

MESOTHELIOSIS IN CATTLE

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Definition

Mesotheliosis is characterized by multiple tumours arising from the serous membranes (i.e. mesothelioma). In cattle, this incurable affection was first described by Brieg in 1918 (2). In this species and in man, mesotheliosis seems to be more frequently observed (or at least, described) today than in former times: There is a total of 175 bovine cases, including 16 cases seen in the Hannover Cattle Clinic (HCC) from 1974 to 1991 (1, 2, 3, 4, 5). Many of the reports, however, describe only p.m. findings. Formerly, these tumours have been denominated as "pearl-like affection", "papillomatosis", or "carcinomatosis" of peritoneum, pleura, and/or epicardium (2).

Cause

In human medicine, the causal correlation between mesotheliosis and previous exposition to asbestos is considered as valid. Because of the slow development of the tumours (lasting 20 to 50 years in man), however, this association has not been proven in all cases observed. Croft found mesotheliosis in calves getting water containing asbestos fibres (2). Controlling the environment of the bovine patients observed in the HCC, hints concerning contacts with asbestos-concrete - potentially leading to ingestion of such material - were obtained in 9 out of 16 cases. On the other hand, an experiment heifer, treated orally in the HCC with greyish and blueish asbestos-concrete (260 and 530 g, of which 100 and 330 g were pulverized, in 3 and 11 doses, respectively) did not develop mesotheliosis within 9 months of observation (i.e. 8 months after last dosage). Apparently, the type of asbestos involved is determining the danger - if any - emanating from asbestos-concrete.

Occurrence

Obviously, there is no breed-linked predisposition to bovine mesotheliosis. There is, however, a maximum of observations in fetuses and young calves, and another one in elder adult animals (Diagram 1). Among the latter, females are - of course - prevailing; the comparatively high proportion of male patients within the juvenile group seems to be due to the fact, that the peritoneal lining of their vaginal processus is commonly involved, thus allowing to detect tumour growth by inspection and palpation (of the scrotum) easier than in young female animals (Table 1).

Table 1: Subdivision of 175 cases (including 16 own observations) of Bovine Mesotheliosis according to age and sex

Age:	< 2 years	> 2 years	not given
Male:	18 (7)	11 (-)	-
Female:	8 (2)	27 (7)	-
Sex not given:	31 (-)	14 (-)	66 (-)

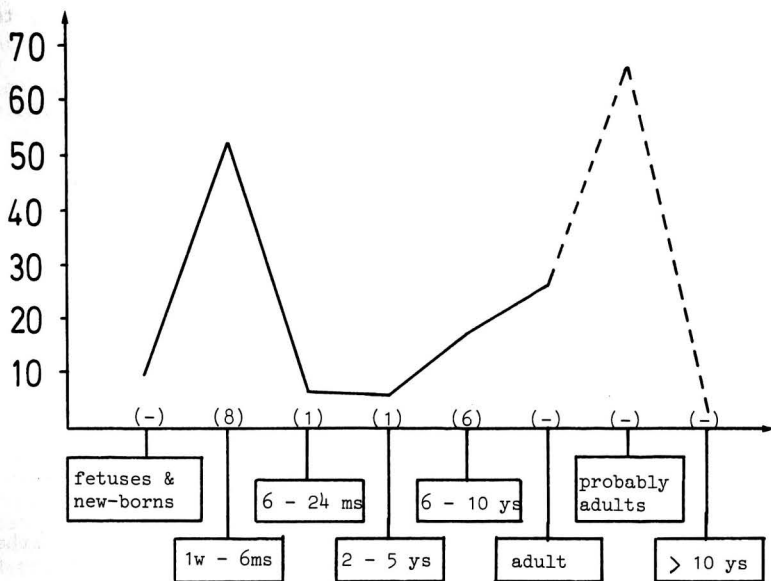


Diagram 1: Subdivision of 175 cases (including 16 own observations) of Bovine Mesotheliosis according to age

Distribution

Hugh-Jones (2) and Croft (2) observed regional concentration of bovine mesotheliosis in the UK and in USA, respectively. In a farm reported to the HCC by the attending veterinarian, two cows of the same age were found to be simultaneously affected by mesotheliosis.

Lesions

In cattle, mesotheliomas usually arise from the peritoneum, including in male animals the Proc. vaginalis peritonaei. In some cases, they involve furthermore, or exclusively, the pleura and/or the pericardium (Table 2). These tumours form multiple grain- to fist-sized greyish-yellow to orange-red patches or nodules adhering evenly or by peduncles to the parietal and visceral serosa. Within the cavity

Table 2: Subdivision of 175 cases (including 16 own observations) of Bovine Mesotheliosis according to the localisations of the tumours

Abdominal cavity:	117 (8)
Abdominal and thoracal cavity:	16 (7)
Thoracal cavity:	20 (1)
Processus vaginalis peritonaei:	12* (4)*
Localisation not given:	17 (-)

* some of these animals are also mentioned in other subgroups

affected, they propagate by contact-metastases. Mesothelioma may tend to calcify or to invade regional lymphnodes; they have not been observed to metastasize into other organs.

