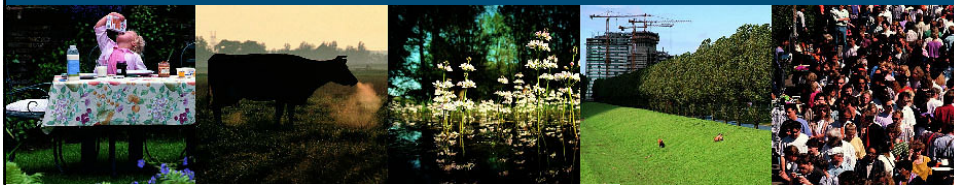


Foot pad dermatitis: a brief overview of research performed at Wageningen University

Jan van Harn



Outline of presentation

- Poultry trail facility
- Effect of light schedules
 - EC guideline
- Effect of broiler strain / breed
- Effect of bedding material and bedding amount
- Water management
 - lowering water pressure and the use of drip cups
- Daily adjusting CP gift (Dynamic Feeding)





Het Spelderholt

- Is part of the division Livestock Research of Wageningen UR
- Het Spelderholt is a unique poultry research centre for The Netherlands as well as other countries
- Het Spelderholt was founded in 1921 in Beekbergen and moved to Lelystad in January 2004
- Het Spelderholt is a research centre and supplier of poultry knowledge

Accommodation for



Laying hens



Broilers



Broiler parent stock

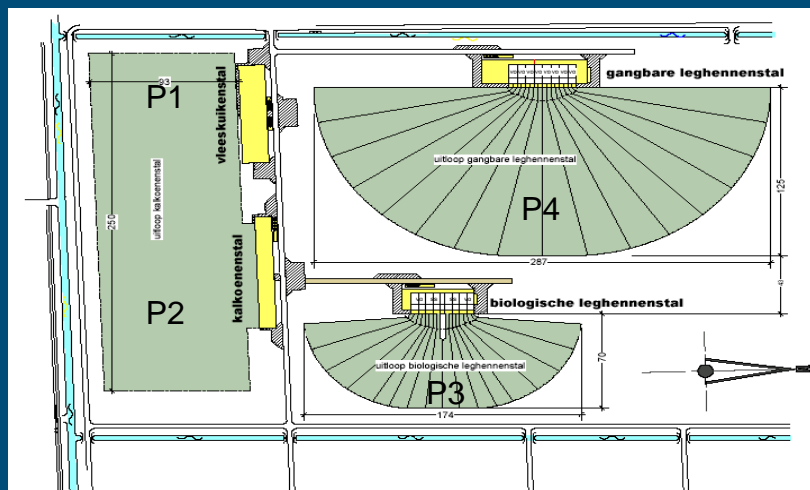


Turkeys



Ducks

Map of Het Spelderholt

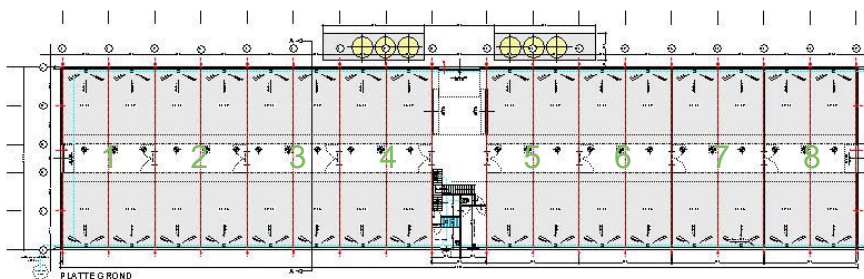


P1 – Broiler (and duck) house



- P1 is a mechanically ventilated house

P1 – Broiler (and duck) house



P1 – Broiler (and duck) house

- 8 climate controlled rooms (135 m²). Each room can be divided in four pens of 28 m² each, two pens of 56 m² or one pen of 150 m².
- 32/16/8 experimental units
- 565/1130/2675 broilers per unit
- In total up to 21,400 broilers
- Pan feeding (Minimax-Roxell)
- Drinking system: drip cups (Ziggity)



- Nutrition
- Management (e.g. light regimes, feed restriction)
- Environmental (e.g. Ammonia or fine dust)
- Animal health and welfare

P1 – Broiler (and duck) house

- Also designed for research in small scale floor pens (performance trials, 10-14 broilers/pen). More than 100 pens!



