# Description of Abomasal Displacements in Dairy Calves

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## Introduction

Abomasal displacement is a well recognized ailment of the digestive tract of adult dairy cattle. However, reports of the disease in rearing calves are scarce. Calves with displacement of abomasum are noticed by the owner because of the following: reduced appetite, poor weight gain, recurrent tympany, and diarrhea with normal or quiet behavior.[2-6,11,13-15] Recurrent tympany can occur as a result of the accumulation of free gas due to reflex inhibition of the forestomach motility caused by the presence of abomasal contents.[5] Calves between 6 and 14 weeks old seem to be the most susceptible.[3,8,11,14] Nonetheless, abomasal torsion has been reported in younger calves.[7,12,15] According to reports, the majority of abomasal displacements in calves occur in male calves and more frequently in fattening male calves.[2-4,11-14] Diagnosis of the condition is often made at necropsy[1,2,11,12,15] and sometimes in the live animal. When the latter is the case, the displaced abomasum has been diagnosed using auscultation/percussion and auscultation/ballotment.[2-4,6,13] Abomasal displacements in calves have been related to pneumonias, and abomasal torsions to perforating ulcers.[1-4,10] In calves, hypochloremic metabolic alkalosis may occur as a result of hydrochloric acid sequestration in the abomasum and forestomachs with the possibility of inducing rumenitis.[5,6] Such metabolic changes are well documented in adult dairy cattle.[8,9,18]

The purpose of this paper was to evaluate the incidence of abomasal displacements in a large number of female dairy calves as well as to determine their characteristics with regard to abdominal position, the efficacy of the diagnostic methods employed, the concurrent diseases present and the electrolyte and acid-base alterations occurring in these animals.

## Materials and Methods

This study was carried out at the rearing center of the Complejo Agropecuario Industrial de Tizayuca (CAIT), Hgo, Mexico. In this center, calves are brought in at 3 days after birth and reared on whole milk (3 liters fed once a day from a bucket), high protein concentrate starting at one week and high quality alfalfa hay from 15 days of age onward. Weaning is practiced in groups when the calves are eating at least 1 kg of concentrate per day. After weaning, calves are kept in groups and fed alfalfa hay, concentrate and a mineral salt mixture.

The period of study was from October 30 to December 17, 1985. During this time, more concentrate was fed to the calves in the corrals and 50 cases of abomasal displacement were diagnosed. Each case was clinically evaluated considering the following criteria:

1) Abdominal position: high, medium or low.
2) Methods of diagnosis: observation, external palpation, auscultation, auscultation/percussion, auscultation/sucussion and rectal palpation.
3) Occurrence of associated diseases.
4) Metabolic disturbances occurring as a consequence of the abdominal displacement.

Five ml of blood from the jugular vein were collected from each animal using a syringe with heparin, for the determination of blood pH and bicarbonate according to the technique described by Sanford.[16] Another sample of 10 ml was collected in a sterile tube and allowed to clot. The serum was frozen and transported to the laboratory and later thawed for the determination of $Na^+$, $K^+$, $Cl^-$ and $Ca^+$ as described by Sanford,[16] and Mourey.[17] Urine

samples, for the measurement of pH*, were collected by vulvar stimulation and introduction of an AI rod towards the bladder. For every case of abomasal displacement, a healthy heifer of similar body size was randomly selected from the same pen and blood samples taken for pH, bicarbonate, $Na^+$, $K^+$, $Cl^-$, and $Ca^+$ determinations to use as control values. All blood and serum samples were run at the Instituto Nacional de Enfermedades Res Piratorias (Calzada de Tlalpan No. 4502, Mexico D.F. 14080).

## Results

We detected 50 (0.99%) cases of abomasal displacement out of an average herd population of 5,021 animals during the observation period. The majority (49%) of abomasal displacements occurred to the left side of the animals (LDA) with only three cases of right displacement of abomasum (RDA) being identified.

When we considered the frequency of the disease related to the size of the rearing center we found 27 cases (1.625%) out of the population of 1,661 animals in growth stage I, and 23 cases (0.684%) out of a population of 3,360 animals in growth stage II. The abdominal position of the displaced abomasum varied considerably according to age (Table 1). In young animals the abomasum had a tendency to occupy a ventral position compared to older animals where it was more frequently located in a medial position inside the abdomen.

