteric and respiratory diseases account for large economic losses to the cattle industry each year. Fetal wastage, including abortion, also significantly impacts cow herds. An accurate diagnosis of the cause of pneumonia, diarrhea, and abortion is essential for effective prevention and control of the various causes of these diseases.

Bovine respiratory disease or "shipping fever" is considered to result from a combination of viral and bacterial infections and stress. *Pasteurella haemolytica* is the most important pathogen in fatal cases and may cause respiratory disease in the absence of a predisposing virus. Other bacteria frequently contribute to pneumonia caused by *P. haemolytica*, once damage has begun.

Causes of fetal abortion may be classified as maternal or fetal. Maternal causes include physiologic changes caused by metabolic disease, hormonal imbalances, nutritional deficiencies or imbalances, environmental stresses or trauma, toxins, and infectious agents. Fetal and placental changes are usually due to infectious agents including bacteria, viruses, fungi, or protozoa.

The present summary was performed to demonstrate the relative importance of various causes of enteric, respiratory, and fetal wastage in Kansas cattle determined at the diagnostic laboratory level.

Experimental Procedures

Cattle diagnoses and age were summarized for cases of diarrhea, pneumonia, and abortion in cattle from computer records of submissions to the KSU Veterinary Diagnostic Laboratory for calendar year 1991. Specimens included

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carcasses or tissues submitted by practicing veterinarians throughout Kansas. Tissues submitted for bacterial culture or viral examination alone were not included in the present study. A diagnosis was made following light microscopic, bacteriologic, and virologic examination of tissues, and information was summarized in a computer database. Antimicrobial susceptibility studies were conducted using an automated Sensititre® system. Pathogenic bacterial isolates were classified as percentage susceptible, moderately susceptible, or resistant to the various antimicrobial agents.

Results and Discussion

Causes and numbers of submissions for diarrhea in cattle are summarized in Table 1 according to age. Most submissions for diarrhea were for calves less than 1 month old (117 cases). In 8.5% of these submissions, more than one pathogen was identified. The most common pathogens identified were coronavirus, *E. coli*, and *Salmonella* (22.2%, 13.7%, and 12.8% of submissions, respectively). Few of the *E. coli* isolates were K99 positive. Antibiotic susceptibility results for *Salmonella* isolates are summarized in Table 2. None of the antibiotics cleared by the Food and Drug Administration for use in cattle were effective against more than 39% of the *Salmonella* isolates. The three most common causes of diarrhea in 1- to 18-month-old cattle were BVD virus, coccidia, and *Salmonella*.

Causes and numbers of submissions for respiratory disease in cattle are summarized in Table 3 according to age. Most submissions for cases of pneumonia were from feedlot cattle 7 to 18 months of age. The two most commonly identified types of pneumonia in calves less than 1 month old were that caused by *P. multocida* and interstitial pneumonia (11.1% of submissions each). The latter was usually associated with septicemia (generalized bacterial infection from *Salmonella*, *E. coli*, etc.). In 1- to 6-month-old calves, *P. multocida* and *P. haemolytica* (24.4% and 20.0% of submissions, respectively) were the most commonly isolated pathogens. *P. haemolytica* and *P. multocida* also were the most commonly isolated pathogens in yearlings with pneumonia (29.2% and 17.7% of submissions, respectively). In 20% of the yearling cases, more than one pathogen was identified, including various combinations of bacteria and/or viruses. Antimicrobial susceptibility results for *P. multocida*, *Haemophilus somnus*, and *P. haemolytica* isolates from all 1991 bovine respiratory submissions are summarized in Table 2.

The three most commonly identified causes of bovine abortion were bacteria (approximately 20% of submissions), BVD virus, and IBR virus (Table 4).

Cases of diarrhea, pneumonia, or abortion with an idiopathic diagnosis were those for which no cause could be determined by routine laboratory testing. The primary reasons for no diagnosis were 1) submitting tissues from animals extensively treated with antibiotics or late in the disease process, 2) advanced postmortem change in submitted tissues, and 3) improper tissue collection and/or submission by the referring veterinarian. Even with extensive laboratory workup in abortion cases, the cause was not determined in nearly 70% of the cases, a finding similar to those of most other U. S. diagnostic laboratories.

[3]Radiometer America, Westlake, OH 44145.

Table 1. Causes of Diarrhea in Three Age Groups of Cattle for 1991 Diagnostic Laboratory Submissions

	Age Group					
	0 to 1 mo.		1 to 6 mo.		7 to 18 mo.	
Cause/Disease	N[b]	%[b]	N	%	N	%
Bovine virus diarrhea	4	3.4	3	23.1	12	41.3
Clostridium perfringens	10	8.5	0	0	1	3.4
Coccidiosis	2	1.7	2	15.4	10	34.5
Coronavirus	26	22.2	1	7.7	1	3.4
Cryptosporidium	11	9.4	0	0	0	0
E. coli 15	13.7	0	0	0	0	
Idiopathic[a]	25	21.4	4	30.8	3	10.3
Rotavirus	12	10.2	1	7.7	0	0
Salmonella	15	12.8	2	15.4	5	17.2
Viral 5	4.3	1	7.7	0	0	
Miscellaneous	6	5.1	0	0	2	8.0
Total diarrhea cases	117		13		29	

[a]Exact cause of the diarrhea could not be determined from submitted specimens.
[b]N = number of occurrences; % = percentage of cases with this diagnosis. Note that number of occurrences is not the same as number of cases because more than one pathogen was identified in some cases.