EC light schedule

- Council Directive 2007/43/EC, June, 28th 2007
'Minimum rules for the protection of chickens kept for meat production' tells:
 - From day 7 until 3 days for (expected) delivery: 6 hours of light per 24-h, with at least one uninterrupted period of darkness of 4 hours, and
 - Light intensity during lighting periods at least 20 lux, measured at bird eye

EC light schedule – M+M

- 3 flocks of 6 weeks (42 days); July 2007 - March 2008
- Stocking density: 19 broilers/m²: 12.840 broilers / cycle
- In total 5 different strains:
 - 1st and 2nd flock: Ross 308, Ross 708, Cobb 500 and Hybro PG+
 - 3rd flock: Ross 308, Ross 708, Cobb 500 and Hybro G+
- Cobb 500 and Hybro PG+ broilers received 3-phase diets with lower protein and amino acid contents compared with Hybro G+, Ross 308 and Ross 708, based on breeder recommendations
- Ad lib feed + water
- 3 light schedules
- 6 climate rooms of broiler house P1; 4 strains/room

EC light schedule – light schedules

Schedule A

Age (days)	Hours L/D
0-3	24L:0D
4-7	23L:1D
8-39	18L:6D
40-42	24L:0D

Schedule C (Ross)

Age (days)	Hours L/D
0-3	24L:0D
4-7	23L:1D
8-39	4L:4D+4(3L:1D)
40-42	24L:0D

Schedule B (Cobb)

Age (days)	Hours L/D
0-3	24L:0D
4-7	23L:1D
8-25	18L:6D
26-35	8L:4D:8L:4D
36-39	10L:4D:8L:2D
40-42	24L:0D

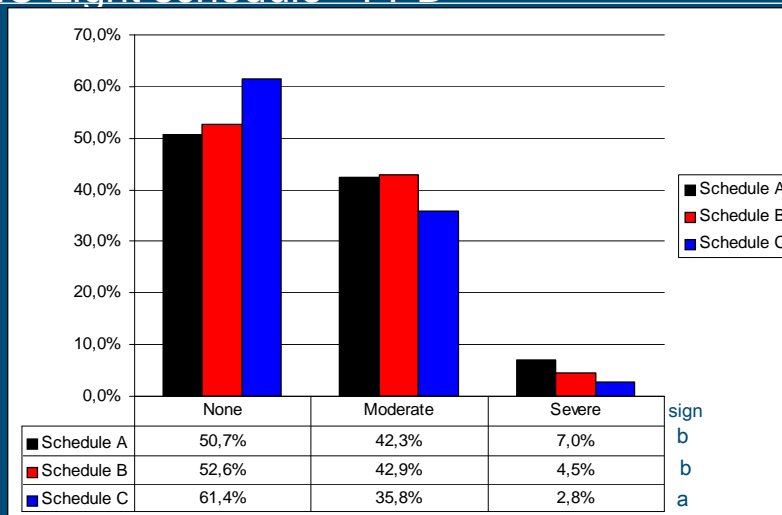
EC light schedule - performance

	Schedule A	Schedule B	Schedule C
Weight d 42 (g)	2576	2604	2591
Growth (g/d)	60,4	61,0	60,7
Mortality (%)	4,1	3,4	4,4
FCR	1,749	1,749	1,744
Feed consumption (g)	4433	4482	4452
Water/feed	1,68	1,68	1,67
EPEF	331	337	333

EC light schedule – slaughter yields

	Schedule A	Schedule B	Schedule C
Live weight (g)	2636	2649	2657
Carcass (%)	67,3 ^(ab)	67,2 ^(a)	67,6 ^(b)
Wing (%)	10,7 ^a	10,8 ^b	10,7 ^a
Leg (%)	34,3 ^a	34,5 ^b	34,4 ^{ab}
Back (%)	17,4 ^{ab}	17,5 ^b	17,3 ^a
Breast meat (%)	29,6 ^b	29,3 ^a	29,7 ^b

