

HOUSING BROILER CHICKENS

Prof. Dr. Frank Tuytens

frank.tuytens@ilvo.vlaanderen.be

OVERVIEW

1. Evolution, Selection & Domestication
2. Cognition & Intelligence
3. Behavioral Systems
4. Abnormal Behaviour
5. Housing layers
- 6. Housing broilers**
7. Human-Animal Relation
8. Assessing, Monitoring & Labelling Poultry Welfare

6. HOUSING BROILERS

- a. Conventional
- b. Patio
- c. Enrichment
- d. Litter & dermatitis
- e. Lighting

A. CONVENTIONAL

Flemish broiler farm anno 2012:

	Spread	Average	Median
Unassisted mortality (%)	1 - 34	3.2	2.0
Assisted mortality (%)	0 - 13	1.1	0.5
Slaughter weight (kg)	2 – 2.8	2.4	2.5
Slaughter age (d)	35 - 88	42.3	41.0
Group size	1500 - 95000	Approx. 20000	Approx. 20000

Unloading/thinning:

- 79% of all flocks
- 20% of the group removed on average
- median age: 35d
- median weight: 2kg

Genotype: 81% Ross, 13% Cobb, 6% other

Mixed sexes: 97.3% of flocks

Dimming (D/L): 85% of all stables

A. CONVENTIONAL

Classic Production Column

Breeder pullet rearing

Broiler breeders

Hatchery

- 1-18d incubation
- transfer & candling
- 18-21d hatching

transport day-old chick

Broiler farms

*transport broiler
(catching & truck)*

Poultry slaughterhouses

Portioning, processing, trading



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Classic Production Column

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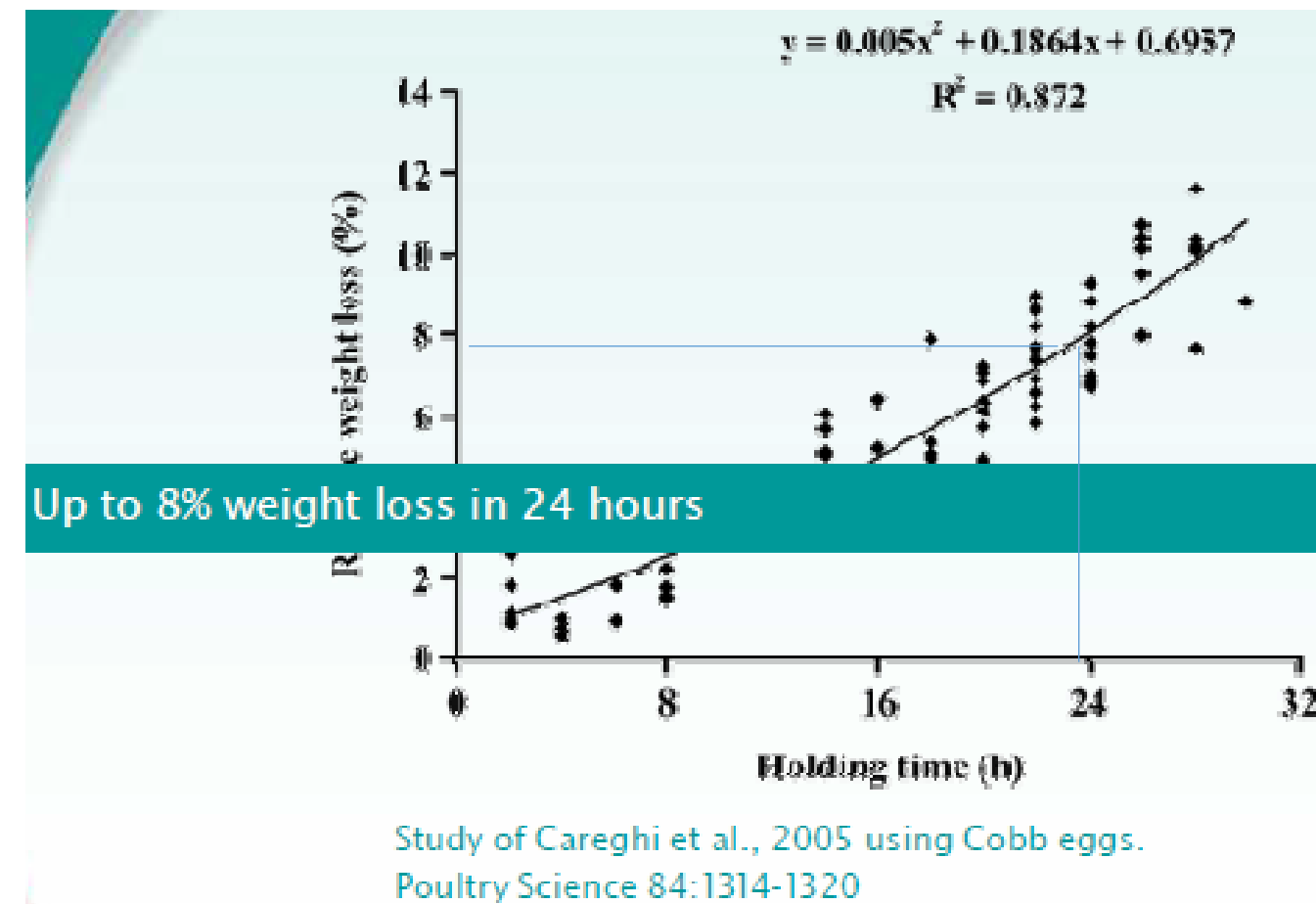
Broiler farms

