Economic optimal production of heifers
Ischaemic teat necrosis and other bovine sites with DD

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Digital Dermatitis

- Probably UK's biggest national biosecurity lapse ever!
- We watched it coming and did NOTHING to prevent
- Now accounts for 30%? of all lameness
- And is becoming increasing associated with other conditions in heifers and cows

Digital Dermatitis

- First reported by Cheli and Mortellaro in Italy in 1972,
- then spread across Europe into the Netherlands in late 1970's and early 1980's
- Reported in UK in 1985

First reported in Italy in 1972…

Can be interdigital ……

IDSH

- Any irritation of i/d cleft, eg ‘foul’, DD, trauma
- Poor foot trimming
- Conformation
- hereditary

Hairy warts = chronic form

DD at other sites + in other species

- ***Other sites*** in cattle
  - UMD = ulcerative mammary dermatitis
  - Ischaemic teat necrosis
  - Hock lesions
  - Pressure sores, eg in recumbent cows

- ***Other species***
  - CODD in sheep + goats
  - Tail biting, ear necrosis + skin lesions in pigs
  - Hoof dermatitis in Elk in Washington State

Ischaemic teat necrosis

- Starts as an erosive lesion on the medial aspect of the teat/udder junction
- Enlarges to spread down the teat
- Becomes intensely irritant, so that eventually the whole teat is licked off

Is it a ‘new’ syndrome, or just reported more?

‘Summer sores’

Diseases + Disorders of Cattle

Blowey + Weaver, **1991,** Mosby Wolfe Publications

Summer sores and teat eczema

Summer sores are eczematous lesions that result from excessive licking, and may be secondary to irritation caused by flies. First seen as irregular-shaped areas of moist, wet eczema at the teat base, they may spread to involve almost the entire teat (**614**), when they can be very painful. **614** shows islets of residual epithelium in the granulation tissue, especially towards the tip of the teat, and there is a serous exudate. At this stage, differential diagnosis from bovine herpes mammillitis (**598**) and necrotic dermatitis (**622**) is difficult. Simple sunburn producing a thickening of teat skin may also occur (**71**).

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Veterinary Record 2004

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Ischaemic necrosis of the base of the teat in dairy cows

SIR, – I wish to report an apparent increase in the incidence of a specific form of teat necrosis in dairy cattle. I have seen the condition occasionally over the years, but over the past 12 months the number of cases has increased considerably. The lesion starts at the base of the teat, in the fold where the teat joins the udder, and is invariably on the medial aspect of the teat. The initial changes are a mild oedema and thickening of the overlying skin with the oedema diffusing into the adjoining udder and into the barrel of the teat. The overlying skin then becomes thickened and necrotic and the lesion is usually first recognised on farm as a dry area of necrotic skin (Fig 1a). The area of dry necrosis often spreads over the medial aspect of the teat to produce a deep ulcerated area, perhaps more correctly termed a rodent ulcer, which can involve half of the teat skin or more (Fig 1b). In some cases the whole teat becomes affected. Teat oedema is marked and at this stage the teat is often highly irritant to the animal, resulting in excessive licking and self-destruction (Fig 1c). The animal then becomes impossible to milk.

Cessation of milking of the affected teat, perhaps assisted by treatment with non-steroidal anti-inflammatory drugs (NSAIDs) plus topical salves, will lead to a slow healing of early cases. However, more advanced cases do not respond and several animals have totally removed the whole teat (and sometimes more than one teat) through excessive licking. The overall process may take four to six weeks.

The condition has been seen in both heifers and cows and at a range of stages of lactation, but always in milking animals and often in higher yielders. The cause is unknown, but from the nature of the lesion it seems that it is most likely to be associated with a disruption of the highly vascular erectile tissue at the base of the teat. The siting of the initial lesion, on the medial aspect of the base of the teat, is the point of impact of the mouth of the liner and one possible cause is simply trauma from the mouth of the liner. If this were the case, then one might expect to see the lesion in animals with poorly aligned, medially facing teats. This is not the case. Discussion with colleagues has suggested that the lesion might be caused by self-trauma, initially stimulated by fly damage. It is true that flies are more likely to land on the medial aspect of the teat as leg movements would remove any flies from the lateral aspect. However, at least two cases have been seen in the colder winter months, and others on hind teats, so this seems less likely.

If the lesion is associated with vasoconstriction of the important erectile plexus at the base of the teat and a subsequent local circulatory failure, then perhaps it is not surprising that NSAIDs are not effective, because these are anti-inflammatory agents. Locally applied vasodilators might be more appropriate, but to date none has been tried. The condition has important welfare and economic considerations and if its incidence is truly increasing then action needs to be taken. Excessive licking of teats following postmilking teat disinfection with hypochlorite, and induced by sodium deficiency associated with maize silage feeding, has been reported previously (Blowey 1996, Lawson 1996), but this was on a herd basis and did not lead to teat trauma.