EC Light schedule - FPD



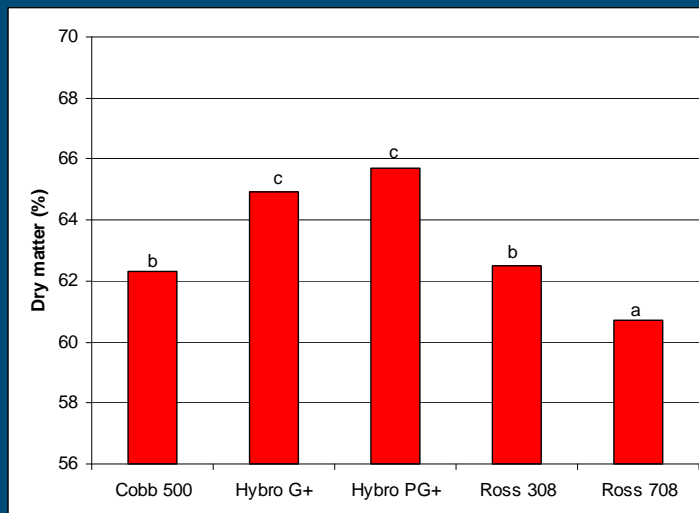
Effect strain - performance

	Cobb 500	Hybro G ⁺	Hybro PG ⁺	Ross 308	Ross 708
Weight d 42 (g)	2582 ^{ab}	2561 ^a	2582 ^{ab}	2645 ^c	2596 ^b
Growth (g/d)	60,5 ^{ab}	60,0 ^a	60,6 ^{ab}	62,0 ^c	60,8 ^b
Mortality (%)	4,2 ^b	4,6 ^b	4,2 ^b	2,9 ^a	3,9 ^{ab}
FCR	1,808 ^d	1,673 ^a	1,803 ^d	1,732 ^c	1,717 ^b
FCR 2600g	1,815 ^c	1,689 ^a	1,810 ^c	1,714 ^b	1,719 ^b
Feed cons. (g)	4593 ^d	4215 ^a	4586 ^d	4508 ^c	4386 ^b
Water/feed	1,71 ^c	1,67 ^b	1,61 ^a	1,70 ^c	1,70 ^c
EPEF	321 ^a	343 ^{bc}	321 ^a	348 ^c	340 ^b

Effect strain – slaughter yields

	Cobb 500	Hybro G ⁺	Hybro PG ⁺	Ross 308	Ross 708
Live weight (g)	2630 ^{ab}	2609 ^a	2632 ^{ab}	2701 ^c	2657 ^{bc}
Carcass (%)	67,5 ^b	67,6 ^{bc}	66,5 ^a	67,6 ^{bc}	67,8 ^c
Wing (%)	10,6 ^b	11,0 ^c	11,2 ^d	10,6 ^b	10,5 ^a
Leg (%)	34,3 ^b	34,5 ^{bc}	35,2 ^d	34,6 ^c	33,7 ^a
Back (%)	17,3 ^a	17,3 ^a	17,7 ^b	17,4 ^a	17,2 ^a
Breast meat (%)	29,8 ^c	29,3 ^b	27,8 ^a	29,7 ^c	30,9 ^d

Effect strain – litter quality



Effect strain - FPD

	Cobb 500	Hybro G ⁺	Hybro PG ⁺	Ross 308	Ross 708
Hock burns					
None	15,7%	37,1%	40,7%	29,4%	26,2%
Minor	42,4% _c	44,4% _a	44,2% _a	48,5% _b	46,3% _b
Moderate	38,6%	17,7%	14,6%	21,1%	25,9%
Severe	3,3%	0,8%	0,5%	0,9%	1,5%
Foot pad dermatitis¹					
None/Minor	55,1%	67,8%	74,0%	44,0%	39,6%
Moderate	39,0% _c	30,3% _a	24,6% _b	48,4% _d	51,9% _d
Severe	5,9%	1,8%	1,3%	7,5%	8,5%

¹ Swedish method (Berg, 1998)

Influence of bedding material, bedding amount, drip cup and reduced water pressure on broiler performance



M + M

- House P1 - PC 'Het Spelderholt'
- 2 flocks (5 weeks/each)
 - 1st flock: July - August 2008
 - 2nd flock: October - November 2008
- 18.080 Ross 308 broilers / flock
- Stocking density: 20 kuikens/m²
- Ad lib feed + water
- Light scheme: 18L:6D (20 lux)



