DIFFERENTIAL DIAGNOSIS OF DIARRHOEA IN ADULT CATTLE

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SUMMARY

Many conditions have been associated with diarrhoea in adult cattle of two years and above in many countries of the world. These include rinderpest, salmonellosis, Johnes disease, paramphystomiosis, schistosomiosis, winter dysentery, ostertagiosis, babesiosis, malignant catarrhal fever, poisonings (arsenic, lead, castor seed, sulphur, fodder beet, bracken fern, ragwort and hexachloroethane), chronic copper deficiency, molybdenosis, renal amyloidosis, congestive heart failure, abomasal displacement and chronic traumatic reticulitis. This paper discusses differential diagnosis of the syndrome on the basis of epidemiological, clinical and laboratory features with expectations of improving clinical acumen of the target group, that is, practicing Veterinary Surgeons.

INTRODUCTION

Diarrhoea is an important syndrome of adult cattle. Many conditions have been associated with the syndrome in cattle of two years and above (Tables 1,2, and 3). A significant proportion of those conditions e.g. Johnes disease, mucosal disease, congestive heart failure, alimentary tract cancer, renal amyloidosis and malignant catarrhal fever are invariably fatal (Table 2; Shoo 1984) while others, particularly rinderpest, (Branagan and Hammond 1965) are of great epidemiological and economic significance. Thus, an accurate, and prompt diagnosis of the conditions is important to enable an early decision on the correct course of action.

The objective of the present work was to discuss differential diagnosis of diarrhoea in adult cattle of two years and above. The presentation is based on epidemiological, clinical and laboratory features of the various conditions (Tables 1,2, and 3). Since Tanzania Veterinary Surgeons are likely to form the largest part of the audience of this work, it should be emphasised at this point that there is very little published information/data in Tanzania not only on conditions of cattle presenting with diarrhoea but also other syndromes. Significant proportion of information presented here is based on experiences on epidemiological, clinical and laboratory data observed on 305 adult cattle cases which formed part of thesis by Shoo (1984) together with data from literature including the limited one from Tanzania. The work is intended to raise the awareness of practicing Veterinary Surgeons on the many condition which can cause diarrhoea in adult

cattle and improve their clinical acumen. A few of the conditions occur in temperate and subtropical countries only and this has been clearly indicated in the text. However vast majority of them are of world-wide in their distribution.

EPIDEMIOLOGICAL FEATURES

Epidemiological information provides a good guide towards diagnosis in that it allows the separation of probables from possibles. Information such as geographical distribution of the conditions, number of animals involved in a herd, age and seasonal incidences are important, as detailed below.

Geographical distribution.

Various conditions like salmonellosis, Johnes disease, mucosal disease, malignant catarrhal fever, renal amyloidosis, left abomasol displacement, congestive heart failure, babesiosis, nephrosclerosis together with poisoning by lead, organophosphates, arsenic, castor seed and sulphur may occur on various farms world wide (Blood and Radostitis 1989). Others, occur only in certain localities and sometimes, under special circumstances. Chronic ragwort poisoning and upper alimentary tract cancer are cases in point which are likely to occur on farms infested with ragwort (*Senecio spp*) (Betty and Markson 1954; Cockburn and others 1955; Donald and Shanks 1954; Petrie and Logan 1981) and bracken fern (*Pteridium aquilinum*) (Plowright 1955; Plowright and others 1971; Jarrett and others 1978; Campo and others 1980), respectively. Chronic copper deficiency/molybdenosis occur on farms where soils are deficient in copper or have excessive amount of molybdenum (Allcroft 1952; Buxton and Allcroft 1955; Parker and Rose 1955; Gardner and Hall-Patch 1962). Rinderpest is known to occur in Africa, Asia and parts of Eastern Europe only (Rossiter and others 1983; Blood and Radostitis 1989). Winter dysentery has been reported from temperate countries (Hedstrom and Isacksson 1951; Roberts 1957; Hutchins and others 1958; Edwards and Siers 1960) while ostertagiosis occur in winter rainfall areas of the world (Armour 1974) and are unlikely to occur in Tropical areas (Sewell and Brocklesby 1990). Conditions like hexachloroethare poisoning due to destruction of war stores and poisoning due to Brazillian groundnut meal occurred as isolated incidents in Britain (Boddie 1947; Clegg 1962) while fodder beet poisoning occurs when there is sudden exposure to large amounts of fodder beet (Price 1954; Penny 1954; Worden and Bunyan 1954).

Number of animals affected

The various conditions can be classified into one of the following groups depending on the number of animals affected in a herd.