TABLE 1. Abdominal position of the displaced abomasum in heifers in growth stages I and II.

| Abdominal Position | Growth Stage I n | % | Growth Stage II n | % | Total n | % |
|---|---|---|---|---|---|---|
| Dorsal | 2 | 7.4 | 4 | 17.4 | 6 | 12.0 |
| Medial | 8 | 29.6 | 13 | 56.6 | 21 | 42.0 |
| Ventral | 17 | 63.0 | 6 | 26.1 | 23 | 46.0 |
| Totals | 27 | 100.0 | 23 | 100.0 | 50 | 100.0 |

Each animal was examined using six methods of diagnosis, with the exemption of rectal palpation that could not be done in small animals (Table 2). The simultaneous use of auscultation and sucussion as well as auscultation and percussion (Figure 1) gave the best results followed by auscultation, external palpation and observation. Rectal palpation seldom permitted the identification of a displaced abomasum.

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TABLE 2. Efficacy of the different methods of diagnosis for the displacement of abomasum in heifers.

| Method | n | Efficacy |
|---|---|---|
| Observation | 32/47 | 68.08% |
| External Palpation | 33/47 | 70.21% |
| Auscultation | 36/47 | 76.60% |
| Auscultation/ Percussion | 39/47 | 82.98% |
| Auscultation/ Sucussion | 39/47 | 82.98% |
| Rectal Palpation | 8/21 | 38.09% |

FIGURE 1.

With regards to the concurrent diseases affecting heifers with displacement of abomasum, bronchopneumonia was by far the most frequent, either alone or associated with other disease (Table 3). Diarrhea, ascitis dermatomycosis, pododermatitis and infectious bovine keratoconjunctivitis were less frequently found either alone, associated among themselves or to bronchopneumonia.

The metabolic alterations in heifers diagnosed with LDA and RDA are shown in Table 4. Normal values obtained from sampling the control herdmates are included in Table 4. These values are the basis for the evaluation of the alterations encountered in animals with

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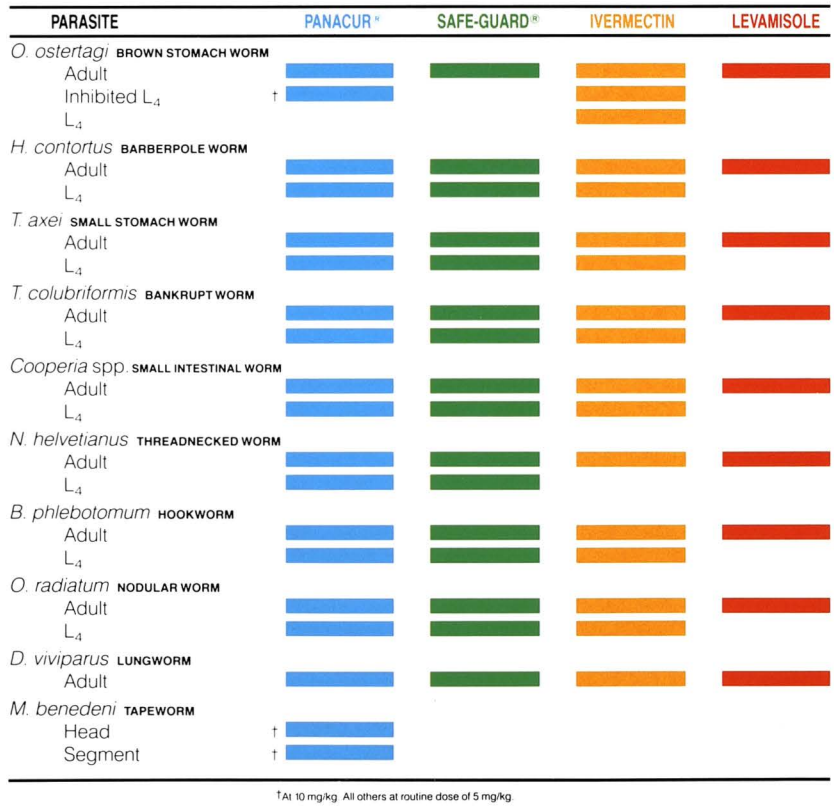


