

# Effectiveness of Vaccination of Feedlot Cattle with Bovine Respiratory Syncytial Virus (BRSV)

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## Summary

The seroprevalence of BRSV antibodies in 2 groups of 96 steers on arrival at the feedlot varied from 23% to 62% in 1984 and 1985, similar to previously reported surveys. The increase in the seroprevalence rate of cattle not vaccinated for BRSV was evidence of BRSV infection during the trials. The number of BRSV vaccinated cattle treated for bovine respiratory disease was 24% and 27% less in 1984 and 1985, respectively, than nonvaccinated controls. The average daily gain of the vaccinated cattle was 12% greater than nonvaccinated cattle during the 32 day trial in 1984 and 74% greater during the 28 day trial in 1985.

The prevalence of positive serum antibody titers to Bovine Respiratory Syncytial Virus in reports from Europe, Canada and the United States, summarized by Baker *et al* in 1985, varied from 14% to 94%.<sup>1</sup> Seroprevalence rates of 66% in beef cattle and 64% in dairy cattle in the northwestern United States were reported in 1985.<sup>2</sup> Isolation of the virus and seroconversions established a causal role for BRSV in "pulmonary edema-emphysema of weaned calves" in Nebraska.<sup>3</sup> Bohlender *et al* reported a treatment rate for undifferentiated respiratory disease of 33.9% in controls compared to 15.9% for calves vaccinated with an experimental BRSV vaccine in a 1981 field trial.<sup>3</sup> Kucera *et al* reported an incidence of treatment for respiratory disease in nonvaccinated animals of 47.9% compared to 20.5% in calves that received 2 doses of a BRSV vaccine.<sup>4</sup> Infection with BRSV was diagnosed in each of 3 epizootics of respiratory disease in beef calves.<sup>5</sup> Two epizootics of respiratory disease associated with BRSV occurred in a dairy herd during a seroepizootiologic study.<sup>6</sup> Forty-six percent of the calves in 1 study and 71% in a second had a 4-fold increase in serum antibody titer in paired samples collected at the auction barn and subsequently at the feedlot. The BRSV was isolated from 13 calves at the feedlot, 11 with acute respiratory disease.<sup>7</sup> We report here on the effects of vaccinating calves with a BRSV vaccine at the time of arrival at the feedlot on

the incidence of bovine respiratory disease (BRD) and feedlot performance in trials conducted in 1984 and 1985.

## Materials and Methods

*Experimental design*—Medium framed, well-muscled, crossbred steer calves with an average weight of approximately 500 pounds were procured through a Kentucky order buyer in October of 1984 and 1985. Processing on arrival at the feedlot included identifying by ear tag, weighing individually, vaccinating for infectious bovine rhinotracheitis, bovine virus diarrhea, parainfluenza-3, clostridial diseases, leptospirosis and *Haemophilus somnus* as well as administering 2.5 M units of vitamin A IM and 0.22 mg/kg ivermectin. Sixteen calves were randomly assigned to each of 6 pens. All calves were bled by jugular venipuncture to provide initial serum samples. Calves in 3 pens were vaccinated with an attenuated BRSV. The calves in the other 3 pens were not vaccinated.

*Ration*—The feed for each pen was weighed at each feeding and unconsumed feed was periodically removed and weighed back. Consumption was calculated on an air dry basis. The receiving ration was good quality, mixed orchard grass-alfalfa hay to appetite plus 0.45 kg/head/day each of cracked corn and natural protein supplement. Beginning seven days post-processing the hay was top dressed with corn silage. During the next 4 days the silage was increased and the hay decreased to provide a ration for the duration of the trials of corn silage to appetite plus 1 kg corn and 0.7 kg supplement/head/day. The cattle were weighed individually at the end of the trial, day 32 in 1984 and day 28 in 1985, for calculation of the average daily gain (ADG). The cattle were bled at the time of weighing to provide a final serum sample.

