

# Ileus and Subileus in the Young Bovine Animal

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Forms of ileus and subileus occurring in the calf are predominantly as in the adult bovine animal, but there are certain differences in the younger animal concerning aetiology and pathogenesis of digestive tract obstruction as well as incidence, clinical appearance, diagnosis and therapy. In addition, types of ileus not yet observed in the adult ruminant occur in the young animal.

The differences mentioned could be due to, firstly, the fact that the gastrointestinal tract of the young animal is in the process of development and differs, sometimes considerably, from that of the adult as regards anatomy, topography and function. In addition, the specific symptoms appear to be influenced by the comparatively lower sensitivity to pain of younger individuals. As yet, this branch of buiatrics has on the whole not been closely studied; however, some communications concerning certain ileus forms are available.

The following review is of necessity restricted to the depiction of some characteristic aspects, due to the multiplicity of possible tract obstructions and the space available.

## Incidence

The authors' own observations relate to 181 cases admitted to the II. Medizinische Tierklinik of the University of Munich from 1981 to 1985. Details about the frequency of the various ileus forms as well as their distribution can be obtained from Table I. When related to patients of the same age range (up to 6 months) with diseases of the digestive organs, admitted over the same time span, the proportion of ileus conditions is about 10%. This relatively high figure is due to local peculiarities, as is the breed incidence of approx. 90% for the "Deutsches Fleckvieh/Simmental" and the predominance of male animals (about 67% fattening bullocks).

### *Left abomasal displacement (n = 39)*

Following the reporting of five such cases in 1981, it has become evident that left-sided displacement of the abomasum (LDA) in the calf (Figure 1) is by no means unusual. Left-sided alterations in abomasal position sufficient to be regarded as pathological dislocations have

recently even been observed in calves two to three weeks old.

A point worth emphasizing about the *aetiology* is that 10 cases of LDA with perforated abomasal ulcers as well as 5 with non-perforated ulcers were seen.

On admission, following a course of from one to fourteen days duration, the following *symptoms* were seen: variable or reduced appetite, at times diarrhoea, at other times faeces of thick soup-like to dry/pudding-like consistency with mucus, normal body temperature, normal heart rate (27/39), rarely reduced (2/39), more frequently increased (11/39), left paralumbar fossa flattened or raised by tympany, metallic and splashing sounds on auscultation with percussion or with ballotment of the left flank.

Fig. 1. Left abomasal displacement: in a calf (at about 10 weeks old)

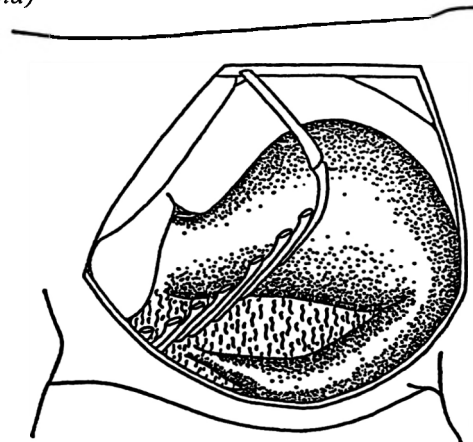
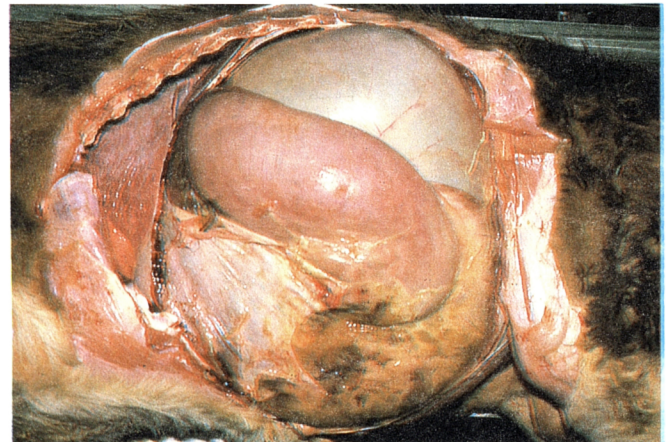


FIGURE 1. Displacement of the abomasum to the left. Ventrally signs of peritonitis (Bursitis omentalis) due to a perforated ulcer.