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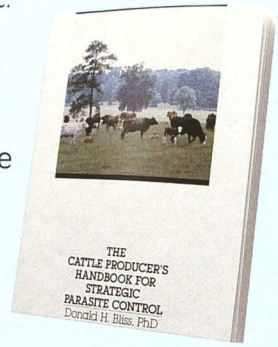


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**EXAMPLES:**

| Dose (5 mg/kg) | Dose (10 mg/kg) | Cattle Weight |
|---|---|---|
| 2.5 mL | 5.0 mL | 109 lbs. |
| 5.0 mL | 10.0 mL | 217 lbs. |
| 10.0 mL | 20.0 mL | 435 lbs. |
| 15.0 mL | 30.0 mL | 652 lbs. |
| 23.0 mL | 46.0 mL | 1,000 lbs. |

Under conditions of continued exposure to parasites, retreatment may be needed after 4-6 weeks. There are no known contraindications to the use of the drug in cattle.

**WARNINGS:** Cattle must not be slaughtered within 8 days following last treatment. Because a withdrawal time in milk has not been established, do not use in dairy cattle of breeding age.

**CAUTION:** Keep this and all medication out of the reach of children.

**DOSAGE:**
**Cattle – 5 mg/kg (2.3 mg/lb) for the removal and control of:**
Lungworm: *(Dictyocaulus viviparus)*
Stomach worm (adults): *Ostertagia ostertagi* (Brown stomach worm)
Stomach worm (adults & 4th stage larvae): *Haemonchus contortus/placei* (barberpole worm) *Trichostrongylus axei* (small stomach worm)
Intestinal worm (adults & 4th stage larvae): *Bunostomum phlebotomum* (hookworm) *Nematodirus helvetianus* (thread-necked intestinal worm) *Cooperia punctata* and *C. oncophora* (small intestinal worm) *Trichostrongylus colubriformis* (bankrupt worm) *Oesophagostomum radiatum* (nodular worm)
**Cattle – 10 mg/kg (4.6 mg/lb) for the removal and control of:**
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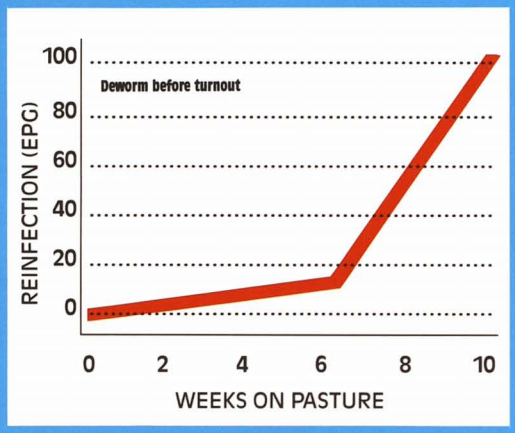


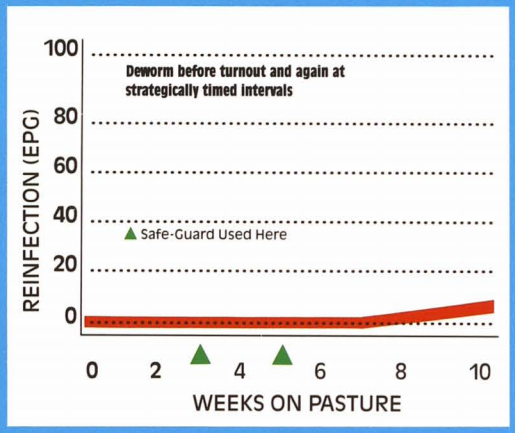


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TABLE 3. Concurrent diseases diagnosed in heifers with displacement of abomasum.

| Disease (s) | n | % |
|---|---|---|
| Bronchopneumonia | 17 | 36.3 |
| Bronchopneumonia, ascitis | 4 | 8.5 |
| Bronchopneumonia, diarrhea | 1 | 2.1 |
| Bronchopneumonia, other* | 6 | 12.7 |
| Diarrhea | 4 | 8.5 |
| Diarrhea, ascitis | 1 | 2.1 |
| Other* | 3 | 6.4% |
| None | 11 | 23.4 |
| Totals | 47 | 100.0 |

*Dermatomycosis or Infectious Bovine Keratoconjunctivitis or Pododermatitis.