Treatments



1 + 2. Bedding material + bedding amount

White wood shavings: 1 en 2 kg/m²

Chopped wheat straw: 1,25 en 2,5 kg/m²

Ground rapeseed straw: 1 en 2 kg/m²

Silage maize: 1,75 en 2,25 kg/m²

Treatments



3. Drip cup

YES / NO (= only nipple drinker)

4. Water pressure

Normal (0-11 days: 10-15 ml/min; 12-35 days: 20 – 24 ml/min)

LOW (0-35 days: 10-15 ml/min)

Observations

- + Performance
- + Slaughter yield at 35d
- + Litter quality
- + FPD en hock burns on 21 + 33 days
- + Gaitscore on 35 days
- + Fine dust (PM2.5 and PM10) and ammonia emissions

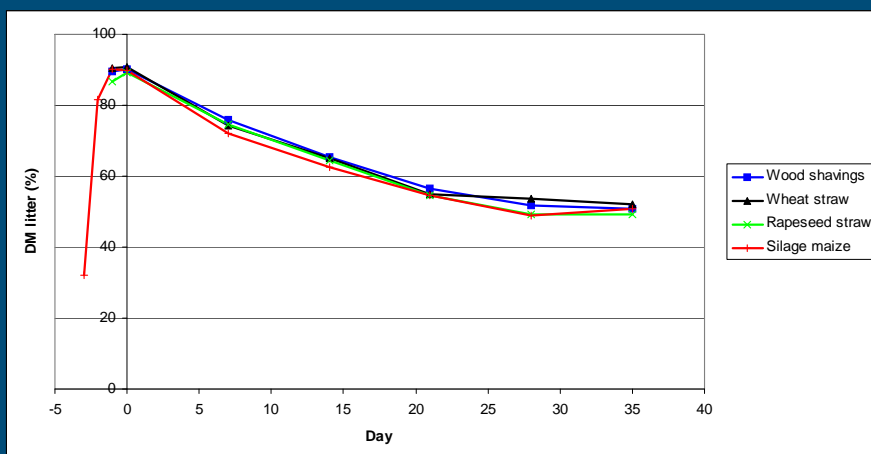
Bedding material – Performance 35 days

	Wood shaving	Wheat straw	Rapeseed straw	Silage maize
Weight (g)	2078	2069	2074	2058
Growth (g/d)	58,3	58,0	58,2	57,7
Mortality (%)	2,6	2,8	2,6	2,4
FCR	1,604	1,598	1,597	1,598
Feed consumption (g)	3270	3244	3249	3227
Water/feed	1,80	1,77	1,81	1,79
EPEF	354	353	355	353

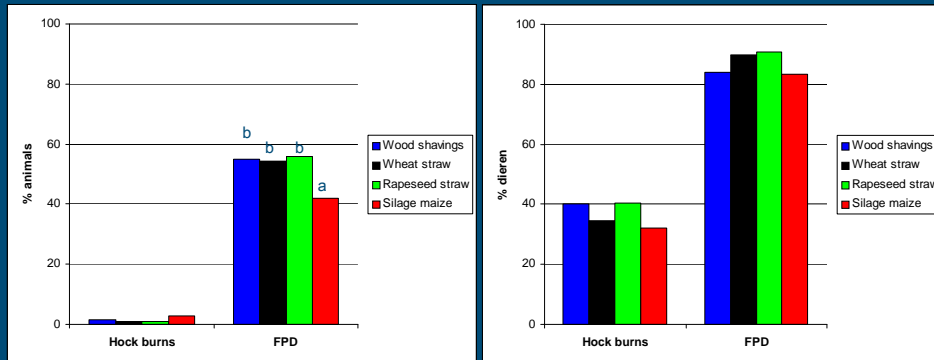
Bedding material – slaughter yields 35 days