I would be interested to hear if other colleagues have experienced similar problems.

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References
BLOWEY, R. W. (1996) Teat licking in dairy cattle. *Veterinary Record* **138,** 372
LAWSON, R. B. (1996) Teat licking in dairy cattle. *Veterinary Record* **138,** 424

Testing for maedi-visna

SIR, – The findings reported in the letter by J. H. Payne and others (*VR*, January 17, p 94) of the solely neurological signs in clinical cases of maedi-visna (MV) in two flocks are very interesting. We would agree with the authors that it is likely that the prevalence of MV in the national flock is on the increase and would like to take this opportunity to report our experiences from administering the Maedi-Visna Accreditation Scheme.

The Scottish Agricultural College (SAC) took over the running of the scheme from MAFF in 1996. Table 1 shows the numbers of flocks that have failed at the qualifying tests, that is, testing flocks of unknown status wishing to join the scheme. The data are given in two-year periods in an attempt to reduce random fluctuation between years. This is necessary when looking at such a small data set.

None of the owners of the above flocks was previously aware that their flock was infected with MV. In addition, one MV accredited flock in 1999 and two accredited flocks in 2002 purchased sheep from non-accredited flocks but the bought-in animals subsequently failed at the first qualifying test. The outbreak of foot-and-mouth disease in 2001 affected the number of flocks joining the scheme in that year. Many of the flocks that were culled were restocked with MV accredited stock and there is no requirement for these flocks to go through qualifying tests.

The existence of the Maedi-Visna Accreditation Scheme for the past 21 years has helped keep thousands of pedigree flocks free of disease. There is no doubt