LDA or RDA. There were significant alterations in almost all parameters studied. In animals with LDA, the $HCO_3^-$ and sodium levels were elevated, potassium showed no significant changes and chloride, calcium, blood pH and urine pH were reduced. The three animals with RDA showed similar changes consisting of an increase in $HCO_3^-$ and sodium, decrease in chloride, calcium, urine pH and also in potassium; however, blood pH increased.

## Discussion

The majority of abomasal displacements in the rearing center of the CAIT, are diagnosed when the animals are clinically examined at the time they are transferred from the area of growth stage I to growth stage II, or from growth stage II to gestation. However, in some of the affected animals, poor body condition is observed. Abomasal displacements in young cattle have been reported mainly in male calves.[2-4,11-13] Our study shows that abomasal displacement is not rare in female dairy calves raised under intensive feeding and management conditions. In our rearing system, the examination carried out at the time of transfer from one area to the other, allows the clinician to diagnose this condition that otherwise would go undetected. This seems to indicate that abomasal displacements in rearing dairy heifers may be more common than expected.[1,3,4,10] The simultaneous use of auscultation and sucussion permitted the identification of the great majority of abomasal displacements, followed by auscultation and percussion and by auscultation alone. These methods have been the basis for diagnosis by other authors.[1,3,4,13] Interestingly, in two thirds of the calves (32/47) with LDA, the abomasum could be observed bulging from the left of the abdomen (Figure 1). Often on closer inspection one could see the displaced abomasum moving up and down under the abdominal wall probably as a result of abomasal contractions. There was a tendency for the abomasum to be in a ventral position in younger animals and in a dorsal position in older ones. Only 24% (11/47) of cases with LDA did not present any other diseases with 77.6% (36/47) having at least one other disorder. Bronchopneumonia alone or with another disease was the most frequent associated problem. This, however, reflects the prevalence of diseases in the CAIT, where respiratory problems are the number one problem for the rearing center. Acid-base alterations as a consequence of abomasal displacements in calves, have not been reported in the literature to our knowledge. We found an increase in $HCO_3^-$, hypochloremia, hypokalemia, hypocalcemia,

TABLE 4. Clinical chemistry in healthy heifer and with displacement of the abomasum.

| | Normal | | | | Left abomasal Displacement | | | | Right abomasal Displacement | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | $\bar{x}$ | ± | SD | n | $\bar{x}$ | ± | SD | n | $\bar{x}$ | ± | SD |
| $Cl^-$ | 50 | 107.434 | ± | 3.358 | 47 | 105.474 | ± | 3.178* | 3 | 104.600 | ± | 3.874* |
| $HCO_3^-$ | 50 | 21.025 | ± | 2.424 | 47 | 23.629 | ± | 3.948* | 3 | 28.333 | ± | 0.723* |
| $Na^+$ | 50 | 141.959 | ± | 5.012 | 47 | 144.77 | ± | 7.338* | 3 | 145.300 | ± | 9.462* |
| $K^+$ | 50 | 5.062 | ± | 0.528 | 47 | 4.978 | ± | 0.626 | 3 | 4.803 | ± | 0.215* |
| $Ca^+$ | 50 | 11.603 | ± | 1.396 | 47 | 10.288 | ± | 1.694* | 3 | 10.205 | ± | 1.364* |
| Blood pH | 50 | 7.417 | ± | 0.069 | 47 | 6.842 | ± | 0.637* | 3 | 7.456 | ± | 0.057 |
| Urine pH | 50 | 7.746 | ± | 0.404 | 47 | 6.842 | ± | 0.637* | 3 | 6.860 | ± | 0.404* |

* ($p < 0.05$)



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hypernatremia, aciduria and no changes in blood pH in calves affected by abomasal displacement. These changes are similar to those observed in cows with displacement, or volvulus of the abomasum,[8,9,18] except for blood pH which showed acidosis, instead of the alkalosis that occurs in adult dairy cattle. A possible explanation for this might have been the acidification of the sample due to the time lapse between sampling and processing.


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