Herd Problems

These include conditions which affect several to many animals in a herd at a time. Examples are rinderpest, salmonellosis, schistosomiosis, paramphistomiosis bovine virus diarrhoea, poisonings by lead arsenic, organophophate, sulphur and castor seed, grain overload, winter dysentery, ostertagiosis, chronic copper deficiency/molybdenosis, and babesiosis. (Shoo, 1984).

Single animals problems

Belonging to this group are Johnes disease,

mucosal disease, alimentary tract cancer, renal amyloidosis, left abomasal displacement, congestive heart failure, nephrosclerosis and traumatic reticulitis. (Shoo, 1984).

Age incidence

While rinderpest, salmonellosis, mucosal disease, malignant catarrhal fever, grain overload, chronic ragwort poisoning, winter dysentery, ostertagiosis, chronic copper deficiency/molybdenosis as well as lead, arsenic, organophasphate, sulphur and castor seed poisonings may affect all age groups (Blood and Radostitis 1989), upper alimentary tract cancer (Jarret and others 1978) and renal amyloidosis (Shoo, 1988) have been reported in adult cows only. Mucosal disease occurs most commonly in cattle less than two years of age but older ones are also affected (Dow and others 1956). Johnes disease has a peak age incidence of three to six years (Shoo 1989) and left abomasal displacement, four to seven years (Blood and Radostitis 1989).

Seasonal incidence

Only a few of the conditions have a particular seasonal incidence; for example, occurence of malignant catarrhal fever coincides with calving of wildebeests or lambing by ewes,(Selman and others, 1974). Babesiosis is also likely to occur during warm wet weather when tick activity is high (Blood and Radostitis 1989).

CLINICAL FEATURES

The conditions which cause diarrhoea in adult cattle may be classified into one of the following groups on the basis of their major presenting signs:-

Diarrhoea per se

These cases present with diarrhoea as the major sign. Other signs may become obvious after careful examination. Categorised under this group are Johnes disease, paramphistomiosis, schistosomiosis, ostertagiosis, winter dysentery, chronic copper deficiency/molybdenosis, grain overload, arsenic and sulphur poisonings, left abomasal displacement, upper alimentary tract cancer, chronic traumatic reticulitis and nephrosclerosis (Shoo 1984).

In paramphistomiosis, there is also anaemia and submandibular oedema (A. Makundi 1992 - Personal communication). In arsenic (Orr 1952, Weaver 1962) and sulphur poisoning (Harvey 1924, McFarlane 1952) as well as grain overload,(Blood and Radostitis 1989), the rectal temperature is normal to subnormal. In grain overload,there is also dehydration, staggering gait and drowsiness. In arsenic poisoning on the other hand, there is intense diffuse abdominal pain. The latter sign which may be localised in cases of acute traumatic reticulitis is usually absent in chronic cases of the condition.

Differentiation of Johnes disease, ostertagiosis, and winter dysentery on the basis of clinical signs alone is difficult unless epidemiological and laboratory data is also considered (Shoo 1984). However, there is no marked loss of body condition in cases of winter dysentery due to the acuteness of the condition.

In cases of chronic copper dificiency/molybdenosis (Allcroft 1952), there may be depigmentation of the skin. In left

abomasal displacement, there is a characteristic "ping" sound detected following a combined auscultation and percussion of left paralumbar region(Millar 1974). The sound is intermittent and repeated examination may be required. This feature is diagnostic for left side abomasal displacement.

Diarrhoea in cases of upper alimentary tract cancer unlike in other conditions contains large pieces of poorly digested herbage and it is sometimes referred to as "fibrous diarrhoea"(Shoo 1984). Cases of nephrosclerosis are stunted and there is evidence of urea smell in their breath. The kidneys are also smaller than normal on rectal examination (Shoo 1984).

Diarrhoea and excessive salivation

Rinderpest, bovine-virus diarrhoea, mucosal disease and malignant catarrhal fever differ from the other conditions in that in addition to diarrhoea, they also present with excessive salivation due to erosive/ulcerative stomatitis (Blood and Radostitis 1989). Furthermore, malignant catarrhal fever differs from rinderpest and mucosal disease clinically because it also present with keratitis, a marked lymphadenopathy and sometimes haematuria due to cystitis (Selman and others 1974). Occassionally, there may also be dysentery. It is generally difficult to differentiate rinderpest from mucosal disease on the basis of clinical signs alone and therefore, epidemiological and laboratory information is important in this respect. Nonetheless, unlike rinderpest, lameness is a marked feature in mucosal disease (Shoo 1984) . Although organophosphate poisoning presents with diarrhoea and excessive salivation (Blood and Radostitis 1989), oral lessions are not encountered. Animals affected by organophosphate poisoning may also have constricted pupils, muscle stiffness and a staggering gait.