\*Paper presented at a plenary session of the XIVth World Congress on Cattle Diseases, Dublin, August 26-29, 1986.

TABLE 1. Ileus and subileus forms in 181 juvenile bovines, aged up to 6 months; also distribution according to sex, age and use.

Diagnosis	n	Sex		Age in weeks				Use	
		♂	♀	-4	-8	-12	-24	BS	FS
Left abomasal displacement	39	31	8	5	18	10	7	8	31
Tympany of the abomasum with right displacement	20	13	7	4	9	2	5	8	12
Abomasal torsion	8	5	3	2	4	1	1	3	5
Torsion intestinal mesentery	14	10	4	4	4	4	2	4	10
Intestinal displacement to the left of rumen	2	2				1	1		2
Caecal dilatation and displacement	19	15	4	6	6	6	1	3	16
Intussusception	26								
i. jejunum & ileum	16	11	5	10	3		3	5	11
i. ileocaecal	3	1	2	4				2	1
i. colon	7	3	4	5	2			4	3
Strang./incarc./Volv. intestin.	28	15	13	12	8	4	4	14	14
Umbilical hernia (abomasum)	7	7		1	2	3	1		7
Paralyticus ileus	14	8	6	3	2	2	7	6	8
Obstruction/impaction of the intestine	4	2	2	1	1		2	2	2

Abbreviations: BS = Breeding Stock      FS = Fattening Stock      Dirksen and Doll

The *diagnosis* depends on determining the origin of the metallic and splashing sounds, which could be from either the abomasum, rumen or the abdominal cavity. In addition, the following procedures should be considered: evaluation of pH and chloride values of ruminal fluid aspirated by stomach tube and fluid derived via paracentesis (ruminal contents pH>5.5, Cl<90, usually <60 mmol/l, abomasal fluid pH<4.0, Cl>90 mmol/l); an attempt at removal of gas by stomach tube; repeated (diagnostic) rolling over the back followed by a recheck using auscultation; laparoscopy; laparotomy.

*Treatment* is initially conservative, by rolling the animal over its back. If unsuccessful, a right-sided laparotomy and manual repositioning are carried out. *Results*: conservatively treated: 26; cured after one rolling: 12, after being rolled twice: 2; not cured by rolling: 12 (7 successfully treated surgically, 5 euthanatized/slaughtered) Surgically treated: 16; cured: 9, euthanatized/died immediately or later: 7. Not treated: 3 (spontaneous cure: 1; euthanatized/died: 2.)

*Abomasal tympany with right displacement (n =20)*

This condition consists of a usually peracute gaseous enlargement of the abomasum with an increase in size dorsocaudally along the right body wall (Fig. 2). Concurrently the duodenum is twisted back on itself. In addition, cases with a protracted course occur where the abomasal dilation evidently develops gradually.

The main factor in the *aetiology* would appear to be errors in the nature or method of nutrient (liquid) administration. Non-perforated abomasal ulcers were noted in 7 cases and a perforated ulcer in one.

Fig. 2 Abomasal tympany with right displacement

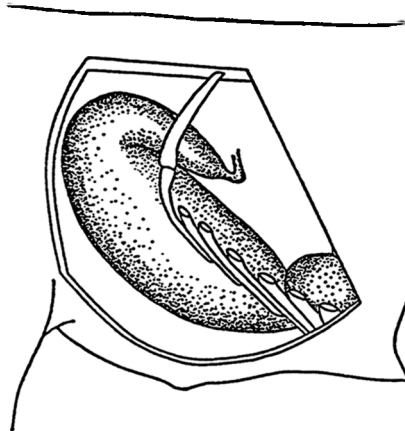
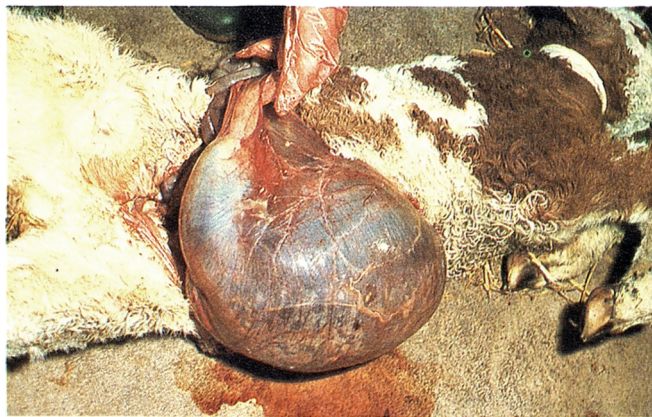


FIGURE 2. Abomasal tympany of medium degree.