	Wood shavings	Wheat straw	Rapeseed straw	Silage maize
Live weight (g)	2161	2146	2149	2137
Carcass weight (g)	1404	1404	1407	1392
Carcass (%)	65,0 ^a	65,4 ^b	65,5 ^b	65,2 ^{ab}
Wing (%)	11,0	11,0	10,9	11,0
Leg (%)	34,8	34,6	34,7	34,8
Filet (%)	29,0	29,2	29,1	29,0

Bedding material – Litter quality



Bedding material - FPD and hock burn on 21 and 33 days



Bedding material - Conclusions (1)



Bedding amount

- No effect of bedding amount on performance, slaughter yield and external quality
- A increase of the bedding amount resulted in a higher DM content

Bedding Material - Conclusions (2)



Bedding material

- No effect on performance
- Lower carcass % with wood shavings compared with wheat and rapeseed straw
- Small differences in litter quality
- Less FPD with silage maize??
- Higher energy costs with silage maize (\pm 10-20%)

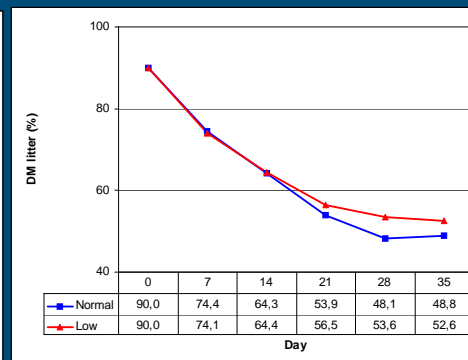
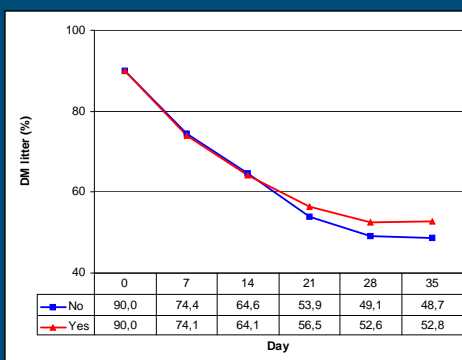
Drip cup / water pressure – Performance 35 days

	Drip cup		Water pressure	
	No	Yes	Normal	Low
Weight (g)	2047 ^a	2093 ^b	2074	2065
Growth (g/d)	57,4 ^a	58,7 ^b	58,2	57,9
Mortality (%)	2,5	2,6	2,6	2,6
FCR	1,603 ^b	1,594 ^a	1,598	1,600
Feed consumption (g)	3219 ^a	3276 ^b	3253	3242
Water consumption (ml)	5815	5833	5891 ^b	5756 ^a
Water/feed	1,81 ^b	1,78 ^a	1,81 ^b	1,78 ^a
EPEF	349 ^a	358 ^b	355	353

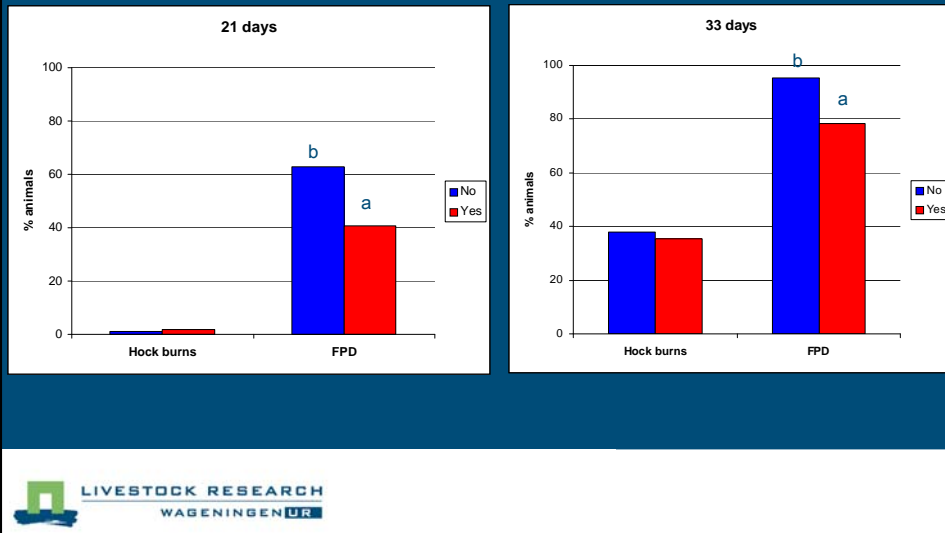
Drip cup / water pressure – Slaughter yields at 35 days