*transport broiler
(catching & truck)*

Poultry slaughterhouses

Portioning, processing, trading

Approx. 30h between hatching 1^e - last chick
Approx. 5% of life before placing them in barn
(no food, no water)

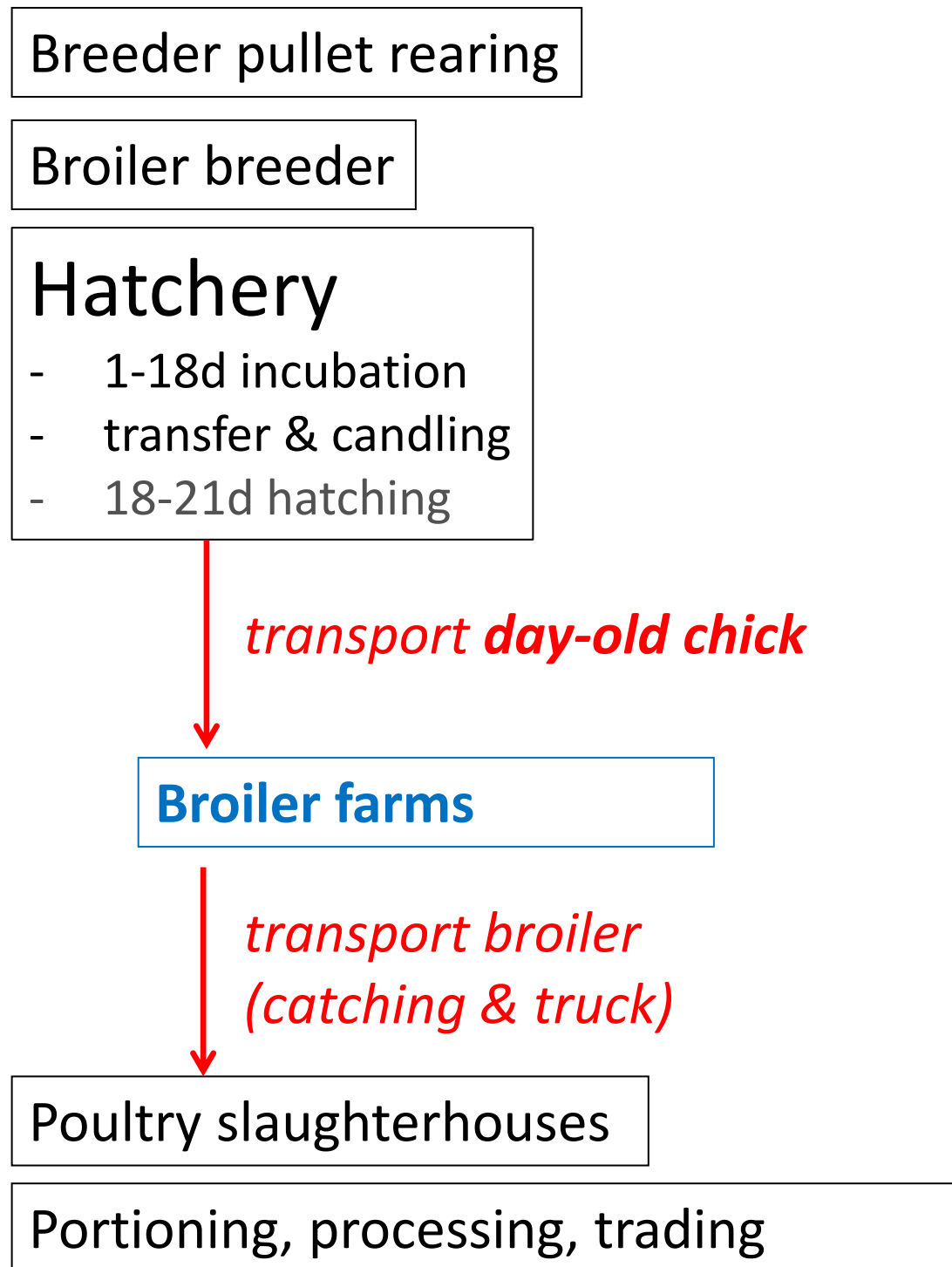


Delayed feeding