*Symptoms* in the typical case appeared as a sudden onset alteration in the animal's general state of well-being, with restlessness, signs of colic (approx. 40%; faecal tenesmus, paddling, kicking towards the abdomen) increased abdominal size on the right or bilaterally, tachycardia ( $>120/\text{min.}$ ) and tachypnoea as well as metallic and splashing sounds on auscultation with percussion and ballotment of the right abdominal wall. The nature of the faeces varies. Moderate to marked dehydration and a frequently pronounced blood alkalosis are present.

*Treatment:* Paracentesis of the bloated abomasum caudal to the right costal arch using a long needle, or right-sided laparotomy with puncture or abomasotomy. Supportive therapy with spasmolytic/analgesic drugs. Replacement of the milk feed by electrolyte solution for 2-3 days. *Results:* surgically treated: 17; cured: 10, not cured: 7 (euthanasia during or post-op.). Conservatively treated: 3; cured: 2; not cured: 1. Immediately euthanatized/slaughtered: 2.

#### *Abomasal torsion (n=8)*

Observations so far indicate that, analogous to the pathogenesis of abomasal torsion in the adult bovine, the torsion (Fig. 3) in the calf is usually preceded by abnormal filling and enlargement of the organ. However, during the first few weeks of life, primary torsions resembling those of the dog also appear to occur. In these cases mechanical influences—vigorous movements with a full stomach—are assumed to be the main aetiological factor. In other instances abomasal ulcers (2/8 non-perforating ulcers were noted) could contribute to the origin of the condition. The torsions are predominantly to the right (when seen from behind).

The *symptoms* depend on the degree of torsion: with those of  $360^\circ$  and more the course is usually peracute, occasionally with severe colic, a mainly right-sided expansion of the abdomen, splashing sounds on the right on auscultation with ballotment and eventually a "Steel-Band" effect on auscultation and percussion, marked tachycardia ( $>140/\text{min.}$ ) and moderate tachypnoea ( $>40/\text{min.}$ ); reduced frequency of defaecation, faeces containing mucus and blood; moderate to marked dehydration, at times a metabolic blood alkalosis, at other times an acidosis.

Fig. 3 Abomasal torsion (approx.  $360^\circ$ )

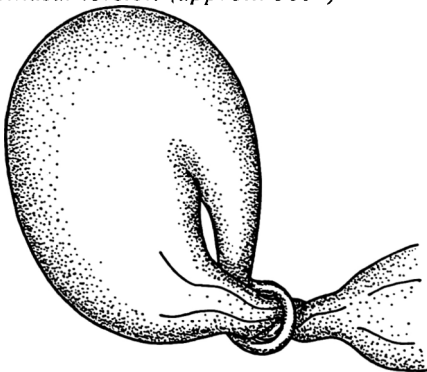
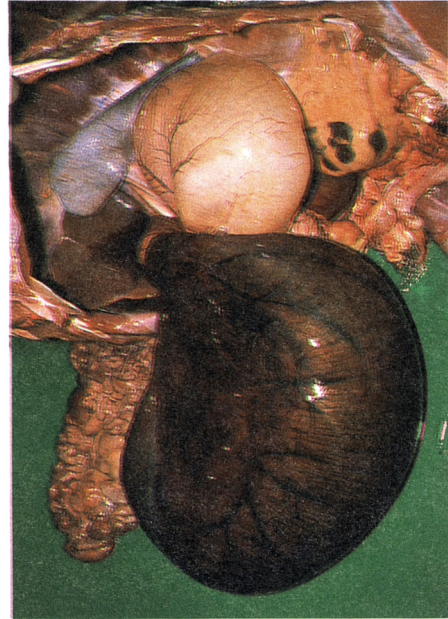


FIGURE 3. Torsion of the abomasum  $360^\circ$  in a calf one week old.