	Drip cup		Water pressure	
	No	Yes	Normal	Low
Live weight (g)	2124 ^a	2172 ^b	2156	2140
Carcass weight (g)	1384 ^a	1419 ^b	1402	1402
Carcass (%)	65,2	65,3	65,0 ^a	65,5 ^b
Wing (%)	11,0 ^b	10,9 ^a	11,0	11,0
Leg (%)	34,7	34,7	34,7	34,7
Filet (%)	29,0	29,1	29,0	29,1

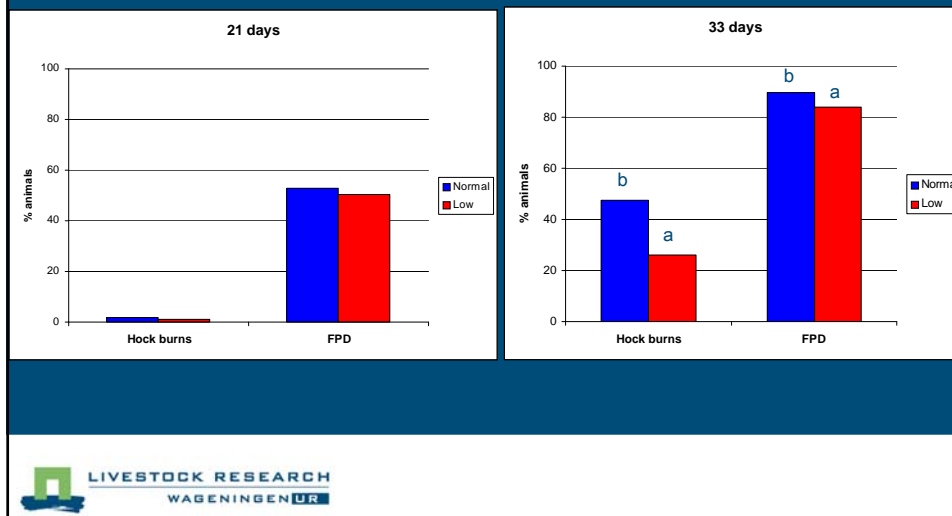
Drip cup / water pressure – litter quality



Drip cup – Hock burns and FPD on 21 and 33 days



Water pressure – Hock burns and FPD on 21 and 33 days



Drip cup - Conclusions

Drip cup

- Better performance (grow, FCR)
- Better litter quality
- Less en less severe FPD



Water pressure - Conclusions

Lowering the water pressure

- No effect on performance
- Higher carcass yield
- Better litter quality (higher DM content)
- Less and less severe hock burn and FPD



Daily adjusting Crude Protein (CP)

(van Harn and Veldkamp, 2005)

- CP is constant in current phase feeding programs
- CP requirement decreases as age increases
- A surplus of CP at the end of each feed phase
- Excretion of excess CP - Water intake increases
- CP supply – requirement
 - protein requirement of the bird
 - color and consistency of manure
 - body weight gain
- Reduced CP levels by adding wheat
- In total 13% less CP intake



Daily adjusting CP – M+M

- 13.560 Ross 308 broilers (as hatched)
- 6 climate rooms P1
 - Each room was divided into 4 compartments/ pens of 28 m² → 24 experimental units
- 20 birds/ m² (= 565 broilers / pen)
- Light schedule: 18L:6D
- Ad lib feed and water
- Observations: performance, slaughter yield, litter quality and external quality (FPD, hock burns)



Daily adjusting CP - Performance

(Van Harn and Veldkamp, 2005)

	Control	Reduced CP
Body weight (g)	2325 ^b	2248 ^a
Body weight gain (g/b/d)	57.1 ^b	55.1 ^a
Mortality %	5.2	5.6
FCR	1.74 ^a	1.86 ^b
FCR 2300 g	1.73 ^a	1.88 ^b
Feed intake (g)	3962 ^a	4102 ^b
Water intake (ml)	6728 ^b	6324 ^a
Water/Feed ratio	1.70 ^b	1.54 ^a