Early
lesion


Increased thickening of scab


Spreads to tip of teat

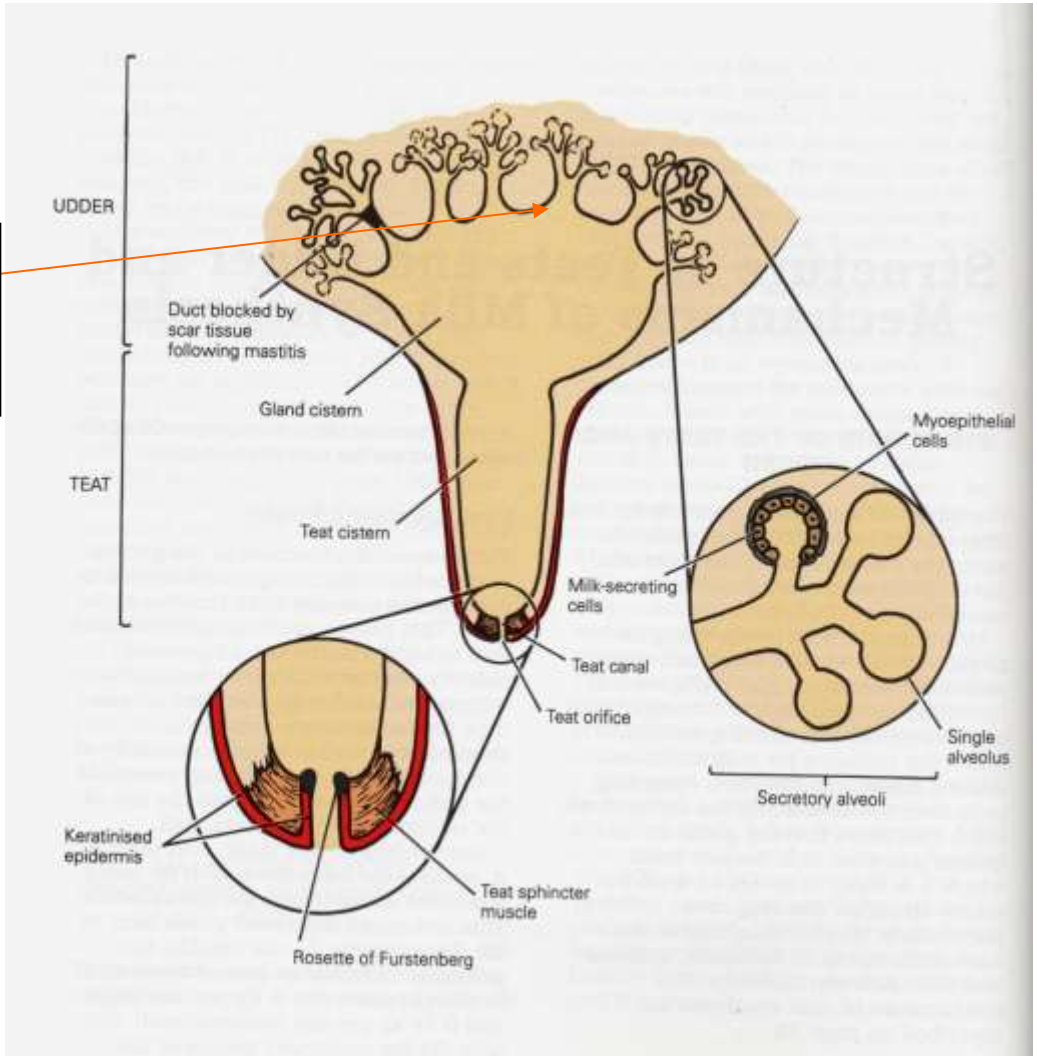
May distort into ‘banana ‘ shape

Typical lesion runs down side of teat


This stage is intensely irritant

Intense irritation because of involvement of erectile plexus at base of teat?

Erectile plexus



Sometimes also see lesions on udder

May find whole teat goes dry and hard – is this another condition?

Ischaemic teat necrosis – two teats have been chewed off

- digital dermatitis Treponemes x 3 have been identified in **80% of cases** sampled
- One ‘new’ treponeme
- PCR + culture positive
- All normal teats were negative

(Simon Clegg, Liverpool)

Veterinary Record
Veterinary Recordveterinaryrecord.bmj.com
Veterinary Record 2016;**178**:71 doi:10.1136/vr.103167

Research

Paper

Bovine ischaemic teat necrosis: a further potential role for digital dermatitis treponemes

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Abstract

A recent outbreak of **ischaemic teat necrosis** (ITN) on mainland UK has resulted in large economic losses for dairy farmers. Typical cases start as an area of dry, thickened and encrusted skin on the medial aspect of the base of the **teat**, where the **teat** joins the udder, often with a fetid odour. The erosion spreads down the **teat**, often causing intense irritation, which in turn leads to more severely affected animals removing the entire **teat**. Due to the severity of ITN and the substantial economic costs to the industry, analyses were undertaken to ascertain if an infectious agent might be involved in the pathology. The study has considered a role for digital dermatitis (DD) treponemes in the aetiopathogenesis of ITN because, as well as being the prime bacteria associated with infectious lameness, they have been associated with a number of emerging skin diseases of cattle, including udder lesions. A high association between presence of DD-associated treponemes and incidence of ITN (19/22), compared with absence in the control population is reported. Furthermore, sequencing of the 16S rRNA gene of treponeme isolates supports the hypothesis that the identified treponemes are similar or identical to those isolated from classical foot DD lesions in cattle (and sheep). Further studies are required to allow effective targeted prevention measures and/or treatments to be developed.

Ischaemic teat necrosis

- **Risk factors**

more common in

  - First lactation heifers
  - Early lactation
  - Higher yielding herds
  - Iodine predip (iodine least effective against DD treps)
  - Herds with sand cubicles
  - Occasionally precalving

But also seen ……

- Precalving heifers (Halifax, Guernsey and Shetland)
  - so milking machine may not be primary factor
- Older cows
- Possibly more cases in summer
- Reports of fly irritation
  - So could there be mild lesions precalving that are then exacerbated post calving?

histopathology

- diffuse severe necrotizing and suppurative inflammation of the teat cistern (teat sinusitis)
- gram positive and negative coccoid bacterial colonies (block C)
- ulceration with a suppurative dermatitis (block A and B).
- The inflammation in the teat appears to start with the ulceration of the mucosa of the teat cistern and extends towards the dermis and epidermis of the skin.

- It is Likely candidate species for the gram positive bacteria include *Staphylococcus aureus* or *Streptococcus spp*. and the gram negative are possibly *Escherichia coli*.

Treatment

- Essential that condition is recognised early (mild scab stage) and treated
- No treatment 100% effective
- Suggestions from farms
  - Remove scab
  - Apply emollient ointment
  - Mix salicylic acid with human hand cream
  - Stop milking the affected quarter

Sarah Wheeler, St Clears, used one of these and heifer eventually went back into herd

Anterior udder sore =
UMD, ulcerative mammary dermatitis.
Some cases have DD treps present

May develop into large granulomatous masses

Treatment of UMD

- Nothing 100% effective
- Cleaning to remove surface debris
- Apply topical disinfectants or antibiotics
- Parenteral antibiotics for extensive lesions – especially to prevent secondary pneumonia

CATTLE

Embolic pneumonia in adult dairy cattle associated with udder cleft dermatitis

WE wish to report a number of cases of pneumonia in adult dairy cows that were associated with embolic spread from abscessation cranial to the udder, in turn preceded by udder cleft dermatitis (UCD) – also known as udder intertrigo and ulcerative mammary dermatitis.