*Treatment:* The acute symptoms make a prompt laparotomy essential (ventral or right-sided approach) together with concurrent circulatory support by means of continuous electrolyte infusion. *Results:* surgically treated: 7; cured: 4, not cured: 3 (partly due to concurrent disease.)

#### *Displacement of the intestine to the left of the rumen (n=2)*

In this instance the intestinal mass has shifted over the rumen to the left, and as a result the small and large intestines lie in contact with the left abdominal wall. The rumen is pushed to the right half of the abdomen and is rotated slightly to the right.

The general condition of the animal is altered to a varying degree depending on the degree and duration of the displacement and the resultant intestinal blockage. In accordance with the grade of ileus, the abdominal size is increased predominantly to the left or bilaterally, and defaecation moderately or severely reduced. In one of the two cases, metallic sounds were detectable in the left paralumbar fossa on auscultation in addition to splashing sounds, although in this animal part of the abomasum was also dislocated to the left. Cardiac and respiratory rates were still within the normal physiological range.

One of the two patients died during pre-op casting, the other was cured by right-sided laparotomy and manual repositioning of the intestinal mass.

#### *Torsion of the intestinal mesentery (n=14)*

The twisting of the intestinal mass around the cranial root of the mesentery (Fig. 5) seems to be sudden in the calf and as a rule occurs more frequently than in the adult bovine animal. Thus the duration of the condition in the cases seen was: 1d/10x, 2d/3x, 3d/1x.

**Symptoms:** Characteristically an acute course with a sudden onset, very severe colic (the animal may kick at its abdomen, throw itself down and roll). These symptoms are rapidly followed by signs of shock and rapid deterioration. Right-sided or bilateral abdominal enlargement (on occasion resulting from ruminal tympany) splashing and sometimes "Steel-Band" sounds detectable on auscultation, (with gaseous dilation of the caecum) and a tympanic percussion echo at the right body wall, suspended defaecation, thick mucus in the rectum, marked tachycardia (>140/min.) and moderate tachypnoea (>50/min.) are additional notable findings. Further aids to diagnosis are the lack of response to spasmolytics (eg. Buscopan - Boehringer, Ingelheim), no decompression on passing of stomach tube and the findings at abdominal paracentesis.

Attempts at *surgery* (right-sided laparotomy) have a prospect of success only if carried out in the early stages and with concurrent measures to help combat shock (continuous infusion by drip, corticosteroids). Results: cured: 4; euthanatized pre-op or during surgery: 6; euthanatized/died post-op: 4.

**Dilatation & displacement with torsion of the caecum (n=19)**

A gaseous dilatation of the caecum with dislocation was present in 7 cases, and an enlargement with varying degree of left or right-directed torsion (when seen from the right) was present in 12 cases (Fig. 4). Worth pointing out is the predilection for calves of up to 12 weeks old (see Table 1). *Aetiologically*, there were no clear-cut features; 6 animals received exclusively milk (4) or milk substitute (2), 8 were fed milk substitute plus concentrates, and 4 received solid food only (1 x unknown). However, some of the patients had been purchased a few days previously and therefore the dietary change could have had some influence. On occasion, changes in the intestinal wall indicating previous inflammation were present.

Fig. 4. Dilatation and torsion of the caecum

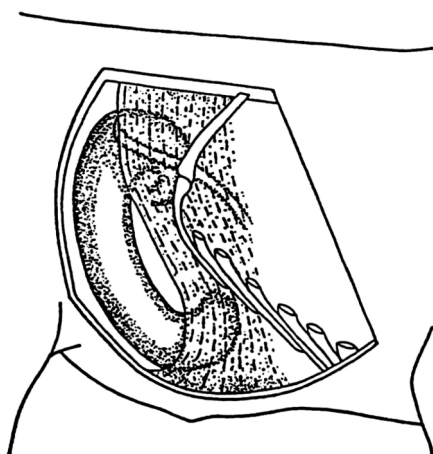


FIGURE 4. Torsion of the intestinal mesentery: twisting of the intestines around the cranial root of the mesentery.