Daily adjusting CP – Slaughter yields

(van Harn and Veldkamp, 2005)

	Control	Daily adjusting CP
Live weight (g)	2418	2372
Slaughter yield (%)	67,2 ^b	66,4 ^a
Wing (%)	10,5	10,5
Leg (%)	34,7 ^a	35,2 ^b
Back (%)	18,2 ^a	18,7 ^b
Breast meat (%)	28,7 ^b	27,5 ^a

Daily adjusting CP – litter, FPD

(Van Harn and Veldkamp, 2005)

	Control	Reduced CP
Dry matter litter (%)	69.8	74.1
N-content litter (g/kg)	40.6 ^b	39.2 ^a
Ammonia concentration (relative)	100	85
Foot pad irritation (%)		
No	26.5 ^b	70.0 ^a
Minor	24.0	15.5
Moderate	43.5 ^a	14.5 ^b
Severe	6.0 ^(a)	0.0 ^(b)

Daily adjusting CP

(Van Harn and Veldkamp, 2005)



	Control	Daily adjusting CP
Breast irritations		
None	11,0%	11,0%
Minor	63,0% ^a	75,5% ^b
Moderate	23,5% ^b	13,5% ^a
Severe	2,5%	0,0%
Hock burns		
None	15,5% ^a	53,5% ^b
Minor	57,5%	42,5%
Moderate	25,5% ^b	4,0% ^a
Severe	1,5%	0,0%

Conclusions of daily adjusting CP

- Decrease DG and FCR
- Decrease slaughter yield and breast meat yield
- Better litter quality
- Less foot pad dermatitis and hock burns
- Better gait

Underfloor heating (van Harn, 2008)

	Control	Underfloor heating
Weight d 35 (g)	2170	2161
Growth (g/d)	60,8	60,5
Mortality (%)	2,5	2,6
FCR	1,64	1,65
Feed consumption (g)	3480	3498
Water/feed	1,75	1,77
EPF	362	357

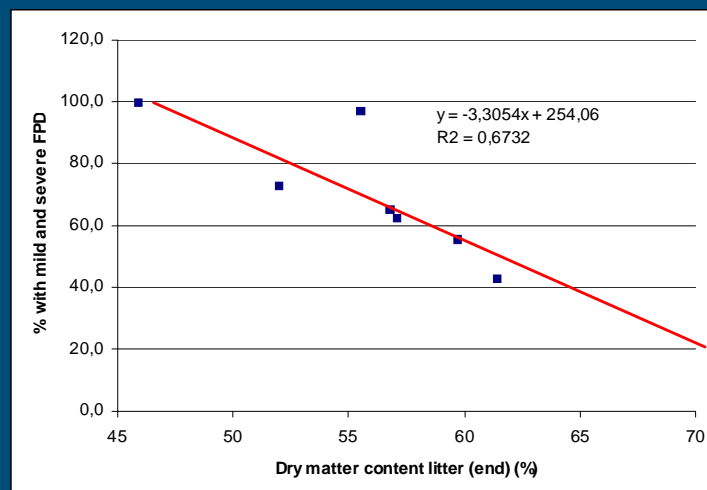
Underfloor heating (van Ham, 2008)

	Control	Underfloor heating
Dry matter litter		
Day 35	52,5 ^a	57,7 ^b
Avg.	67,8 ^a	72,1 ^b
Hock burns		
None	9,1%	10,0%
Minor	41,3%	53,1%
Moderate	48,8%	36,6%
Severe	0,9%	0,3%
Foot pad dermatitis¹		
None/Minor (Class 0)	16,9%	55,6%
Moderate (Class 1)	61,3%	36,3%
Severe (Class 2)	21,9%	8,1%
FPS²	74 ^b	34 ^a