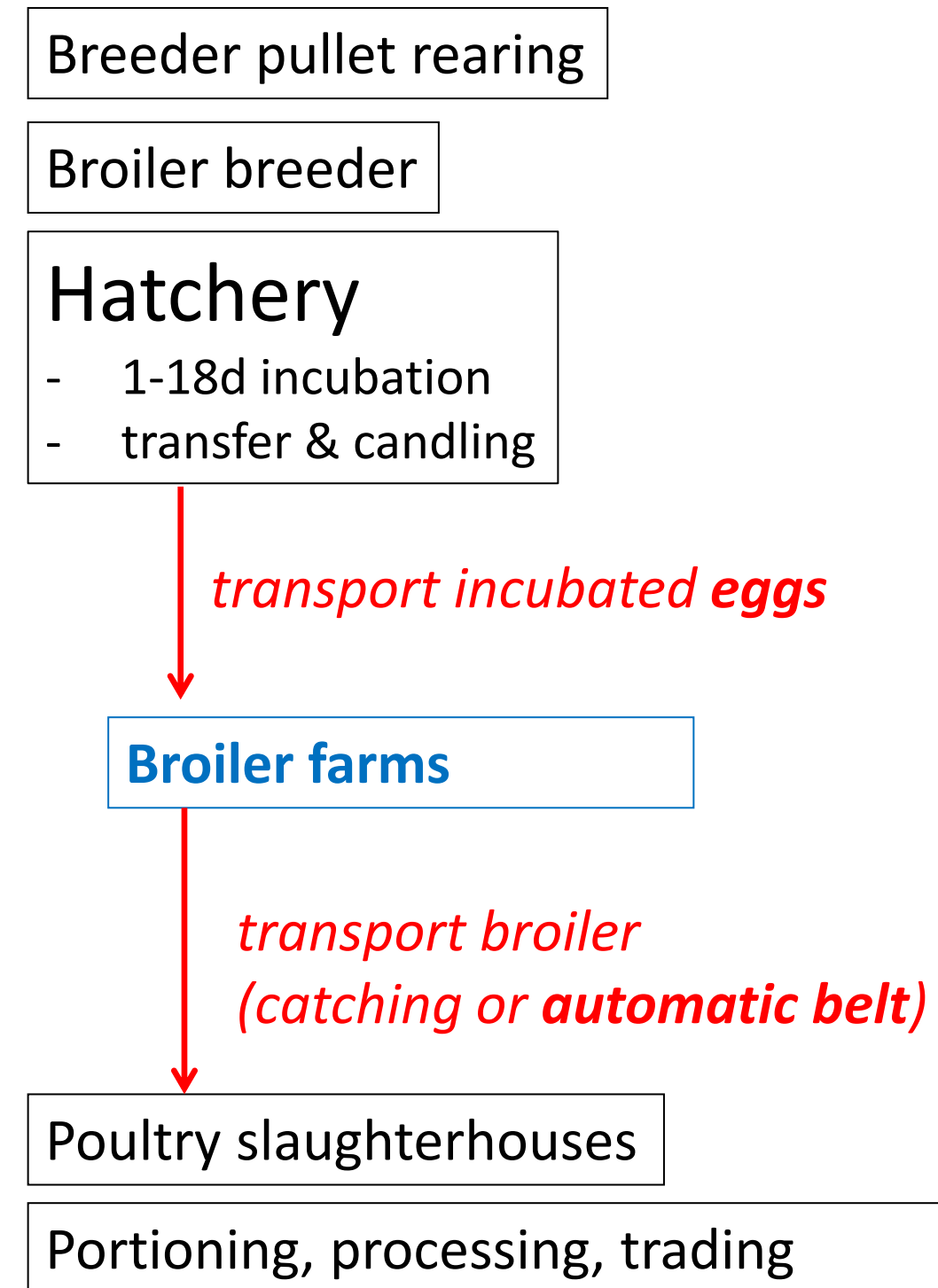
- ↳ immune system
- ↳ gastro-intestinal system
- ↳ pectoral muscle
- ↳ thermoregulation

B. PATIO

Classic Production Column



Alternative: Patio system (Vencomatic)



B. PATIO

Alternative: Patio system (Vencomatic)

Chicks have immediate access to feed and water:

- ↗ hatching %
- ↘ mortality up to d7
- 1d sooner ready for slaughter

Breeder pullet rearing

Broiler breeder

Hatchery

- 1-18d incubation
- transfer & candling

transport incubated eggs

Broiler farms

*transport broiler
(catching or **automatic belt**)*

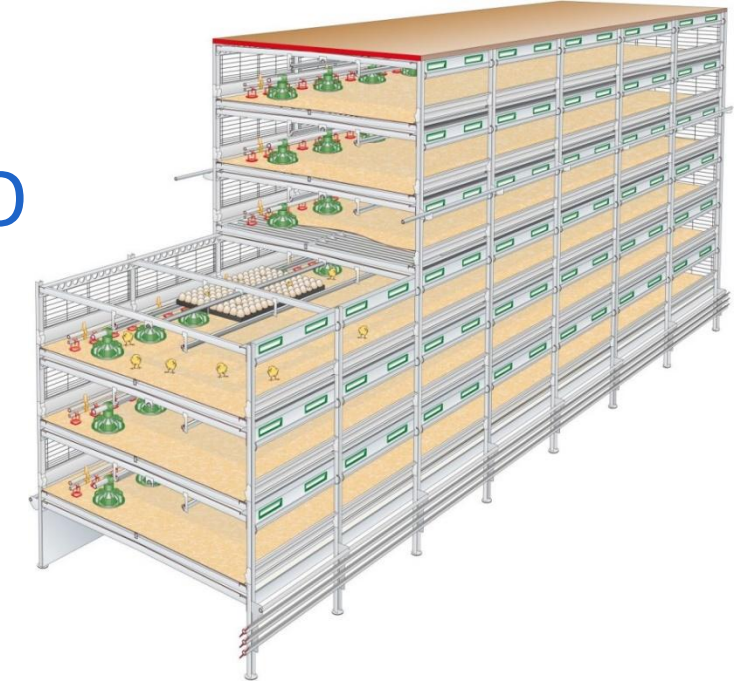
Poultry slaughterhouses

Portioning, processing, trading

B. PATIO



www.youtube.com/watch?v=1MVVXO



C. ENRICHMENT



alfalfa/straw/hay bales
(Beter Leven label)
(resting & pecking)

> Pecking objects
(more picking)

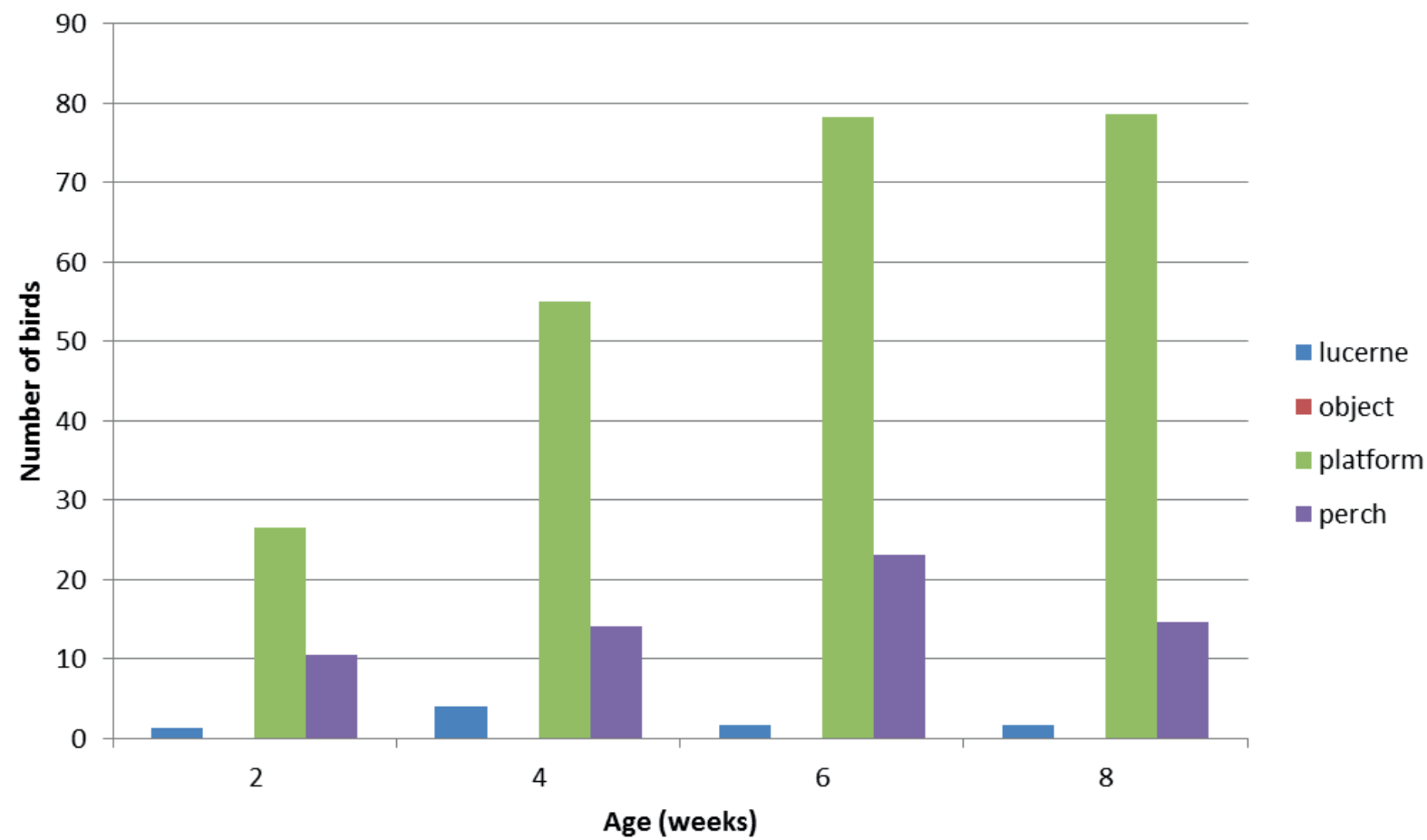
Platform (>perch)
(resting)