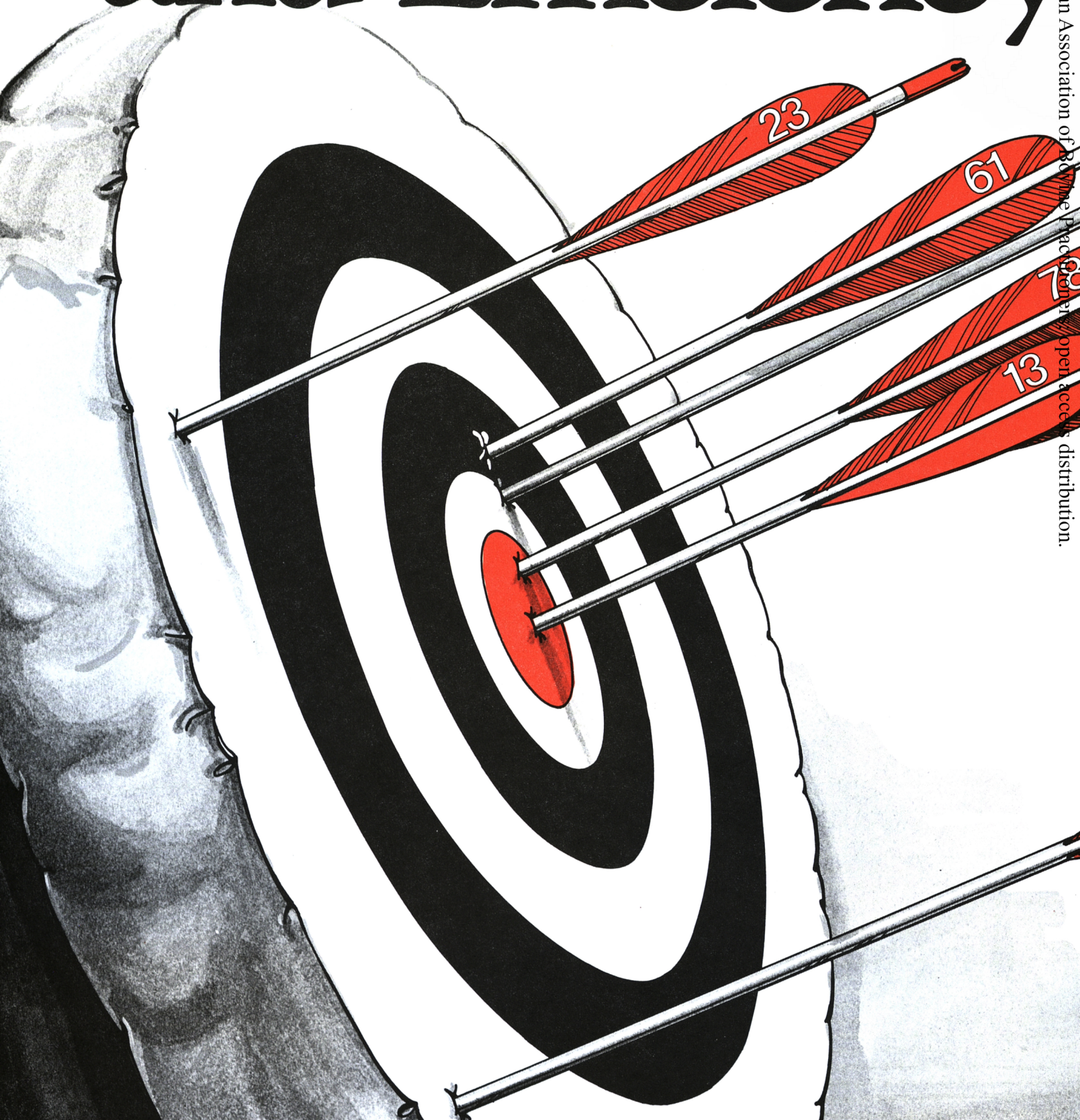
*Clinical*—Cattle were observed daily by 1 or both investigators. Cattle with clinical signs of respiratory disease were restrained, evaluated and treated with antibiotics if indicated. Antibiotic therapy was continued until the rectal temperature was below 39.5C for 2 consecutive days and the clinical condition of the animal was improved.

*Serology*—Sera were heated at 56C for 30 minutes. The serum neutralization test was performed in microtiter plates using 2-fold serum dilutions and an established bovine turbinate cell line. Geometric mean titers (GMT) by

Submitted as Journal Paper # 10,703, Purdue Agriculture Experiment Station, West Lafayette, IN 47906.

Supported in Part by a Grant from Norden Laboratories Inc., Lincoln, NE 68501.