Histologically, the tumours of the own 16 cases show either an epithelial type of growth or a biphasic growth pattern with spindle cells and fibrous tissue underlying the epithelial component. Usually, the tumours have a papilliform structure, often forming an adenoid configuration. In the group of older animals, the tumour cells are mostly columnar or cuboidal, whereas in calves they are often more polymorph, sometimes forming multinucleated cells. After special staining, ferruginous bodies were demonstrated in none of the investigated tumours. By scanning electron disperse X-ray analysis, however, several particles revealing aluminium, silicium, some magnesium and iron - i.e. elements occurring in asbestos fibres - were demonstrated in digested tumour tissue from one calf.

Clinical signs

Fetal mesotheliosis may cause dystocia by the bulky increase of the calf's abdominal volume, making fetotomy or caesarean section necessary. Peritoneal mesotheliosis developing pre- or postnatally, leads to increasing hydrops ascites, the abdominal outline becoming pear- or apple-shaped in juvenile or adult animals, respectively. Furthermore, reluctance to feed, unsatisfactory development or nutritional state, decrease in milk-yield, and - later on - diarrhea, and listlessness are observed. Eventually, the animal - suffering from cardiac and/or respiratory failure - becomes unable to raise. Suspicion of mesotheliosis is substantiated in male animals by palpation of the scrotum, in calves by transabdominal palpation or touching an eventual hernial sac, and in adult animals by rectal exploration: The tumours feel like multiple, flat to spheroid nodules of various size, showing a firm (sometimes even hard) consistency and being fixed on the parietal serosa or on the surface of the abdominal viscera. Ascitic fluid is felt as a liquid "streaming" between the abdominal organs by the movements of the examiner's hand. Diagnosis may be verified by abdominal puncture, exploratory laparo-, scroto-, or herniotomy. In mesotheliosis, punctate is abundant, yellow-orange to brick-red, more or less turbid (sometimes containig flakes) and inodorous. It's protein content is 1.4 to 5.0 g/100 ml, it's specific gravity 1.012 to 1.030, it's content in nucleated cells 1100 to 6300/ μ l; cell differentiation reveals numerous erythrocytes, some leukocytes, and isolated macrophages of "foamy" appearance (apparently containing red blood cells). When opening the peritoneal, scrotal or hernial cavity, greyish-yellow to orange-red tumours with smooth or fringy surface are detectable, and copious amounts of abdominal fluid of similar appearance leak off.

In animals with thoracal mesotheliosis, the accumulation of pleural fluid (in those with pericardial involvement also of the pericardial fluid) causes compression of the heart with ensuing venous stasis and increasing respiratory disturbance. It also results in absolute percutory matting on the ventral parts of the thoracal wall.

Differential diagnosis

The following bovine diseases are clinically similar to mesotheliosis and should therefore be differentiated by careful examinations basing upon the signs mentioned below:

- Generalized peritonitis causes inflammatory adhesion of the parietal and visceral serosa, detected by rectal exploration.

- Serosal tuberculosis ("pearl disease") is detected by intracutaneous tuberculin testing.
- Lymphosarcoma can be differentiated by palpation of accessible lymph nodes, white blood count, and - in adult animals - by serological control.
- Ascites of non-mesothelious origin: No tumours palpable.
 - - Cardiac insufficiency: Examination of the heart and jugular veins (including white blood picture);
 - - Thrombosis of posterior vena cava: Control of liver function, serum protein content, serum glutaraldehyde-test, ultrasound-scanning;
 - - Amyloid nephrosis: Rectal palpation of kidneys, urine control, hypo-albuminemia.
- Carcinomatous metastases (originating from liver, uro-genital tract or lungs) usually do not cause hydrops ascites.

Assessment

Mesotheliosis is an incurable disease. Since the carcass cannot be used for consumption, the animal should be euthanized and necropsied. Considering the possible correlation between bovine mesotheliosis and previous exposition to asbestos fibres (or processed asbestos concrete), it seems reasonable to ascertain the diagnosis by post-mortem and histological examination, and to control the animal's environment, especially in relation to the presence of materials containing asbestos.

References

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Summary

Based upon pertinent veterinary literature and 16 own observations, the authors give a survey on definition, supposed cause, occurrence, distribution, macro- and microscopic lesions, clinical signs, differential diagnosis, and assessment of bovine mesotheliosis, a tumourous disease apparently getting more frequent in recent years.

Zusammenfassung

Ausgehend von den einschlägigen Mitteilungen des tierärztlichen Schrifttumes und 16 eigenen Beobachtungen geben Verff. einen Überblick über Wesen, vermutete Ursache, Vorkommen, Verbreitung, makro- und mikroskopische Veränderungen, klinische Befunde, Differentialdiagnose und Beurteilung der Mesotheliose des Rindes, einer in den letzten Jahren offensichtlich häufiger gewordenen Tumorkrankheit.

Resumen

Basandose en las comunicaciones de la literatura veterinaria y 16 observaciones propias, los autores dan una sinopsis sobre definición, causas presumables, incidencia y distribución, lesiones macro- y microscópicas, hallazgos clínicos, diagnóstico diferencial y apreciación de la mesoteliosis bovina, enfermedad tumoral al parecer de frecuencia aumentada durante estos últimos años.