(slow growers) De Jong & van Wijhe-Kiezebrink 2014

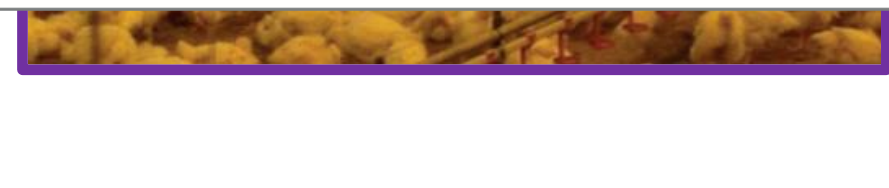
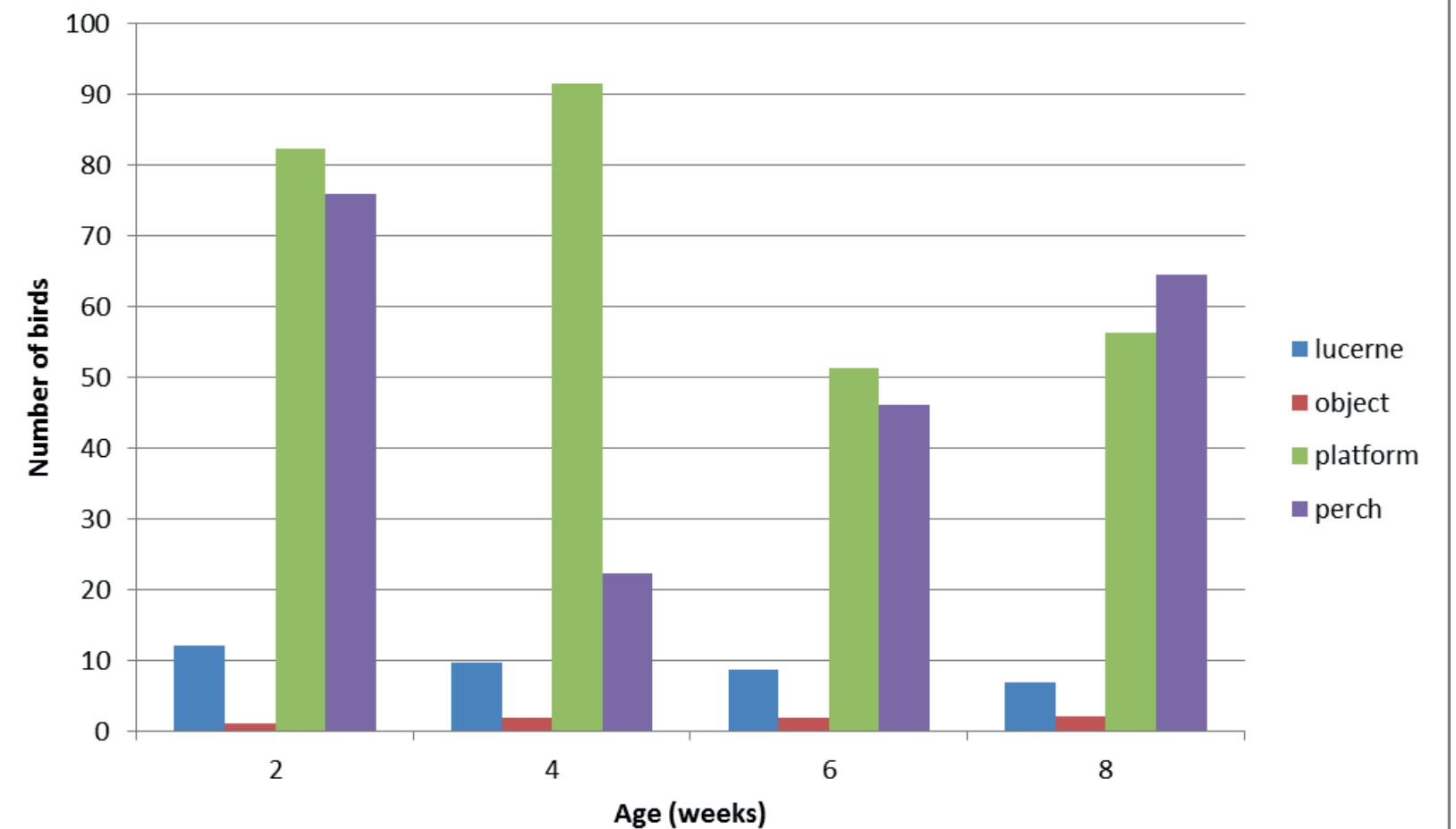
C. ENRICHMENT



Number of birds on enrichment



Number of birds under enrichment



alfalfa/straw/hay bales
(Beter Leven label)
(resting & pecking)

>

Picking objects

Platform (>perch)
(resting)

(slow growers) De Jong & van Wijhe-Kiezebrink 2014

D. LITTER & DERMATITIS

Footpad lesions ← wet & sticky litter!

