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Det Sundhedsvidenskabelige Fakultet



Leg health in broilers – Pathology and animal welfare consequences

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Plan

- What is the problem?
- Leg problems in focus in recent years
- Causes of leg problems in broilers
- Animal Welfare consequences
- Conclusions – status of current knowledge and where to focus future research.




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What is the problem of leg health in broilers?



- Leg health is often mentioned as one of the main challenges for broiler welfare.
- Leg problems affect production (economy) and animal welfare.
- Many types and pathologies of leg problems, each with their own set of potential causes.
- Focus on improving leg health during the past decades – via breeding, management and nutrition.
- The broiler changes rapidly, so old results may not be applicable to modern-day broiler chickens.



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Assessment of leg health



The most commonly used is the Bristol Gait-Scoring system (Kestin et al., 1992).

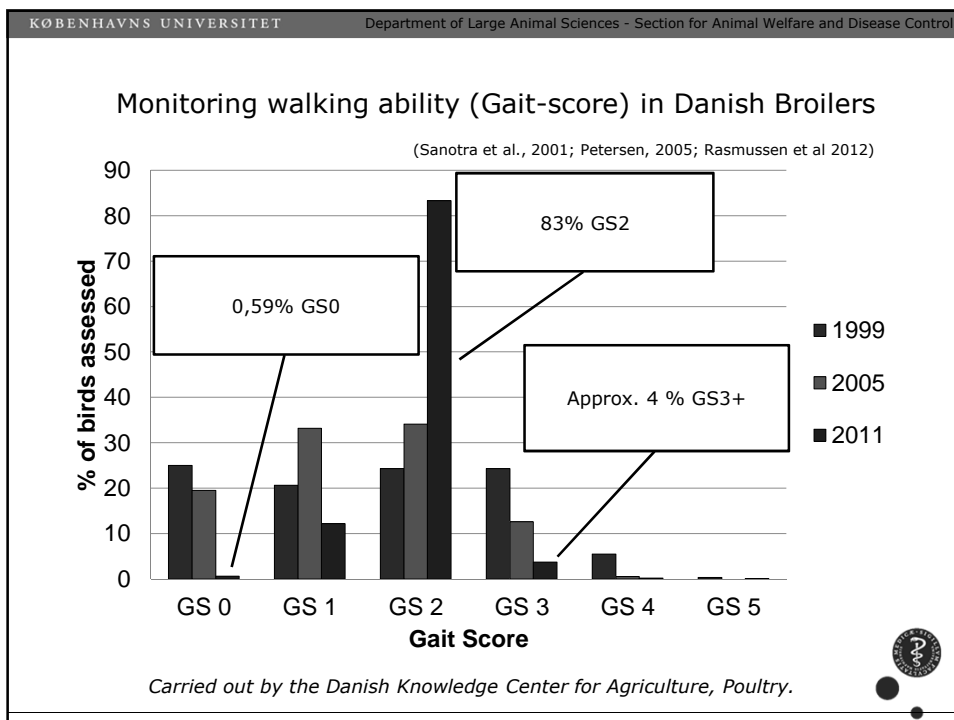
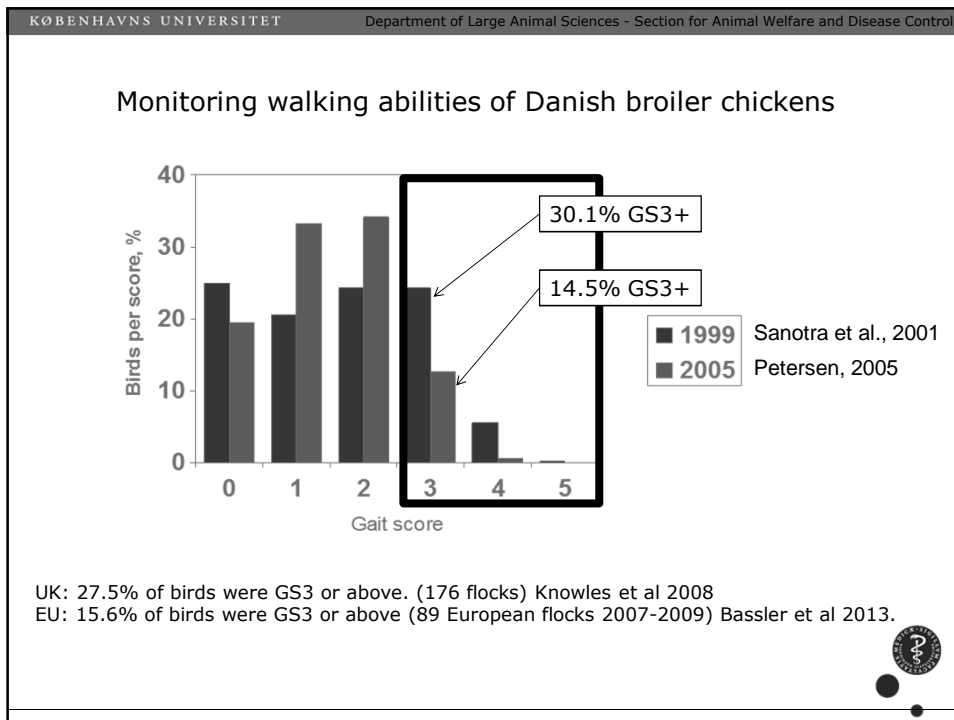
GS0: Normal, dextrous, and agile
 GS1: Slight gait abnormality, but difficult to define
 GS2: Definite and identifiable abnormality
 GS3: Obvious abnormality, affects the ability to move
 GS4: Severe abnormality, only takes a few steps
 GS5: Incapable of walking