**Symptoms:** In the main, the calves were acutely (4-7d) or peracutely (1-2d) ill. Notable signs were inappetance, colic (5x), reduced or suspended defaecation (in part following previous diarrhoea), bilateral (usually) or right-sided abdominal enlargement, metallic and/or splashing sounds detectable on auscultation with percussion or ballotment on the right side (15) or both sides (4), in one case however, exclusively on the left; moderate tachycardia, respiratory rate usually normal. Eight cases had a metabolic blood alkalosis, 4 had a decompensated acidosis.

**Course:** of the 17 cases in this group, 5 animals which arrived moribund were euthanatized or died after a short time. With *surgical intervention*, which should be carried out as soon as possible, supportive intensive therapy (infusion, corticosteroids) are indispensable. Surgically treated: 14; cured: 5 (1 x caecal amputation); euthanatized during surgery: 3; euthanatized/died post-op: 6 (post-shock 3, recurrence 2, wound complication 1). The diminished success rate compared to that in dilatation and torsion of the caecum of adult bovines can clearly be accounted for by the fact that in a number of the calves a substantial devitalization of the intestine was already present. It is evident that intestinal wall damage, atony and toxin absorption occur more rapidly in the calf than in the older bovine animal.

**Intestinal invaginations (Intussusception (n =26)**

There are major differences in intestinal intussusceptions of older cattle. In the first instance the wide variety of sites affected (Fig. 5) and the high proportion of comparatively rare invaginations in the area of the colon are distinctive. They include infrequent types such as I. ileocaecalis (2) and



I. caecocolica (2).

Regarding *aetiology and pathogenesis*, the fact that 14 out of 26 calves had previously been diarrhoeic or had shown diarrhoea at the time of the invagination points to the cause of the condition. Also worth noting is that 16 of the 26 patients were receiving exclusively liquid nourishment (milk, milk substitute or nutrient/electrolyte fluids).

*Fig. 5. Bovine intestinal mass from the right (schematic) site and main direction of the twist in intestinal mesenteric torsion as well as the predominant sites for intestinal invagination.*

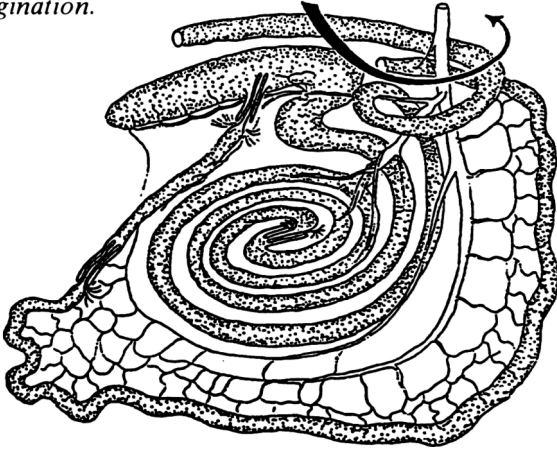


FIGURE 5. Calf with dilatation and torsion of the caecum.



Contrary to the situation in the older bovine, *recognition* of intestinal intussusceptions in the calf poses considerably greater difficulties. This is referable not only to the impossibility of carrying out a rectal examination in animals of less than six months of age, but also to the absence of indicative clinical signs, and masking of the invagination by the frequently preceding diarrhoea. Thus only 2 of the 26 calves showed signs of colic, absence of defaecation was noted in

only 5 and melaena in only 7. Contour and tension of the abdominal wall were usually unremarkable. Splashing (and occasionally also metallic) sounds were sometimes audible on the right, sometimes on the left or bilaterally on auscultation. However, their origin (intestine, abdominal cavity, rumen, abomasum) could not be identified. The degree of dehydration and blood acid/base balance varied, evidently independent of previous diarrhoea and treatment. Cardiac and respiratory rates fluctuated between 60-160 beats/min. and 20-68 respirations/min.