- Contact dermatitis
- Mainly on middle footpad
- Can also occur on toes
- Skin turns dark
- Emergence of deep necrotic lesions



Check manure consistency (using manure box)
Loosen tightly packed litter
Encourage scratching / foraging by chickens



spread mealworms
(temporary ↗ activity, pecking & scratching)

(Pichova et al 2016)

D. LITTER & DERMATITIS

Risk factors footpad dermatitis (idem: hock burns)

Individual/flock

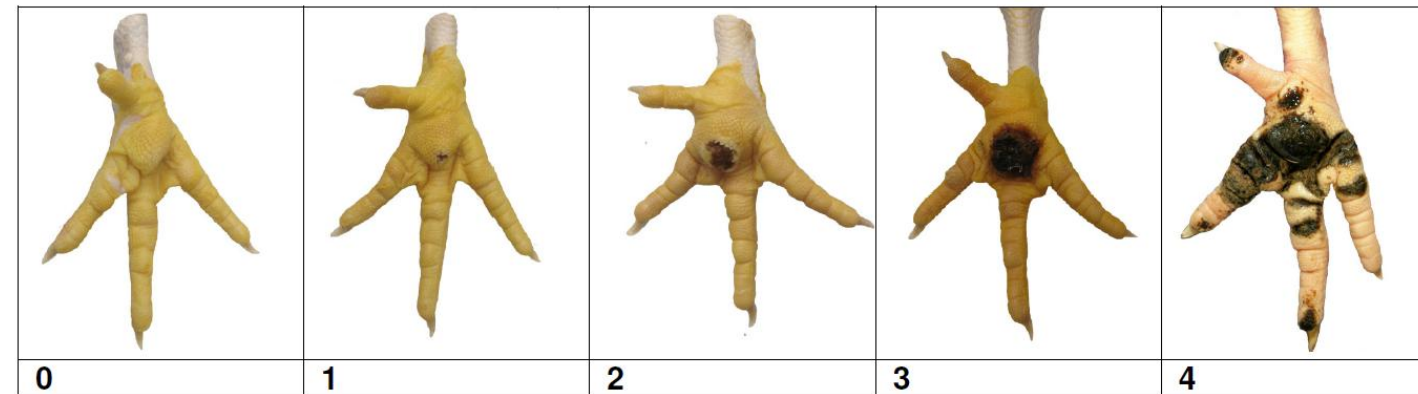
Age/weight
Genetics
Stocking density
Illness (digestion, diarrhoea,...)
Feed & water consumption (manure)
Thinning
(sex: rooster < hen)
.....

Environment (housing & management)

Litter type, quantity, management
Feed (amount and viscosity of manure)
Ventilation & climate control
Season
Drinkers (leakage and spillage)
Outdoor run
Lighting
Disease control (Ab) & hygiene
Perches
.....

D. LITTER & DERMATITIS

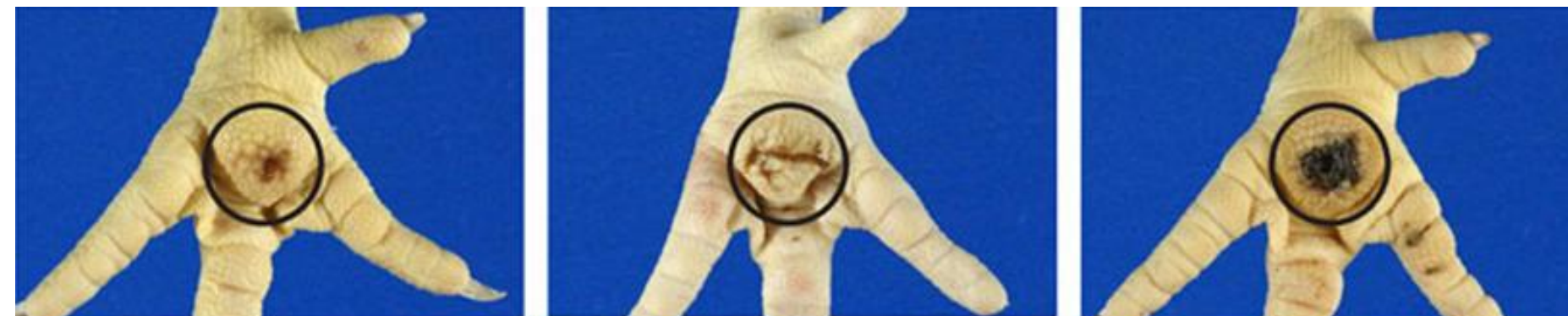
Footpad lesions: PREVALENCE



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BE 2014 (mean: 11 flocks)	10.2%	5.0%	18.3%	59.2%	7.4%
	↓				
BE 2011 (median: 10 flocks)	2.2%		28.7% ^a	71.3% ^a	
BRA 2011 (median: 10 flocks)	2.9%		83.0% ^b	12.2% ^b	