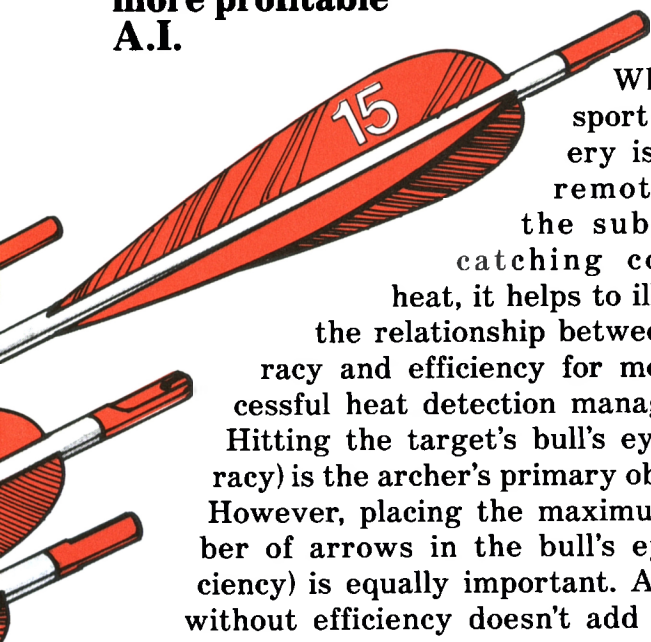
# Heat Detection and Efficiency



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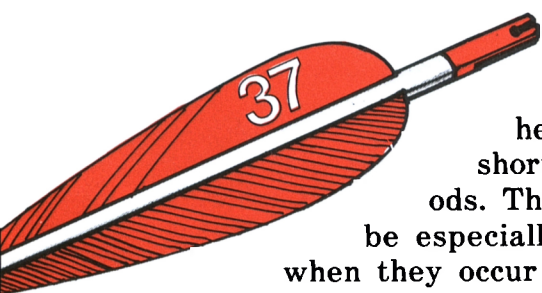
# Accuracy

**Combined objectives that add up to more profitable A.I.**



While the sport of archery is rather remote from the subject of catching cows in heat, it helps to illustrate the relationship between accuracy and efficiency for more successful heat detection management. Hitting the target's bull's eye (accuracy) is the archer's primary objective. However, placing the maximum number of arrows in the bull's eye (efficiency) is equally important. Accuracy without efficiency doesn't add up to a winning score!

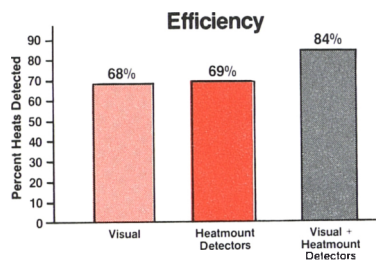
If visual observation alone could consistently hit the "target," average conception rates and calving intervals in your clients' herds would be better than they are today. Visually observing a standing mount is certainly the most accurate means of identifying a cow in heat. When successful, it places the "arrow" right on the bull's eye of accurate heat detection. However, the efficiency of visual observation alone is too often missing the



target in the average herd. A lot of missed heats result from shortened heat periods. This problem can be especially compounded when they occur at night when most heat activity takes place. This explains one of the most common causes of missed heats and *exposes* the major limitations of relying solely on visual observation to catch cows in heat.

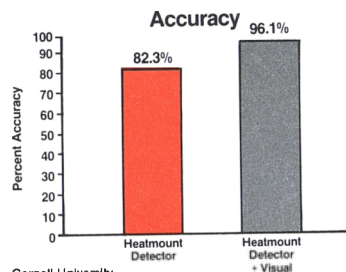
**Kamar heatmount detectors increase heat detection efficiency, put more "arrows" on the target.**

University research has clearly demonstrated the benefits of combining visual observation with Kamar heatmount detectors



Source: J. Dairy Sci. 64:1738

to increase heat detection efficiency while maintaining a high degree of accuracy. Individually, these methods offer average heat detection efficiency but when combined, efficiency improves significantly. The strength of visual observation's accuracy plus the efficiency contribution of Kamar detectors support the concept of combining these heat detection methods to increase overall heat detection effectiveness.



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treatment group were derived by log-2 transformation of the serologic data.

## Results

**Serology**—Sixty two percent of the steers assigned to the vaccination treatment group and 50% assigned to the non-vaccinated group in the 1984 trial were seropositive to BRSV on arrival. At the end of the trial 92% were seropositive in both treatment groups. The GMT increased from 11 to 97 in the vaccinated steers and 7.2 to 79 in the nonvaccinates. The prevalence of seropositive steers on arrival was much lower in 1985, 34% of the vaccinated group and 23% of the nonvaccinated group. At the conclusion of the trial 68% of the vaccinated steers and 75% of the nonvaccinated were seropositive. The GMT increased from 2.7 to 9.5 for the vaccinated steers and 1.7 to 9.2 for the nonvaccinated steers (Table I).