Table 2. Antimicrobial Susceptibility Results for *Haemophilus somnus, Pasteurella multocida, Pasteurella haemolytica*, and *Salmonella* spp. Isolated from Cases of Diarrhea and Pneumonia for 1991 at the KSU Veterinary Diagnostic Laboratory

	H. somnus				*P. multocida*				*P. haemolytica*				*Salmonella*			
Antimicrobial	S[a]	I[a]	R[a]	N[a]	S	I	R	N	S	I	R	N	S	I	R	N
Ampicillin	69	0	31	16	59	8	30	86	39	2	59	123	29	1	70	76
Amikacin[b]	100	0	0	3	57	21	21	28	82	6	9	33	100	0	0	23
Augmentin[b]	63	19	19	16	84	8	7	86	94	3	2	123	39	46	14	76
Ceftiofur[c]	54	0	38	13	64	15	17	59	71	3	21	90	4	9	87	54
Tetracycline	69	13	19	16	34	24	37	86	31	7	62	123	22	0	76	76
Cephalothin	31	25	38	16	66	9	21	86	77	7	15	123	63	5	32	76
Enrofloxacin[b]	81	13	6	16	88	5	6	86	91	3	4	123	97	1	1	76
Erythromycin	56	31	13	16	8	58	34	86	2	64	33	123	0	0	100	76
Gentamycin[b]	56	19	19	16	58	21	19	86	80	14	6	123	66	1	33	76
Penicillin G	50	19	19	16	29	41	30	86	8	33	59	123	0	0	100	76
Spectinomycin[b]	50	0	50	16	4	12	84	85	1	14	85	123	0	3	97	73
Neomycin	44	0	56	16	31	0	69	86	66	0	34	123	28	0	72	76
Sulfachlor-pyridazine	33	0	33	3	11	15	74	27	24	18	55	33	5	0	95	22
Sulfadi-methoxine	0	33	33	3	15	7	74	27	30	6	61	33	0	0	100	22
Trimethoprim/sulfa[b]	62	8	31	13	68	7	25	59	84	4	11	90	80	0	20	54

[a]S = % of isolates susceptible; I = % of isolates moderately susceptible; R = % of isolates resistant; N = Total number of isolates tested.
[b]Antibiotics not cleared by the FDA for systemic use in cattle.
[c]Ceftiofur (Naxcel®) was used at the 0.5 and 1.0 microgram levels. Thirty of the 90 *P. haemolytica* isolates were tested at the 1.0 and 2.0 microgram levels; 29 isolates were susceptible and 1 was resistant.

Table 3. Causes of Respiratory Disease in Three Age Groups of Cattle for 1991 Diagnostic Laboratory Submissions

	Age					
	0 to 1 mo.		1 to 6 mo.		7 to 18 mo.	
Cause/Disease	N[a]	%[a]	N	%	N	%
Actinomyces pyogenes	2	4.4	2	4.4	9	6.1
Atypical interstitial pneumonia	0	0	0	0	13	8.8
BVD virus[b]	0	0	1	2.2	6	4.1
BRSV[b] 1	2.2	1	2.2	9	6.1	
Haemophilus somnus	1	2.2	8	17.8	15	10.2
Idiopathic[c]	25	55.6	17	37.8	36	24.5
IBR virus[b]	0	0	0	0	5	3.4
Interstitial pneumonia	5	11.1	2	4.4	8	5.4
PI_3	1	2.2	2	4.4	3	2.0
Pasteurella[d]	2	4.4	1	2.2	5	3.4
Pasteurella haemolytica	2	4.4	9	20.0	43	29.2
Pasteurella multocida	5	11.1	11	24.4	26	17.7
Miscellaneous	1	2.2	3	6.7	1	0.7
Total pneumonia cases	45		45		147	

[a]N = number of occurrences; % = percentage of cases with this diagnosis. Note that number of occurrences is not the same as number of cases because more than one pathogen was identified in several cases. [b]BVD = bovine virus diarrhea; BRSV = bovine respiratory syncytial virus; IBR = infectious bovine rhinotracheitis. [c]Exact cause of the pneumonia couldn't be determined from submitted specimens. [d]Other than *P. haemolytica* and *P. multocida*.

Table 4. Causes of Abortion in Cattle for 1991 Diagnostic Laboratory Submissions

Cause/Disease	N[a]	%[a]
Idiopathic[b]	137	69.5
Bacteria	19	9.6
BVD virus[c]	8	4.1
IBR virus[c]	6	3.0
Chlamydia	5	2.5
Actinomyces pyogenes	4	2.0
Bacillus sp.	4	2.0
Escherichia coli	3	1.5
Viral 3	1.5	
Leptospirosis	2	1.0
Mycotic	2	1.0
Salmonella	2	1.0
Staphylococcus aureus	1	0.5
Streptococcus	1	0.5
Total 197		

[a]N = number of cases; % = percentage of total cases. [b]Cause of abortion could not be determined from the submitted tissues or fetuses. [c]BVD = bovine virus diarrhea; IBR = infectious bovine rhinotracheitis.