FIGURE 6. Dilatation and torsion (slight degree) of the caecum.

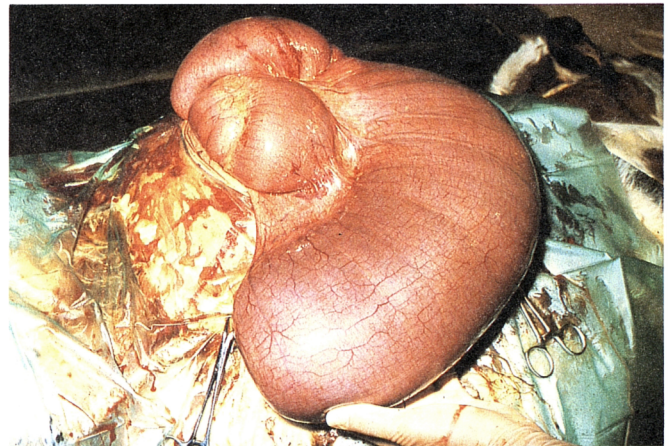


FIGURE 7. Intussusception of the jejunum at the predominant site (see schematic presentation).



The prospects for successful surgical treatment are currently poor due to the condition being recognized too late, and the resultant debility, which can also be due to the preceding diarrhoea. A similar situation affects the human baby.

*Intestinal strangulation incarceration & volvulus (n =28)*

The 28 cases distribute as follows:

Strangulated through strands of connective tissue	2
Incarcerated in umbilical hernia	4
in mesentery	1
in epiploic foramen	1
in scrotum	1
<i>Volvulus of the jejunum</i>	18

Although there are differences regarding *symptoms* and *course* between intestinal strangulations or incarcerations on the one hand and intestinal entanglement on the other, the findings will be grouped together here for reasons of space. According to the histories, the course was peracute in 19 patients, acute in 7. The most notable manifestations were colic (11), increased abdominal wall tension (23), and in some animals spherical (7) or right-sided abdominal protrusion, bilateral (12) or right-sided (10) fluid and/or metallic sounds on auscultation with ballotment and percussion, faeces absent (7) or largely of a thick, pasty consistency (14) and containing mucus (10) or blood (5). Cardiac rate was usually 100/min. (22),

respiratory frequency usually 32-56/min. Incarcerated umbilical herniae were straightforward to diagnose due to the solid, non-reduceable enlargement of the umbilicus.

The prognosis in cases of volvulus is in principal poorer (due to rapidly ensuing devitalisation of the tract, intoxication, shock) than in strangulations and incarcerations. Of the 28 cases under discussion, 11 admitted as moribund soon died or were euthanatized (volvulus 9, Incarceratio 2). *Laparotomies: 17; cured: 7; euthanatized/died: during op. 5, later 5.*

*Incarcerated abomaso-umbilicus (n =7)*

In these patients part of the abomasum (5) or parts of the abomasum and small intestine (2) were entrapped in an umbilical hernia. They were admitted following a course of 1 to 7 days (4) or more (3).

The main *symptom* was the presence of a slightly fluctuating but otherwise doughy/firm enlargement approx. 8-15 cm in diameter, in the area of the umbilicus. Following abomasal reflux, three calves had ruminal fluid with a marked increase in chloride values (92-96 mmol/l at pH values from 6.0 to 6.5) as well as a compensated metabolic alkalosis. Two of the patients had to be euthanatized due to the diagnosis having been made too late; 5 were operated on; cured: 4, not cured: 1 (post-op shock).

*Constipation with obstruction of the intestine (n=4)*

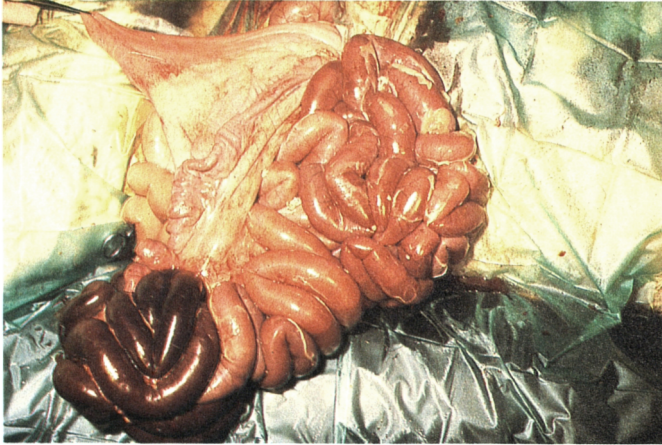
Signs consisting of a marked alteration in general well-

TABLE 2. Differential diagnosis of the ileus and subileus conditions in the young bovine.