TABLE I  
SEROCONVERSION OF FEEDLOT STEERS TO BOVINE RESPIRATORY SYNCYTIAL VIRUS

Treatment	Year	Percent Seropositive		GMT**	
		Initial	Final	Initial	Final
Vaccinated*	1984	62	92	11	97
	1985	34	68	2.7	9.5
Nonvaccinated	1984	50	92	7.2	79
	1985	23	75	1.7	9.2

\* Received a single dose of vaccine, Norden Laboratories Inc., NE 68501

\*\* Geometric Mean Titer

**Incidence of BRD**—Thirty-three percent (16/48) of the BRSV vaccinated steers required treatment for BRD in both 1984 and 1985. The incidence of BRD in the nonvaccinated treatment group was 44% (21/48) in 1984 and 46% (22/48) in 1985. The death losses were one vaccinated steer in 1984 and 1 nonvaccinated steer in 1985, both with fibrinous bronchopneumonia (Table II).

**Feedlot Performance**—The BRSV vaccinated steers had an ADG of 2.03 pounds in 1984 compared to 1.81 for the nonvaccinated steers. During the 1985 trial the ADG of the vaccinated steers was 2.14 pounds and the nonvaccinated 1.23. The vaccinated steers consumed 4.48 pounds of feed per pound of gain in 1984 compared to 4.75 pounds for the nonvaccinated steers. Vaccinated steers consumed 5.44 pounds of feed per pound of gain in 1985 while the nonvaccinated steers consumed 7.41 pounds (Table II).

## Discussion

The seroprevalence of BRSV antibodies at the time of arrival of the steers at the feedlot was similar to reported survey results but almost 2-fold greater in 1984 than 1985. Variation in SN test conditions would not account for the 2-fold difference as the same protocol was followed each year.

TABLE II  
EFFECT OF VACCINATION WITH BOVINE RESPIRATORY SYNCYTIAL VIRUS ON CLINICAL PERFORMANCE OF FEEDLOT STEERS

Treatment	Year	Treated for BRD*	Deaths	ADG**	Feed/Gain ***
Vaccinated †	1984	16	1	2.03	4.48
	1985	16	0	2.14	5.44
Nonvaccinated	1984	21	0	1.81	4.75
	1985	22	1	1.23	7.41

\* Bovine Respiratory Disease

\*\* Average daily gain

\*\*\* Pounds feed on air-dry basis consumed per pound of gain

† Bovine Respiratory Syncytial Virus Vaccine  
Norden Laboratories Inc., Lincoln, NE 68501

The difference probably reflects greater previous experience with BRSV in 1984. The final seroprevalence in 1984 was 92% for both treatment groups. The increase from 50% seropositive to 92% in the nonvaccinates provides serologic evidence of BRSV infection of the cattle during the course of the 1984 trial. The increase of 52% in the seroprevalence of the nonvaccinated cattle compared to 34% in the vaccinated group indicates BRSV activity during the 1985 trial. The GMT of the vaccinated group increased 9-fold and the nonvaccinates 10-fold during the 1984 trial, a much greater change than the 4- and 5-fold increases recorded in 1985. Similar variation in increases in GMT has been reported.<sup>4</sup>

The number of BRSV vaccinated steers treated for clinical BRD in 1984 was 24% less than the nonvaccinates. Similarly 27% fewer BRSV vaccinated than nonvaccinated steers were treated for BRD in 1985. The reduction in clinical BRD in the vaccinated calves was less than the 43% to 47% previously reported.<sup>3,4</sup> However, the calves in the trials reported here received only 1 dose of vaccine as compared to 2 doses given in previous reported trials which could account for the difference. A lower incidence of treatment for BRD in calves vaccinated twice compared to those vaccinated once has been reported.<sup>4</sup> Further, the previous reports dealt with vaccination with BRSV preweaning and/or at weaning and retention on the ranch of origin. Serologic evidence of 4-fold increase in titer as well as isolation of virus established an association between BRSV and the occurrence of BRD in calves following assembly in the markets and transportation to the feedlot, circumstances similar to the procurement of cattle for these trials.<sup>7</sup>

The ADG of the vaccinated steers was 12% greater than the nonvaccinates in 1984 with 6% reduction in the feed/pound of gain. During the 1985 trial the ADG was 74% greater for the vaccinated steers and the feed/pound of gain was reduced by 36%. The duration of the 1984 trial was 32 days and the 1985 trial 28 days. It could be anticipated that compensatory gain later in the feeding period would offset some of the early advantages in performance of the vaccinated cattle.