Diarrhoea with or without, dysentery

Salmonellosis, schistosomiosis, castor seed poisoning and at times malignant catarrhal fever and rinderpest do present with diarrhoea and sometimes, dysentery. There is no stomatitis in salmonellosis, schistosomiosis or castor seed poisoning. In castor seed poisoning and schistosomiosis, unlike the other two conditions, rectal temperature is usually normal or subnormal (Fox 1961) while in salmonellosis fever is a feature although in chronic cases it may be normal (Hughes and other 1971)

Diarrhoea and subcutaneous oedema

Both renal amyloidosis and congestive heart failure belong to this category. In renal amyloidosis unlike congestive heart failure, kidneys are enlarged and this can be detected by palpation of the left kidney per rectum (Shoo 1988). Causes of congestive heart failure were classified into three groups (Shoo 1984). These were primary heart diseases (endocarditis, traumatic pericarditis and ventricular septal defect), Cor-pulmonale cases (diffuse fibrosing alveolitis and other severe pneumonias, lung cancer, and high altitude disease) and mediastinal masses (abscesses, tumours, cysts). Specific cause of congestive heart failure can be established by a detailed auscultation of the chest. For example, presence of systolic murmurs in endocarditis

Table 1. **Incidents of disease in adult cattle in which diarrhoea was a major feature as reported in the Veterinary Record either for the first time or following a better understanding of the condition***

INCIDENT	AUTHOR(S)
Red water	Montgomery (1904)
Johne's disease	McFadyean (1907)+
Lead poisoning	Waters (1909)
Ragwort poisoning	Leyshon (1926)
Salmonellosis	John(1946)
Hexachloroethane poisoning due to destruction of war stores	Boddie (1947)
Winter dysentery	Rollinson (1948)
Castor seed poisoning	Anderson (1948)
Brachen fern poisoning	McLauchlan (1951
Conditioned copper deficiency	Allcroft (1952)
Sulphur poisoning	McFarlane (1952)
Fodder beet poisoning	Price (1954)
Mucosal disease	Dow and others (1956)
Alimentary tract cancer	Jennings and McIlyre (1957)
Arsenic poisoning	Weaver (1962)
Abomasal disease	Pinsent and Ritchie (1955)
Abomasal disease	Pinsent and others (1961)
Poisoning due to Brazillian groundnut meal	Clegg (1962)
Bovine renal amyloidosis	Murray and others (1972)
Ostertagiosis	Selman and others (1976)

+ First report of the disease but in J. Comp. Path.

* After Shoo (1984)

Table 2. Conditions presenting with diarrhoea in adult cattle admitted to Glasgow University Veterinary Hospital, 1973-1983*

Condition	No. of Confirmed Cases
Johne's disease	89
Ostertagiosis	61
Mucosal disease	30
Congestive heart failure	29
Abomasal displacement	20
Alimentary tract cancer	17
Traumatic reticulitis	15
Ragwort poisoning	10
Renal amyloidosis	9
Acute bracken fern poisoning	3
Salmonellosis	1
Lead poisoning	1
Malignant catarrhal fever	1
Nephrosclerosis	1
Gastroenteritis of unknown cause	18

* After Shoo (1984)

Table 3. Incidents of cattle deaths due to conditions in which diarrhoea could be a feature as recorded in Tanzania from 1980/1989*

Disease	No. of cattle deaths	% of all cattle deaths
Babesiosis	22,977	5.3
Worms+	3,667	0.8
Plant poisonings+	614	0.1
Chenmical poisonings+	356	0.1
Rinderpest**		

+ Unspecified.

** Data not availlable but outbreaks did occur in 1981/82 (Rossiter and others 1983)

* Source: Ministry of agriculture, livestock development and coorperative, Tanzania.

TABLE 4: Differential diagnosis of diarrhoea in adult cattle - laboratory features

Condition	Salient ante-mortem laboratory features	salient post-moterm laboratory features	Reference
Rinderpest	Marked leucopaenia and lymphopaenia, virus isolation from lymphnode biopsy virus isolation from lymph nodes.	Erosive stomatitis and gastro-enteritis. zebra stripes in ileocoecal junction	Scott and Brown (1961) Rossiter and others (1983)
Salmonellosis	Leucopaenia neutropaenia,	Fibrinohaemorrhagic enteritis, isolation of Salmonella from mesenteric lymph nodes and gall bladder	Minga (1985)
Johnes disease	Clumps of acid fast bacilli (positive ion 50% of cases). Complement fixation, agar gel immunodiffusion and fluorescent antibody tests useful.	Thickening and corrugation of intestines, present of acid fast bacilli in intestinal mucosal	Julian (1975) Shoo and others (1989)
Schistosomiasis	Faecal egg count	Mesenteric vessels schoistosome pair count	McCauley and others (1983a,b)
Paramphistomiasis	Detection of immature flukes in faeces by decanting method; fluke egg counts in faeces.	Immature flukes in small intestine.	Blood and Radostitis (1989)
Mucosal disease	Leucopaenia, Lymphopaenia neutropaenia, isolation of virus from blood or nasal swabs, antibody negative.	Erosive stomatitis and gastroenteritis, erosions in feet, isolation of the causal virus from lymphnode or spleen.	Brownlie and others (1984)

