Digital dermatitis: the current state of knowledge

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Outline

- What is digital dermatitis?
- How can we control it?
- How can we detect it?
Outline

• What is digital dermatitis?
• How can we control it?
• How can we detect it?
What is digital dermatitis?

“Hairy heel warts, Strawberry foot rot, Mortellaro disease ...”

Digital Dermatitis
What is digital dermatitis?

“A contagious disease characterized by a circumscribed superficial ulceration of the skin along the coronary band, commonly along the hair/horn junction of the rear feet” [Döpfer and Berry, 2008]
Like some human diseases?

Syphilis

Yaws

Treponema pallidum bacteria

Open sore or chancre

P. M. V. Martin ©

D. Finney ©

T. pallidum pertenue

IMTSSA®
Widespread?

1974: Italy [Cheli and Mortellaro]
1980’: USA [Rebhurn et al]
UK [Blowey]

1990’:
Chile [Rodrigues-Lainz]
Brazil [Cruz]
France [Gourreau]
Japan [Kimura]
Korea [Jeong]
South Africa [Van Amstel]
Israel [Yeruham]
Australia [McLennan]
Canada [Borgmann]

2000’:
Greece [Katsoulos],
Sweden [Hillström],
Iran [Nowrouzian],
Morocco ...
Widespread?

18 - 90% dairy farms are affected

5 - 85% cows within farm are affected

Median 5 - 10% cows/farm on a given day


The 3rd claw disorder in frequency after Heel-Horn-Erosion and Sole Haemorrhage

Why should we care on it?

Lameness

Decreased welfare
Challenges

- Decreased production
- Cost of treatments
- Time-consuming
- Economic losses

Lameness + Contagiousness
Challenges

No eradication

Variability of efficacy of treatments

Efficient substances might be forbidden

Difficulties to control it
Outline

• What is digital dermatitis?

• How can we control it?

• How can we detect it?
Key points for its control

Introduction of pathogen

Environmental factors
Management practices

Treatments

Infection

Cure

Individual factors
Prevent infection?

Introduction of pathogen

Environmental factors
Management practices

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Cure

Individual factors
Which pathogens are involved?

**Treponema**
- *T. vincentii/medium*-like
- *T. phagedenis*-like

*T. denticola, T. brennaborense, T. pedis*

**Other bacteria:** *Guggenheimella bovis, Bacteroides, Campylobacter, Fusobacterium, Peptococcus sp.*
Is the immune system efficient?

**POORLY**

*Treponema* → macrophages functions → Acquired immune response

Short duration of immune response [Trott et al. 2003]

Self-cure scarcely ever described
Frequent reoccurrence of DD
Vaccination not efficient
Sources of *Treponema*

*Infected animals*

+ Sheep (footrot)?
+ Gastro-intestinal tract?

*Slurry and manure*

*Hoof trimming material*

[Dhawi et al. 2005; Döpfer et al. 19997; Shibahara et al. 2002; Wells et al. 1999]
How do they enter the skin?

Wet conditions

Trauma

“In experimental studies moisture and reduced access to air were necessary for successful transmission”

[Berry 2002]
Impact of the environment and management practices

Housing

Cubicle > straw yards
Concrete > slatted floor
Automatic scrapers > tractors
Limited access to pasture

Hoof trimming procedures
> 12 months

Nutrition

High concentrate feed intake at the beginning of lactation

[Somers et al. 2003; Somers et al. 2005]
Are some animal more susceptible?

**Dairy breeds**

**First lactation**

At the **peak** of lactation

Heifers of cows *previously infected*  
(Heritability: 0.029 - 0.1)

[Onyiro et al. 2008; Somers et al. 2005; Waaij et al. 2005]
Prevent infection?

**Introduction of pathogen**
- Purchase *DD-free* cows
- *Cure* DD cows
- *Disinfect* hoof trimming material

**Environmental factors**
- Management practices
- **Provide a** *dry and non wounding environment*
- **Hoof-trimming < 12 months***

**Individual factors**
- **Select** heifers from cows with no DD history
Improve cure rate?

Introduction of pathogen

Environmental factors
Management practices

Treatments

Infection

Individual factors

Cure
Which treatments are available?

Individual treatments

Collective treatments
Individual treatments

Mostly antibiotics
Oxytetracycline - lincomycin, lincomycin/spectinomycin

Good curative efficacy in 2-3 d. until 14-30 d. post treatment

Development of non antibiotics products, the most promising containing Cu
Individual treatments

No consensus on the best regimen

Best recovery if the lesion treated is
  early [Bathina et al. 2002; Somers et al. 2005]
  cleaned [Kofler et al. 2004]
  above the heels or around the dewclaws [Hernandez and Shearer 2000]

Frequent relapses: 60% of successfully treated cows develop recurrent lesions in 7 to 15 weeks [Berry et al. 1999; Read and Walker 1994]

Time-consuming if prevalence is high
Collective treatments

Applied via footbath, sprayer or foam, mostly during milking
Collective treatments

