

## Ileal adenocarcinoma in a cow: a case report

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**ABSTRACT:** An 11-year-old Pinzgauer cow was presented with signs of traumatic reticuloperitonitis. Sonographical examination revealed ascites, peritonitis and a dilated amotile small intestine, which was confirmed during laparotomy. On the basis of necropsy and pathohistological findings a diagnosis of metastasizing ileal adenocarcinoma was made.

**Keywords:** small intestinal adenocarcinoma; cattle; tumour

Neoplasia of the gastrointestinal tract of cattle, as compared with other species, is rare. There are few records of bovine intestinal adenocarcinoma which appears predominantly in the jejunum (Anderson and Sandison, 1969; Vitovec, 1977; Johnstone et al., 1983; Bristol et al., 1984; Archer et al., 1988). Of 1.3 million cattle slaughtered in 100 abattoirs throughout Great Britain during one year, only one had intestinal carcinoma (Anderson and Sandison, 1969). This is the first report of a bovine ileal adenocarcinoma with detailed clinical, laboratory, sonographical, surgical, and post mortem findings.

### Case presentation

In September 2006, an 11-year-old 613-kg Pinzgauer cow was admitted to the Clinic for Ruminants at the University of Veterinary Medicine of Vienna because of anorexia of six days duration and suspicion for peritonitis. Clinical examination revealed jaundice, a rectal temperature of 39.2°C, a pulse rate of 80 beats per minute and a respiratory rate of 22 breaths per minute. The rumen was atonic and static. The abdominal tension was increased. All pain response tests for traumatic reticuloperitonitis were positive. Faeces were mucous, bloody and scant.

The results of a complete blood count (Cellanalyzer CA 530, Medonic) were within reference ranges

other than a leukopenia ( $2.7 \times 10^9/l$ ) and monocytosis ( $0.14 \times 10^9/l$ ). Venous blood gas and plasma electrolyte analyses (ABL77, Radiometer Copenhagen) revealed hypokalaemic metabolic acidosis (pH, 7.23; pCO<sub>2</sub>, 33 mmHg; pO<sub>2</sub>, 47 mmHg; HCO<sub>3</sub><sup>-</sup>, 13.0 mmol/l; ABE, -12.6 mmol/l; SBIC, 14.2 mmol/l; K<sup>+</sup>, 3.8 mmol/l). Serum biochemical analysis (Hitachi 911, Hitachi Ltd.) indicated high glutamat-dehydrogenase (66.14 IU/l) and gamma-glutamyl transferase (63.00 IU/l) activities and increased bilirubin (29.25 µmol/l) concentration. Urine analysis of a voided urine sample revealed a pH of 6.0 and ketonuria (Combur 9 Test, Roche).

Sonographic examination (Esaote MyLab30CV; Esaote) revealed a hypoechoic ascites, an irregular ruminal surface, and distended amotile loops of jejunum with a luminal diameter up to 7 cm (Figure 1). Abdominal paracentesis yielded a cloudy yellow fluid with small clots.

A tentative diagnosis of ileus, ascites, peritonitis and hepatic disease was made, and exploratory right flank laparotomy was performed. Exploration of the abdominal cavity revealed ascites and generalized peritonitis, and the cow was euthanised.

At necropsy the cow was in a good nutritional state and presented a moderate serous ascites. On the peritoneal surface numerous firm nodules up to 1 cm in diameter were present (Figure 2). There were also areas with more plaque-like lesions, consisting of white firm masses, some of



Figure 1. Sonogram of cross-sections through dilated loops of jejunum in hypoechoic ascites viewed from the right flank (5 MHz)



Figure 2. Metastatic tumour masses on the surface of distended jejunal loops

them confluent. These lesions were situated on all abdominal organs, the mesenterium, omentum major, omentum minus and the peritoneal surface of the abdominal cavity. The small intestine was markedly distended (Figure 2). An annular thickening of the terminal ileum wall that looked like necrotic adipose tissue on its cut surface was noticed. The ileal mucosa showed no gross abnormalities. The omentum major was attached to the abomasum, where a non perforating ulcer was situated. The liver showed severe fatty degeneration. Moderate alveolar and interstitial emphysema and alveolar oedema was diagnosed in the lungs.

Samples taken during necropsy were fixed in 7% neutral buffered formalin, embedded in paraffin-wax, cut into 4–5  $\mu\text{m}$  thick slices and stained with

hematoxylin and eosin (HE). Histological examination of the ileum revealed tumour cells in the tunica mucosa, the tela submucosa, the tunica muscularis (Figure 3) and the tunica serosa. These cells had round to polygonal cytoplasm with polymorphous nuclei, some of them producing mucus and some of them showing the morphology of signet ring cells. Parts of the submucosal nerve plexus (Meissners plexus) were surrounded by tumour cells, and moderate infiltration with lymphocytes was present. The annular thickening of the ileum consisted of necrotic adipose tissue within the subserous connective tissue, covered and divided into smaller lobules by dense scirrhous tissue. It was interspersed with groups of tumour cells, partly forming glandular structures. The nodules on the serosa of the abdominal organs were found to be