**Serologic evidence of BRSV infection during the trial established an association between the virus and the**

**occurrence of BRD. The reduction in the incidence of BRD, the increase in ADG and improved feed conversion of the vaccinated steers during the first month in feedlot all indicate that the BRSV vaccine was efficacious and cost effective in both trials.**

#### References

1. Baker JC, Ames TR, Markham RJF. Serologic studies of bovine respiratory syncytial virus in Minnesota cattle. *Am J Vet Res* 1985; 46:891-892. 2. Evermann JF, Trigo FJ. Clinical and diagnostic significance of

respiratory syncytial virus infection in dairy calves. *Agri-Prac* 1985; 6:15-22. 3. Bohlender RE, McCune MW, Frey ML. Bovine respiratory syncytial virus infection. *Mod Vet Prac* 1982; 63:613-618. 4. Kucera CJ, Wong JCS, Thurber ET, Bohlender RE. The development and evaluation of an experimental bovine respiratory syncytial virus vaccine. *Proc XIIIth Wor Cong Dis Cattle* 1984; 327-332. 5. Baker JC, Ames TR, Werdin RE. Seroepizootiologic study of bovine respiratory syncytial virus in a beef herd. *Am J Vet Res* 1986; 47:246-253. 6. Baker JC, Ames TR, Markham RJF. Seroepizootiologic study of bovine respiratory syncytial virus in a dairy herd. *Am J Vet Res* 1986; 47:240-245. 7. Gillette KG, Smith PC. Respiratory syncytial virus infection in transported calves. *Am J Vet Res* 1985; 46:2596-2600.

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## Abstracts

### **Pulmonary lesions and *Mycobacterium bovis* excretion from the respiratory tract of tuberculin reacting cattle**

S. G. McIlroy, S. D. Neill,  
R. M. McCracken

*Veterinary Record* (1986) 118, 718-721

Although it is generally recognised that tuberculous lesions are present in lymph nodes associated with the respiratory tract in approximately 90 per cent of reactors with confirmed infection, lung lesions are found in only 1 to 2 per cent of such cases during abattoir examination. When lung lesions are not detected, it has been claimed that such cattle are non-excretors and thus unimportant in the epidemiology of the disease. In this study the lungs of 55 reactor cattle were sliced into sections approximately 0.5 cm thick. Tuberculous lesions were evident in over 70 per cent of lungs from reactors with concurrent lesions in lymph nodes of the respiratory system. Further, *M bovis* was isolated from single samples of nasal and, or, tracheal mucus taken at slaughter in 19 per cent of confirmed cases. Several of these reactors had a clear tuberculin test less than six months previously indicating recent infection. This study confirms the continued importance of the infected bovine in the epidemiology and current eradication of bovine tuberculosis. It is suggested that all tuberculous cattle with lesions in respiratory lymph nodes, rather than being regarded as non-excretors, should be considered as possible excretors and thus important sources of infection for other cattle both within and between herds.

### **Aetiology of enzootic haematuria**

N. C. G. Hopkins

*Veterinary Record* (1986) 118, 715-717

The precise aetiology of enzootic haematuria in cattle remains unknown. The involvement of bracken fern (*Pteridium aquilinum*) appears certain because of the close association between bracken fern infested farms and enzootic haematuria. Several toxic principles have been identified but the main carcinogenic element remains to be conclusively demonstrated. More recently, bovine papilloma virus has been implicated in the aetiology of enzootic haematuria. Its possible interaction with bracken fern carcinogen is discussed.

### **Rapid quantitative assessment of the distribution of listeria in silage implicated in a suspected outbreak of listeriosis in calves**

D. R. Fenlon

*Veterinary Record* (1986) 118, 240-242

A silage clamp was sampled for the presence of *Listeria* species. Even though covered by a heavy duty black plastic sheet the top few centimetres of silage were heavily contaminated with *Listeria* species. In the areas nearest the edges of the sheet the pathogenic species *Listeria monocytogenes* was found in numbers in excess of 12,000 organisms/g silage. Using the methods of isolation described, pathogenic species of *Listeria* could be differentiated from non-pathogenic species in three to four days.