Disinfectants, mostly containing Cu

Old products

- Formaldehyde 2-10%
- CuSO4 2-10%

New products

Multi-compounds containing Cu

- Kling-on Blue ®
- Pediline ®
- Hoof-Fit ®
- Hoof-Clear ®
- Hoof Pro + ®

* Not toxic for the environment at the current use in France [Relun et al. 2010]

CuSO4: 82 € HT/bag
1 722 € HT/year (1 footbaths 5% 200 L /15 days)

KoB: 97 € HT/bag
5 044 € HT/year (1 footbaths 200 L /15 days)
Collective treatments: issues

**Time and labour consuming**

European directive on biocidal products 98/8/EC: evaluation needed for 2014

Lack of controlled trial

**Preventive effectiveness** > curative?

**Effectiveness variable** depending on farms

**No consensus** on the best regimen

New products = safer but quite expensive
On-going research
(UMT Cattle Health Management, Nantes, France)

Practical trial in 52 farms

Relevance of herd treatment

Evaluation of the curative and preventive effectiveness of different practical modalities of herd treatments

Taking into account the specific situation of their farm
(prevalence of DD, hygiene management, pasture management, facilities ...)

Results expected in 2011
Improve the cure rate?

Treatment

- Treat lesions as early as possible
- Clean the feet before treatment
- Collective treatment with new disinfectants can be used but
- Treat individually all lesions > 2 cm

Environmental factors
Management practices

Provide a clean surface
Outline

- What is digital dermatitis?
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Why should we detect DD?

Should I **treat** this cow for DD?

Could that cow **transmit** DD to others?

Is this lesion **responsible** for lameness?
Signs seen by farmers

Lameness

Reluctance to bear weight on the affected foot

Long hairs around a circumscribed skin lesion

NOT SUFFICIENT

Affected cows in early stage are mostly not lame

Long hairs can persist even if the lesion is cured
Course of a DD lesion

M0 M4
M4.1
M4
M2
M1
34
M3
Vink ®
## Pain, infectivity, treatment

<table>
<thead>
<tr>
<th>Pain</th>
<th>Infectivity</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>+++</td>
<td>+++</td>
<td>Individual</td>
</tr>
<tr>
<td>+</td>
<td>++</td>
<td>Individual</td>
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<tr>
<td>-</td>
<td>+/-</td>
<td>Collective</td>
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</tbody>
</table>

- Not needed but keep on watch
Which methods are used to detect DD?

Serology not specific enough

**Inspection of the feet**

- In a trimming chute
  “Gold-standard”

- In a standing cow
In a trimming chute

😊

- Best visualisation of the lesions (interdigital space)
- Exploration of other foot lesions
- Essential for the diagnostic of a lame cow

 ngộ

- Time consuming
- Stressful
- Quite expensive

Not adapted for frequent evaluation of the DD status
With a swivelling mirror and a headlamp (standing cow)

Method evaluated during spring 2009

- Inspection of the hind feet during two consecutive milking
- Inspection of the hind feet during trimming

Day 0

- Inter-observer reliability
- Intra-observer reliability

Day 1

- Sensitivity
- Specificity

[Relun et al. 2010]
With a swivelling mirror and a headlamp (standing cow)

Prevalence observed

Figure. Percentage of M-stages observed on the hind feet during trimming for all farms and by farms

[Relun et al. 2010]
With a swivelling mirror and a headlamp (standing cow)

Method **reliable** with 4 M-stages (M0 - M1 - M2 - M34)

Good agreement within observers \((\kappa_w = 0.66)\)

Good agreement between observers \((\kappa_w = 0.61)\)

Good sensitivity and moderate specificity \((Se = 0.90; Sp = 0.80)\)

Compatible with a regular milking

Not expensive tools \((\text{mirror} : 8.88 \, \text{€}; \, \text{headlamp} : 29.18 \, \text{€})\)

[Relun et al. 2010]
With a swivelling mirror and a headlamp (standing cow)

Good visualisation of the lesions
Time-friendly
Stress-friendly
Cost-friendly

Useful for research purposes and for day-to-day hoof health management

No visualisation of the interdigital space
No visualisation of other foot lesions

Not adapted for the diagnostic of a lame cow
What should a farmer do?

Lameness

Yes  No

Treat Individually

Treat

Watch

DD lesion
Conclusion

A contagious disease

Pathogen necessary but not sufficient

Importance of environment and management practices

Most of dairy farms might get infected

With variations of prevalence and severity
Knowledge and prospects

Prevent

- Genetically resistant cattle
- Impact of food and stress

Cure

- Early detection
- Early treatment
- Concomitant treatment of all affected cows
- Best regimen

Clean soils

Housing and management

Regular hoof-trimming

Procedures

Effectiveness / price

Best regimen

Treatments

Outbreak

DD Cases/Cows/farm

Enzstic disease

Time
Thanks for coming ....
Bonus ...