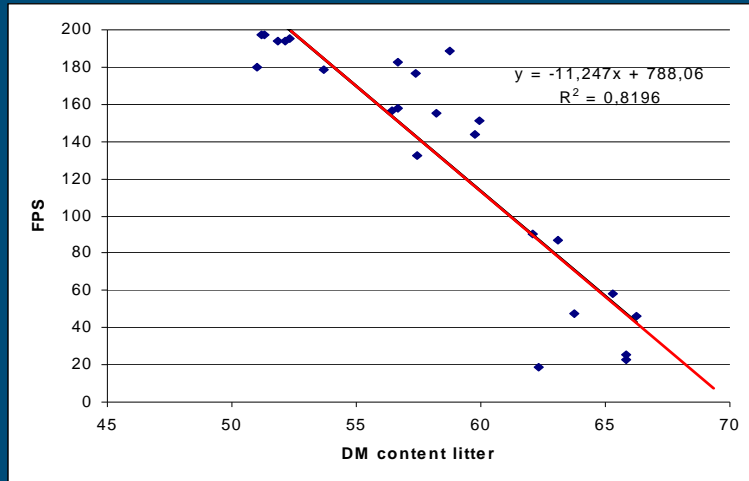
¹ Swedish method (Berg, 1998)

² $FPS = (n_{score\ 0} * 0) + (n_{score\ 1} * 0,5) + (n_{score\ 2} * 2) / (n_{score\ 0} + n_{score\ 1} + n_{score\ 2})$

Relation DM litter and FPD



Relation DM and FPS



$$\text{FPS} = (\text{nscore } 0 \cdot 0) + (\text{nscore } 1 \cdot 0,5) + (\text{nscore } 2 \cdot 2) / (\text{nscore } 0 + \text{nscore } 1 + \text{nscore } 2) \cdot 100$$

CL vs DN (Harn en Van Middelkoop, 1998)

	23L:1D	16L:8D
Weight (g)	2144	2133
FCR	1,73	1,75
Mortality (%)	5,1 b	3,6 a

CL vs DN (van Harn en van Middelkoop, 1998)

	23L:1D	16L:8D
Mild and severe hock burns (%)	57,4	42,4
Mild and severe FPD	9,2	28,0
DM litter (%)	66,6	66,1

CL vs DN (Harn en Van Middelkoop, 1999)

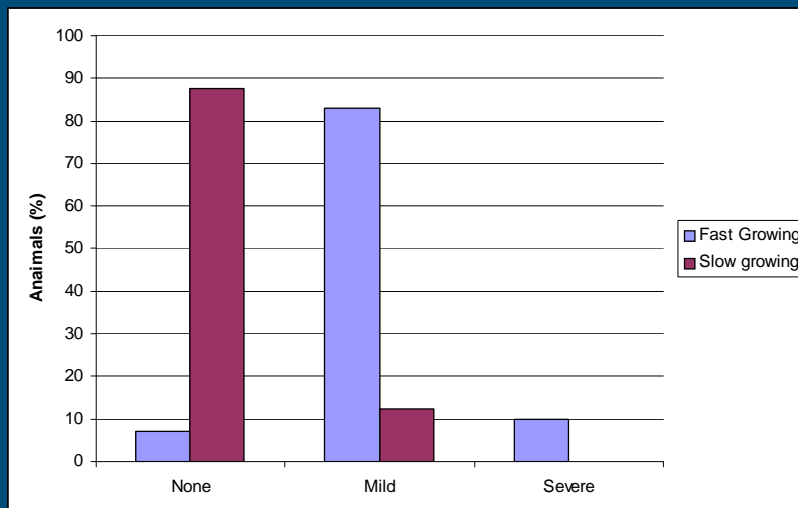
	23L:1D	18L:6D	16L:8D	14L:10D
Weight 42d (g)	2258 a	2307 b	2316 b	2282 ab
FCR	1,69 c	1,66 b	1,64 ab	1,63 a
Mortality (%)	6,2 b	4,7 a	3,8 a	3,8 a
EPEF	288 a	305 b	314 b	311 b

CL vs DN (van Harn en van Middelkoop, 1999)

	23L:1D	18L:6D	16L:8D	14L:10D
Hock burns (%)	60 b	52 b	46 b	22 a
FPD (%)	38 a	87 b	81 b	75 b
DM litter (%)	68	64	65	62

% with mild, moderate and severe lesions; 0 – 3 scoring system.

Fast growing vs slow growing broiler



Reducing FPD by

- Intermittent light
- Litter material (peat + silage maize?)
- Water management
- Lowering CP
- Underfloor heating
- Genetics

Discussion

- Forced litter drying



THANK YOU!



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