Malignant catarrhal fever	Leucopaenia neutropaenia isolation of the virus and detection of rising antibody titre to the virus in African cases	Erossive stomatitis widespread vasculitis	Plowright (1965) Selman and others (1974)Sewell and Brocklesby (1990)
Organophos phate poisoning	No specific test for routine use	No apparent lesions	Clarke and others (1981)
Arsenic poisoning	Levels as high as 16mg/kg of urine or 0.34-1.5mg/kg of milk	Gastroenteritis, high levels of arsenic in liver (10mg/kg wet matter)	Clarke and others (1981)
Lead poisoning	High levels of lead in blood and milk	Fatty degeneration of liver and kidneys, high levels of lead in kidneys (>25mg/kg in wet kidney corter)	Clarke and others (1981)
Chronic ragwort poisoning	Elevated aspartate transminase, alamine phosphate, serum bilirubin, liver biopsy	Fibrosis and negalocytosis in liver	Pertie and logan (1981)
Winter dysentery	Isolation of *Campylobacter fetus var jejuni* from faeces	Not a fatal disease	Campbell and Cookingham (1978) Van Kruinigen and others (1985)
Ostertagiosis	Serum pepsinogen concentration >3 i.u/l	Ostertagia nodules, mucosal hyperplasia and presence of worms in abomasum	Selman and others (1976)
Chronic copper deficiency/molybdeno sis	Macrocytic hypochromic anaemia; Blood plasma levels <7.9 umol/l	Liver levels <0.16 mmol/kg	Allcroft (1952) Gardiner and Hall-Patch (1962)

Upper alimentary tract cancer	No useful test available	Squamous cell carcinoma of the upper alimentary tract	Jarret and others (1978)
Renal amyloidosis	High levels of protein in urine >500mg%	Amyloid deposits in kidneys and other organs	Murray and others (1972), Shoo (1988)
Left abomasal displacement	No useful test available	No useful test available	Millar (1974)
Chronic Traumatic reticulitis	Moderate leucocytosis, neutrophilia	Fibrous adhesions between reticulum and various other abdominal organs	Fox (1980)
Congestive heart failure	There may be leucocytosis and neutrophilia in suppurative cases	Lesions on heart valves, pericardium mediastinum or lungs depending on the cause	Hoffsis (1980)
Nephrosclerosis	Blood urea values >30mmol/l	Nephrosclerosis	Shoo (1984)
Castor seed poisoning	No useful test available	Hemorrhagic gastroenteritis	Geary (1950)
Sulphur poisoning	No useful test available	Gastroenteritis, presence of specks of sulphur in abomasum	McFarlane (1952)
Grain overload	Elevated packed cell volume, decreased ruminal protozoa and Gram negative ruminal bacteria, increased proportion of Gram positive ruminal bacteria	Rumenitis	Loew and Chaplin (1976), Scanlan and Hathcock (1983)
Babesiosis	Piroplasms in erythrocytes	Jaundice, anaemia. splenomegally hepatomegally, red water in urinary bladder	Purnell (1981)

and ventricular septal defect, bilateral muffling of heart sounds and pericardial splashing in traumatic pericarditis, unilateral muffling of the sounds without pericardial splashing in mediastinal masses and abnormal respiratory sounds in cases of cor-pulmonale. In both congestive heart failure and renal amyloidosis there will also be evidence of ascites. The latter may also occur in chronic ragwort poisoning in the absence of subcutaneous oedema. There is however, tenesmus and sometimes prolapse of the rectum in chronic ragwort poisoning.

LABORATORY FINDINGS

Both ante-and post-mortem laboratory investigations are important for confirming the diagnosis made on the basis of epidemiological and clinical observations. Important laboratory features and their relevance in the differential diagnosis of the syndrome have been summarised in Table 4. Some of the ante-mortem laboratory features are diagnostic while others are not. In the case of the latter, a careful consideration of the laboratory findings together with clinical and epidemiological data is essential in establishing a diagnosis.

CONCLUDING REMARKS

Many conditions have been associated with diarrhoea in adult cattle. An accurate and prompt diagnosis of the conditions is important to enable an early decision on the correct course of action. Consideration of epidemiological, clinical and laboratory data in combination is essential for an accurate diagnosis even in the presence of intercurrent disease.

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