Phlebitis in milk vein leads to haematogenous spread to lungs

- Clinical signs
  - Vague malaise; pyrexia
  - Weight loss
  - Smell on breath
  - +/- respiratory signs
  - Very poor response to treatment
  - death
- *Trueperella pyogenes* and *Fusobacterium necrophorum* isolated
- No PCR evidence of DD Treps

FIG 2: Cow B – phlebitis, fibrosis and abscessation of the milk vein and subcutaneous tissue cranial to the udder

FIG 3: Cow B – poorly demarcated dark abscessation in lungs

DD in open hock sores in heifers

DD in open hock sores

- **Digital dermatitis treponemes were detectable and isolated from open hock lesions only,**
- **closed lesions** showing no evidence of treponemal infection, either by PCR or bacterial culture.
- When analysed by 16S rRNA gene sequencing, the cultured treponeme DNA showed complete homology or were very similar to those found in foot lesions, providing further evidence that these bacteria can infect any open wounds on the cow.
- Additionally, **skin swabs from near the open hock wound were also positive on PCR and isolation**, suggesting that bacteria can escape the wound, and travel over the skin surface, providing a potential mechanism for infecting other wounds.
- The isolation of DD treponemes from hock lesions, provides, for the first time a potential infectious aetiology. It may allow for a potential antiseptic spray over the entire surface to reduce infection and promote healing

Hock lesions and pressures sores on cattle

- All ‘open’ hock lesions and pressure sores were DD Treponeme positive
- Also DD treps on adjacent skin in affected animals only – suggests bacterial movement
- perhaps reduces the rate of healing

CODD in sheep + goats

- **Same three bovine DD Treponemes**
- CODD was not seen until 10 years + after DD first reported in UK

- Starts as skin erosion of coronary band
  - Then 50 - 100% of hoof under runs
  - Severe erosion of P3

- Hooves can completely slough
  - Sometimes all 8 hooves shell off – takes 3m+
  - but most regrow over time
  - Typical DD 'stippled' appearance beneath

- Sheep represent risk to cattle + vice versa
- Goats - up to 70% acute lame!

- and now DD treps on sheep skin surface (erosive lesion on carpus)

- (Joe Angell et al Vet Rec May 2017)

Swedish research has found Treps in pigs indistinguishable from DD

Characterization of *Treponema* spp. isolates from pigs with ear necrosis and shoulder ulcers

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ARTICLE INFO

Article history:
Received 3 April 2013
Received in revised form 27 June 2013

Accepted 10 July 2013

Keywords:
Treponema sp. OMZ 840
T. pedis
T. parvum
Ear necrosis
Shoulder ulcer
Pig

ABSTRACT

Ear necrosis and shoulder ulcers in pigs are animal welfare problems and ethical issues that can cause economic losses for producers. Spirochetes have been observed microscopically in scrapings from pig ulcers since the early 1900s, but have until recently not been cultured and therefore not characterized. In this study, 12 *Treponema* spp. isolates were acquired from porcine ear necrosis, shoulder ulcers and gingiva. DNA analysis of the 16S rRNA-tRNA^{Ile} intergenic spacer region (ISR2) or the 16S rRNA gene revealed relatedness to oral treponemes found in dogs and humans. All isolates except one aligned into two clusters, *Treponema pedis* and *Treponema* sp. OMZ 840-like. The 16S rRNA gene of the remaining isolate shared 99% nucleotide identity with *Treponema parvum*. Genetic fingerprinting of the isolates was performed through random amplification of polymorphic DNA (RAPD). In addition, the isolates were characterized by biochemical tests, including api®ZYM, tryptophanase and hippuricase activity, and by testing the antimicrobial susceptibility to tiamulin, valnemulin, tylosin, tylvalosin, lincomycin and doxycycline using broth dilution. All isolates except two showed unique RAPD fingerprints, whereas metabolic activity tests could not differentiate between the isolates. The MICs of all antimicrobial agents tested were low.

DD and tail biting in pigs

(Simon Clegg + Nick Evans)

- tested 25 tail lesions, 11 ear lesions and 17 flank lesions.
  - 88% of tail lesions, 72% of ear lesions and 82% of flank lesions were **positive** for DD treponemes
  - The only tail lesions which were **negative** were early lesions

- Mixture of DD treps, but gp 3 was not found in all lesions (as in Swedish work)

- of the two pens where we tested mouth swabs
  - one had a high prevalence of tail biting (around 75%)- all animals which were mouth swabbed had a treponemes in their mouth,
  - the other pen had a low prevalence of tail biting (maybe 5% max) - no treponemes in the mouth

DD Treponemes isolated from Elk in Washington State – lame from erosive hoof lesions (Kristen Mansfield)

DD in Elk

- Suggested that DD is spread by Elk walking single file along tracks
- So could foot prints be a route of spread?