Tuytens et al 2015



Klasse 0 – geen laesie
Class 0 – no lesion

Klasse 1 – milde laesie
Class 1 – mild lesion

Klasse 2 – ernstige laesie
Class 2 – severe lesion

NL 2011 (mean: 386 flocks)	35.5%	26.1%	38.4%
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D. LITTER & DERMATITIS

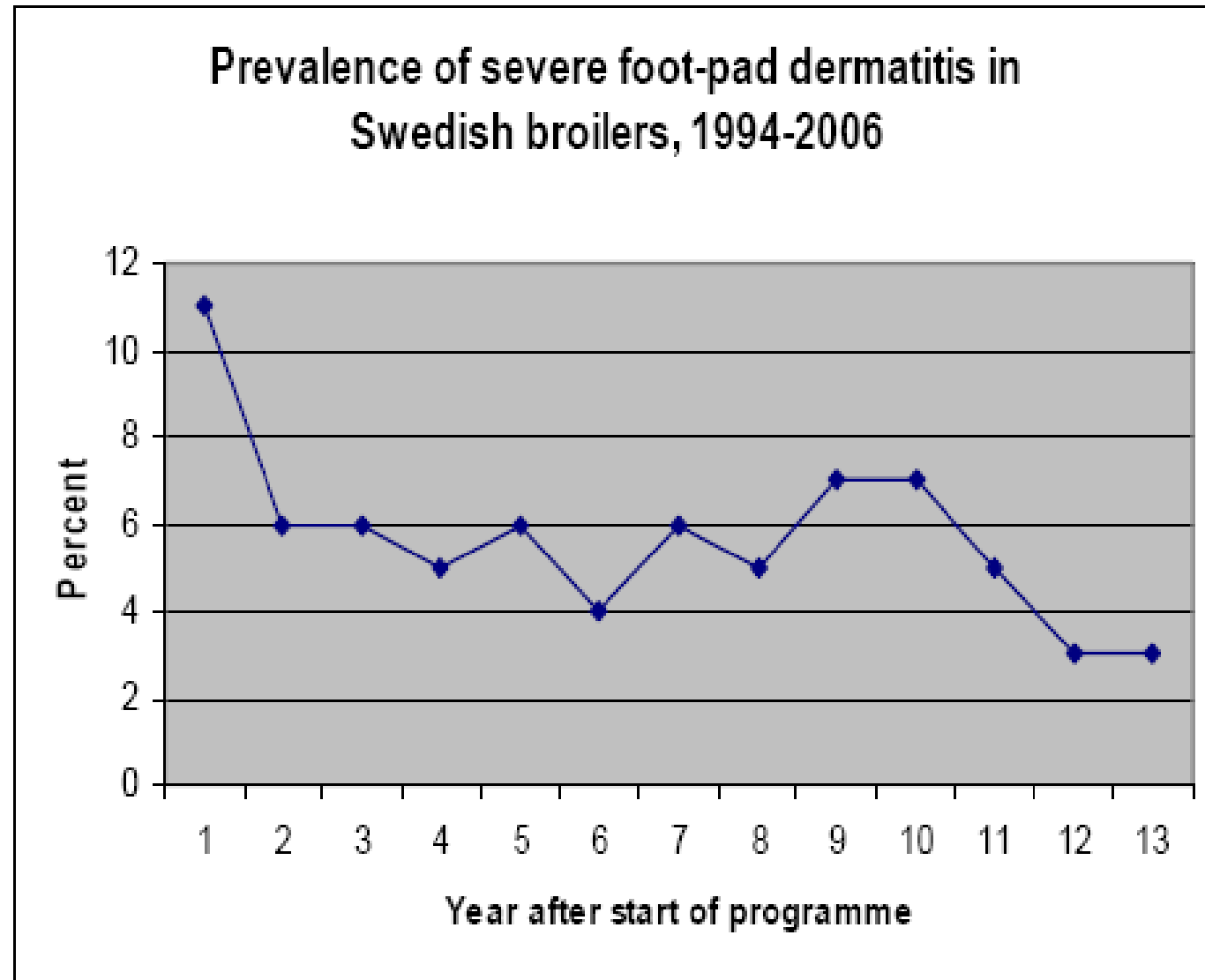
Footpad lesions: REMEDY?