Symptom	Disease to be considered in the differential diagnosis
Colic	severe: Torsio mesenterialis intestini, Torsio abomasi 180°, (Volvulus jejuni) moderate: Strangulatio/Incarceratio/Volvulus intestini, Torsio caeci, Tympania abomasi slight: Incarceratio abomasi umbilicalis, Invaginatio aut Obturatio intestini
Abdominal distension	left: Tympania ruminis, Dislocatio abomasi sinistra, (Dislocatio intestini and sinistram ruminis) right: Tympania aut Torsio abomasi, Dilatio caeci, Torsio mesenterialis intestini, Volvulus/(Strangulatio/Incarceratio) intestini, Ileus paralyticus bilaterally: above-mentioned conditions if at an advanced/severe stage or with concurrent ruminal tympany; with ruminal overload; in pneumoperitoneum with excessive pressure
Abdominal fluid and/or metallic sounds	left: Dislocatio abomasi sinistra, empty rumen with little fluid content, (dislocation of another gas-filled and tense part of the intestinal tract to the left) right: predominantly with Tympania aut Torsio abomasi, Dilatio aut Torsio caeci, (with all other ileus conditions on the right of the abdomen) bilaterally: pneumoperitoneum, concomitance of empty rumen and ileus in the right side of the abdomen and/or peritonitis, (expansion of gas-bloated and/or fluid-filled parts of the intestines throughout the whole of the abdomen)
Suspended or altered defaecation	In all complete gut closures (including Ileus paralyticus) from the second day of the condition onwards. Thick slime in the rectum with blood in Torsio abomasi (360° and above), Invaginatio jejuni s. ilei, Incarceratio/Strangulatio/Volvulus intestini
Abomasal reflex (with blood alkalosis)	Severe in Incarceratio abomasi umbilicalis, moderate in Dislocatio abomasi sinistra, Tympania aut Torsio abomasi, otherwise in all obstructions to gut content movement and increasing with the duration of the condition
Altered abdominal punctate	In ileus conditions slight to moderate (depending on the stage of the disease) increase in quality of peritoneal fluid, turbidity, increased cellular content. Of significance in the prognosis only with a distinct change in the smell or with a low pH



FIGURE 8. Volvulus jejuni.



being, suspended defaecation, taut abdominal walls as well as signs of colic (2) were sufficient indication in 3 patients to suspect an ileus and perform an exploratory laparotomy. This revealed the accumulation of gut contents (1 x fibrin) in the jejunum. One animal was successfully treated. Post-mortem of the fourth case, which showed signs of ileus following diarrhoea, revealed an Obstipatio coli.

FIGURE 9. Incarceration of the abomasum in an umbilical hernia.

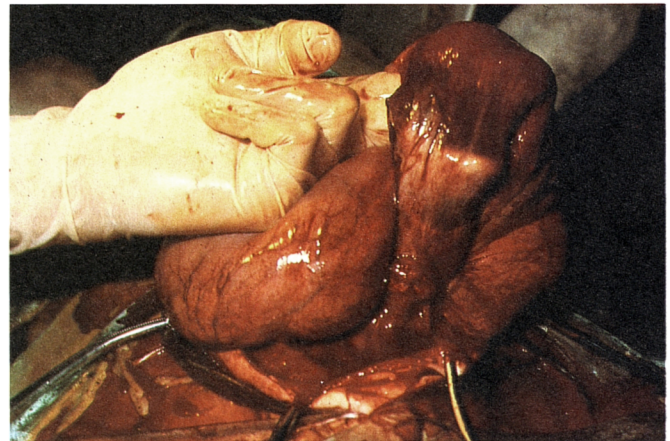


*paralyticus Ileus (n =14)*

Cause and pathogenesis of these cases of ileus are largely unclear. (On occasion, the condition may have consisted of an enterotoxaemia.) They were included in the possible causes because of aspects of differential diagnosis. The reasons leading to a consideration of the presence of a