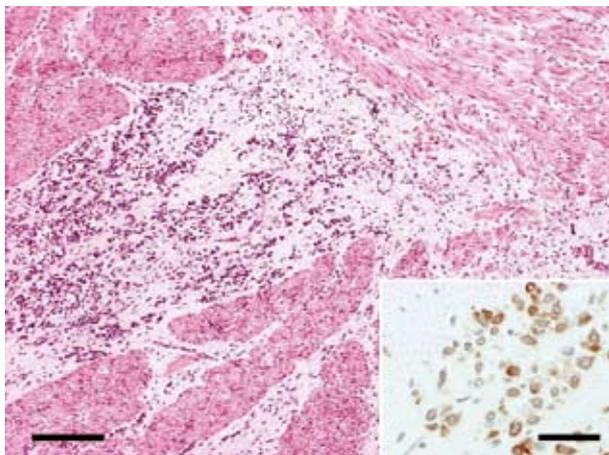


Figure 3. Tumour cells within the tunica muscularis of the terminal ileum (HE, bar = 250  $\mu\text{m}$ ); small figure: Staining for cytokeratin, same location (bar = 50  $\mu\text{m}$ )

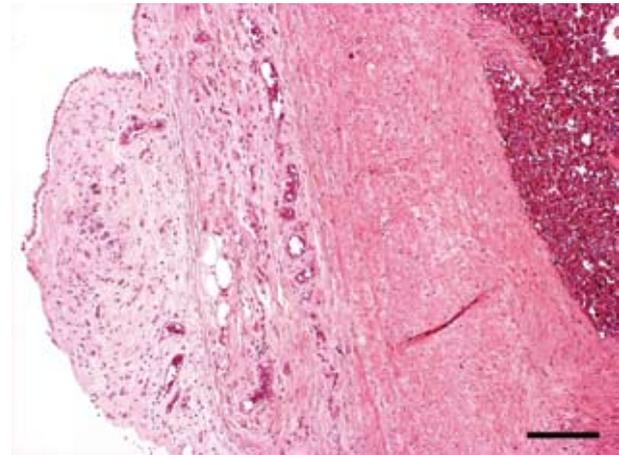


Figure 4. Tumour metastasis with scirrhous reaction and activation of mesothelium on the spleen (HE, bar = 250  $\mu\text{m}$ )

metastases with marked scirrhous reaction (Figure 4). In some locations chronic peritonitis with activation of mesothelium was present. Immunohistochemistry was performed, showing that tumour cells were staining for cytokeratin (Figure 3). Based on the results of histopathology the tumour was classified as an ileal adenocarcinoma.

## DISCUSSION

The low reported incidence of overall neoplasia in cattle, as compared with other domestic animals and humans, may be attributable to the relatively low mean age of commercially slaughtered cattle. In an older population of cattle, intestinal neoplasms may be more frequently encountered. Geographic location is also an important factor in the incidence of bovine gastrointestinal neoplasia (Bertone, 1990). Epidemiologic evidence suggests that, in some tumours, a mutagenic effect may be produced by local environment carcinogens (bracken fern, herbicides) and bovine papilloma-virus (Jarret et al., 1978). No evident aetiological factors were found in this cow and no other cattle on the organic farm has had similar disease. To our knowledge no previous report describes this pathology in an Austrian cattle breed.

The history and clinical signs of this cow suggested traumatic reticuloperitonitis. Presenting clinical signs of small intestinal adenocarcinoma are variable and have been referable to intestinal obstruction, chronic debilitation with gastrointestinal disturbances, liver failure, and peritonitis. Those cases which do occur are usually not diagnosed clinically. Definitive diagnosis of adenocarcinoma may require histologic study of tissue specimens (Bristol et al., 1984; Archer et al., 1988). Serum biochemical analysis and urine analysis pointed to hepatic disease and sonography revealed ileus, ascites and peritonitis which was confirmed during laparotomy. The ascites was probably attributable to intestinal lymphatic blockage caused by the numerous metastases in the intestine as well as the extent of serosal involvement throughout

the abdomen. The mild annular thickening of the ileal wall seemed not to cause an obstruction. The neoplastic infiltration of the Meissner's plexus may have precipitated intestinal distention due to paralysis of the intestinal muscles.

Small intestinal adenocarcinoma may be amenable to surgery, but death from metastatic disease occurs within one year. In general, neoplasia in cattle carries a poor prognosis because of early metastasis of adenocarcinoma. Aetiological factors remain undetermined (Archer et al., 1988; Bertone, 1990).

## REFERENCES

- Anderson L.J., Sandison A.T. (1969): A British abattoir survey of tumours in cattle, sheep and pigs. *The Veterinary Record*, 84, 547–551.
- Archer M.R., Cooley J.A., Hinchcliff K.W., Smith D.F. (1988): Jejunojejunal intussusception associated with a transmural adenocarcinoma in an aged cow. *Journal of the American Veterinary Medical Association*, 192, 209–211.
- Bertone A.L. (1990): Neoplasms of the bovine gastrointestinal tract. *The Veterinary Clinics of North America. Food Animal Practice*, 6, 515–524.
- Bristol D.G., Baum K.H., Mezza L.E. (1984): Adenocarcinoma of the jejunum in two cows. *Journal of the American Veterinary Medical Association*, 185, 551–553.
- Jarret W.F.H., McNeil P.E., Grimshaw W.T.R., Selman I.E., McIntyre W.I.M. (1978): High incidence area of cattle cancer with a possible interaction between an environmental carcinogen and a papilloma virus. *Nature*, 274, 215–217.
- Johnstone A.C., Alley M.R., Jolly R.D. (1983): Small intestinal carcinoma in cattle. *New Zealand Veterinary Journal*, 31, 147–149.
- Vitovec J. (1977): Carcinomas of the intestine in cattle and pigs. *Zentralblatt für Veterinärmedizin A*, 24, 413–421.

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