*Examples from: Knowles TG, et al. (2008)
 PLoS ONE 3(2): e1545. doi:10.1371/journal.pone.0001545*

Other methods (less commonly used)

- LTL test (e.g. Weeks et al., 2001)
- Modified scoring systems (e.g. Garner, 2002)
- Force-plate (e.g. Paxton et al., 2013)
- Kinematic changes (e.g. Caplen et al., 2013)



Gait abnormalities in broiler chickens

Many types of leg problems, for example

- Angular deformities
- Femoral head necrosis
- Arthritis
- Tibial dyschondroplasia (TD)
- Ammonia burns on the feet and hocks
 - Podo-dermatitis
 - Hock burn



Foot pad dermatitis

Foot pad dermatitis / podo dermatitis / foot pad burns



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- Foot pad dermatitis as a welfare problem
- Legal requirement to score feet at slaughter.
- No clear connection between pododermatitis score and gait score.



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Pododermatitis – main risk factor = Litter quality

Litter quality (primary risk factor in most studies).

- Litter type
- Litter depth
- Floor type
- Water drinker type
- Ventilation and drinker management
- Feed source and quality
- Enteric disease
- Breed

Data from the Danish survey (2011)

Dark period

- Better foot pads in longer dark-periods at 28 and 35 d (*Schwean-Lardner et al 2013*)
- Dark period did not affect foot pads (*Knowles et al 2008*)
- Dark period did not affect foot pads (*Bassler et al 2012*)

Commercial conditions

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Tibial Dyschondroplasia (TD)

Caused by inadequate vascularisation and ossification of the growth plate resulting in an abnormal mass of cartilage under the growth plate.

TD prevalence has been substantially reduced in the past 15 years.

Affected by

- Vitamin and mineral composition in the feed
- Genetic variation

Prevalence of TD in the Danish surveys:
57% in 1999, 0.7% in 2005, 4% in 2011

Bone health

The bone growth can deviate in many ways and is affected by management, genetics, physical activity, housing conditions and nutrition.

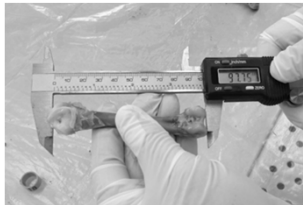


Photo: H.H.Kristensen

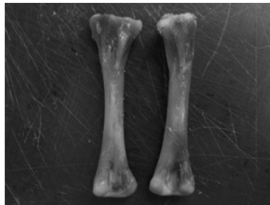


Photo: J.P.Christensen



Photo: J.P.Christensen

Focus of one of the work-packages in PROHEALTH project (EU 7FP).



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Physical activity and leg health

Fast-growing broilers are inactive between 60-90% of their time.

Several studies have confirmed the link between activity and leg health.



Activity can affect bone health in broilers

Stimulating activity, particularly early in the growing period

1. Improve bone mineral density
2. Increase thickness, weight and length of the Tibia
3. Reduce bending and twisting of the legs
4. Improve locomotion ability and reduce leg problems and leg culls

(Kristensen 2007, Reiter and Bessei 2009)



Activity and leg health

Fast-growing broilers are inactive between 60-90% of their time.

Several studies have confirmed the link between activity and leg health.

↑ Activity will ↑ leg health... BUT...

- ◆ But how active should they be?
- ◆ When in the growing period should they be active?
- ◆ How can we stimulate activity?
- ◆ Can we control the activity of broiler chickens?