paralytic ileus were based on the following observations and findings: peracute course with rapid deterioration in the general condition of the animal, reduced or suspended defaecation (11) and a grey/white pasty slime in the rectum, colic (6), raised tension of the abdominal wall (9) and occasionally abdominal distension, abdominal fluid sounds on the right (8) or bilaterally (2) with auscultation on ballotment, ruminal tympany (4), tachycardia (100/min.), moderate (4) to severe (3) dehydration. Lastly, the findings in the abdomen on exploratory laparotomy (13) were decisive. Only 2 patients were successfully treated, one was slaughtered, the others were euthanized or died.

FIGURE 10. Hernia of the same animal as in figure 9 from inside. Fibrous adhesion between hernial sac and abomasum.



**Conclusion**

The first aim of the brief review presented here was to give an insight into the wide range of ileus and subileus conditions presenting in the calf and the juvenile bovine animal. A further aim was to communicate details of experience gained in diagnosis and treatment. If the rate of success of therapy so far has been unsatisfactory in many cases, then this is only in part due to the condition being refractory to treatment eg. perforating abomasal ulcers with peritonitis. To a much greater extent, the poor results were due in most cases to the fact that treatment was initiated too late and the condition was already at an advanced or irretrievable stage. So the most important prerequisite for successful treatment is the early diagnosis of the condition, and therefore diagnosis presents the main problem. It follows that greater use of diagnostic/exploratory laparotomy as an investigative technique should be made in the doubtful cases. On the whole, diagnosis and therapy of ileus and subileus in the young bovine animal provide an interesting area of study in the field of buiatrics.

**Summary**

Though forms of ileus and subileus in the young bovine

animal basically correspond to those of adult cattle, differences exist, however, in several aspects. On the basis of 181 cases in calves up to 6 months of age observations and experiences are communicated on the following diseases: Displacement to the right (n=20), Abomasal torsion (n=8), Intestinal displacement to the left of rumen (n=2), Torsion of

the intestinal mesentery (n=14), Dilatation displacement and torsion of the caecum (n=19), intussusception (n=26), Strangulation/incarceration/torsion of the intestine (n=28), Abomasal/umbilical hernia (n=7), obturator/intestine (n=4), paralytical ileus (n=14). The most important prerequisite for successful treatment is the early diagnosis.

## Abstracts

### Left abomasal displacement and ulceration in an eight-week-old calf

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*Australian Veterinary Journal*, Vol. 63, No. 2, February, 1986

**SUMMARY:** Left displacement of the abomasum was diagnosed radiographically in an 8-week-old female Friesian calf. At surgery, a 4 cm ulcer was repaired and an abomasopexy performed during closure of the abdomen. Recovery from surgery was slow, and regurgitation of rumen contents occurred. Despite medical treatment, the calf died 4 days later.

Left abomasal displacement is a well documented disease of dairy cattle (Robertson 1968; Coppock 1974; Martin *et al* 1978a; Poulsen 1976), but in young calves the condition is rare (Dirksen 1981). This report describes a case of left abomasal displacement with ulceration in an 8-week-old female Friesian calf.

### Studies into immunisation of cattle against interdigital necrobacillosis

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*Australian Veterinary Journal*, Vol. 63, No. 4, April, 1986

**SUMMARY:** Calves were immunised with fractions of *Fusobacterium necrophorum* incorporated in mineral oil adjuvant and then each foot was experimentally exposed to interdigital necrobacillosis (foot abscess) by subcutaneous injection of homologous organisms through the interdigital skin. The number of cells from an 18 h liquid culture that might be expected to cause 50% of the feet of control calves to develop marked swellings following subcutaneous injection was shown to be approximately  $2.2 \times 10^6$  cells. Immunity was shown to be associated with antigens that were located in the supernatant of the culture, and which may be identical with or closely associated with the exotoxins.



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