Activity can be stimulated by:

- 1) Increase distance between feeder and drinker *(e.g. Reiter and Bessei 2009)*
- 2) Meal feeding *(e.g. Nielsen et al 2003)*
- 3) Dynamic light environment *(Kristensen et al 2006)*



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Many different factors can affect leg health in broiler chickens

Light


Activity

Nutrition / feed composition

Feeding regime (meal feeding vs. ad libitum)

Growth rate

Weight



Genetics


Parent flock

Infections

Stocking density

Gender


Litter quality (Litter type, depth, etc)



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Animal Welfare consequences of leg problems

FAWC's 5 Freedoms
1. Freedom from Hunger and Thirst
2. Freedom from Discomfort
3. Freedom from Pain, Injury or Disease
4. Freedom to Express Normal Behaviour
5. Freedom from Fear and Distress



Methods of assessing welfare consequences of lameness

1. Behaviour of lame vs not lame animals
2. Pain medication and walking ability
3. Pathologies with known welfare consequences in other animals



Behaviour in broilers is modified by lameness

Weeks et al., 2000

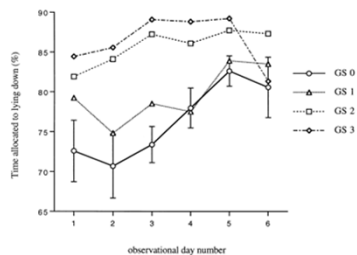


Fig. 1. Proportion of time broilers spent lying down, and the effect of lameness ($p < 0.05$) and age ($p < 0.001$). Birds were from six different flocks, aged 39–49 days old, and their walking abilities ranged from sound (GS 0) to lame (GS 3).

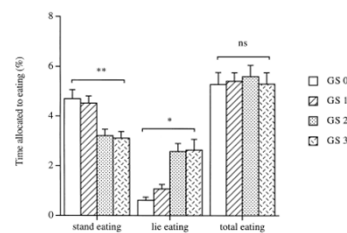


Fig. 5. Proportion of time broilers spent eating, from either a standing or lying position and the effect of lameness on feeding behaviour. Birds were of mixed walking ability, ranging from sound (GS 0) to lame (GS 3) from six different flocks, aged 39–49 days old.

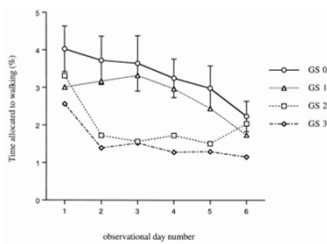


Fig. 3. Proportion of time broilers spent walking, and the effect of lameness ($p < 0.01$) and age ($p < 0.05$). Birds were from six different flocks, aged 39–49 days old, and their walking abilities ranged from sound (GS 0) to lame (GS 3).

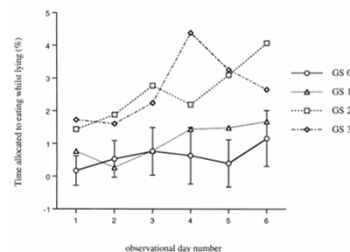


Fig. 6. Proportion of time broilers spent eating whilst lying down, and the effect of lameness ($p < 0.05$) and age ($p < 0.05$). Birds were from six different flocks, aged 39–49 days old, and their abilities ranged from sound (GS 0) to lame (GS 3).

Walking ability/pattern with/without analgesics

- Several studies have found that broilers with GS3 alter their walking ability/pattern when given analgesics, compared to a placebo group. (e.g. McGeown *et al* 1999, Caplen *et al* 2013)
- Caplen *et al* (2013) describe the detailed differences between the walking pattern of lame/non lame birds from kinematic analyses.
- **Studies have focused on GS3 birds in the past, but what about GS2 birds?**



Are broilers with GS2 in pain?



Small pilot-study funded by ViD in 2013 was inconclusive (large variation both within and between flocks).

International studies still have focus on GS3 but new methods could be applied to GS2.

Welfare of broilers with GS2?

- GS2 birds appear to modify their behaviour like GS3 birds (Weeks *et al* 2000), but this needs confirmation.
- No difference between GS2 and GS3 birds in pathology, H:L ratio or respiratory quotient (Skinner-Noble and Teeter 2009)
- Pain experience by broilers with GS2 not yet known and likely to depend on the pathology involved.



Conclusions – status of current knowledge

- Leg health is important for the welfare of broiler chickens.
- Lamé chickens modify behaviour and respond to analgesics.
- Less Danish broilers with both high and low gait-scores, the majority are GS2, which should be the focus in the future.
- Many types of lameness, each with their own pathology, aetiology and welfare consequences.
- Several large commercial studies within Europe agree on some common risk factors for lameness.

Where to focus future research...

- Still unclear whether the majority of Danish broiler chickens have welfare problems.
- Need large-scale interdisciplinary approach to focus on the pathology, aetiology and welfare consequences of GS2 to ensure broiler welfare in the future.



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