- Sweden (°1994), Denmark (°2002) and the Netherlands (°2013, if 42kg/m²)
- Mandatory scoring of 100 legs (scattered) per flock at SH (trained inspector or automated)
- Three classes:

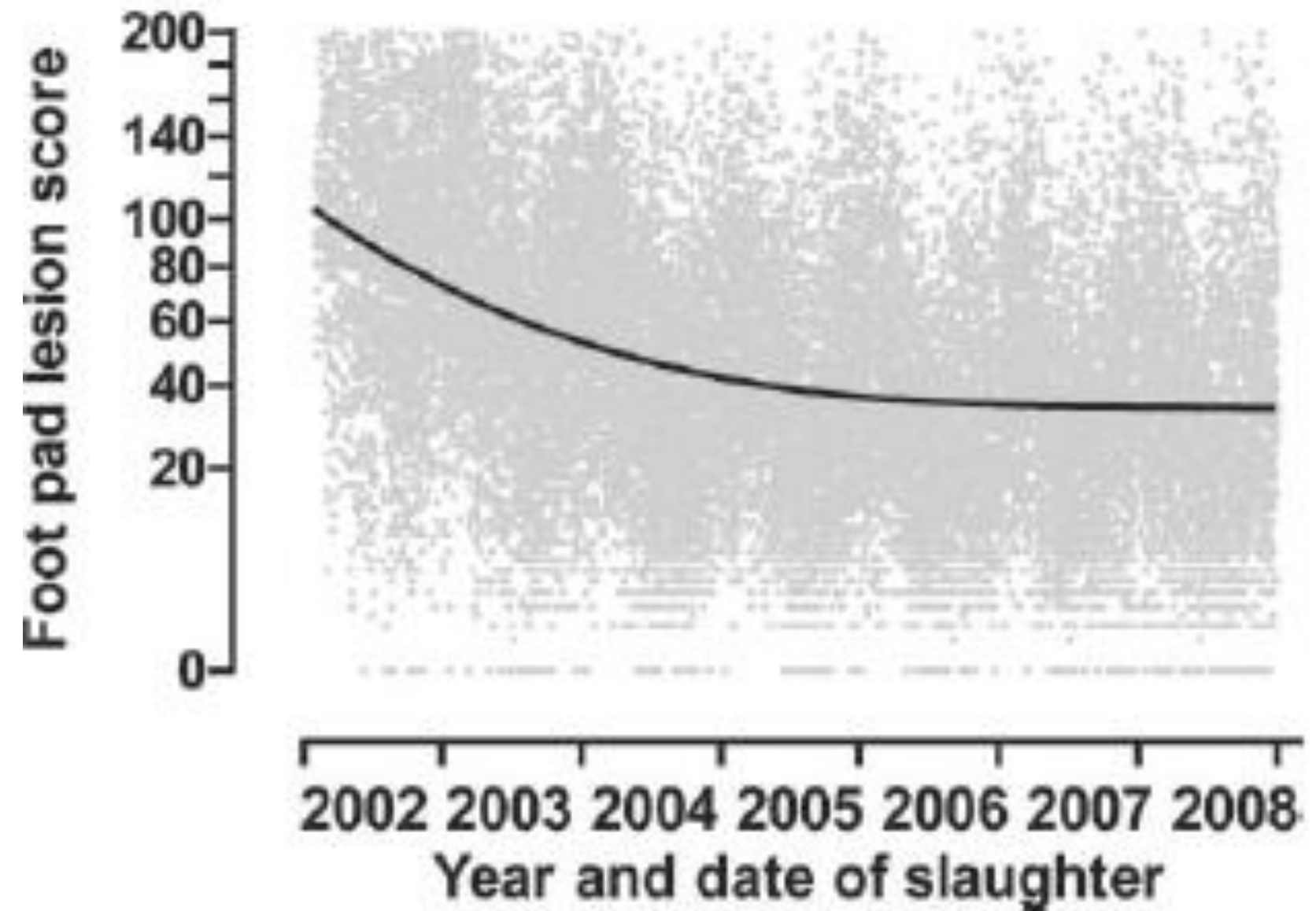
	<u>Relevance to AW</u> (Ekstrand et al., 1998; Haslam et al., 2006)	<u>Weighting factor</u>
- no lesions (score 0)		0
- mild lesions (score 1)	→ probably not painful, but risk for ↓welfare	0.5
- severe lesions (score 2)	→ painful, clearly negative for welfare	2
- Flock score = $((\# \text{ score } 1 \times 0.5) + (\# \text{ score } 2 \times 2) \times 100) / N \text{ total}$
 - <40: no action required
 - 40-80: SWE: 1x: management advice; >1: ↓ stocking density by 1kg/m²
DK: improvement plan
 - >80 SWE: 1x: management advice & ↓ density by 2kg/m²; >1: additional ↓ 1kg/m² (min. 20kg/m²)
DK: improvement plan + inspection service + ↓ density; if no improvement after 6m: 25kg/m²
 - 80-120 NL (annual average): make improvement plan & warning
 - >120 NL (annual average): implement improvement plan & density maximum 39kg/m²

D. LITTER & DERMATITIS

Footpad dermatitis: REMEDY = MONITORING & CONSEQUENCES



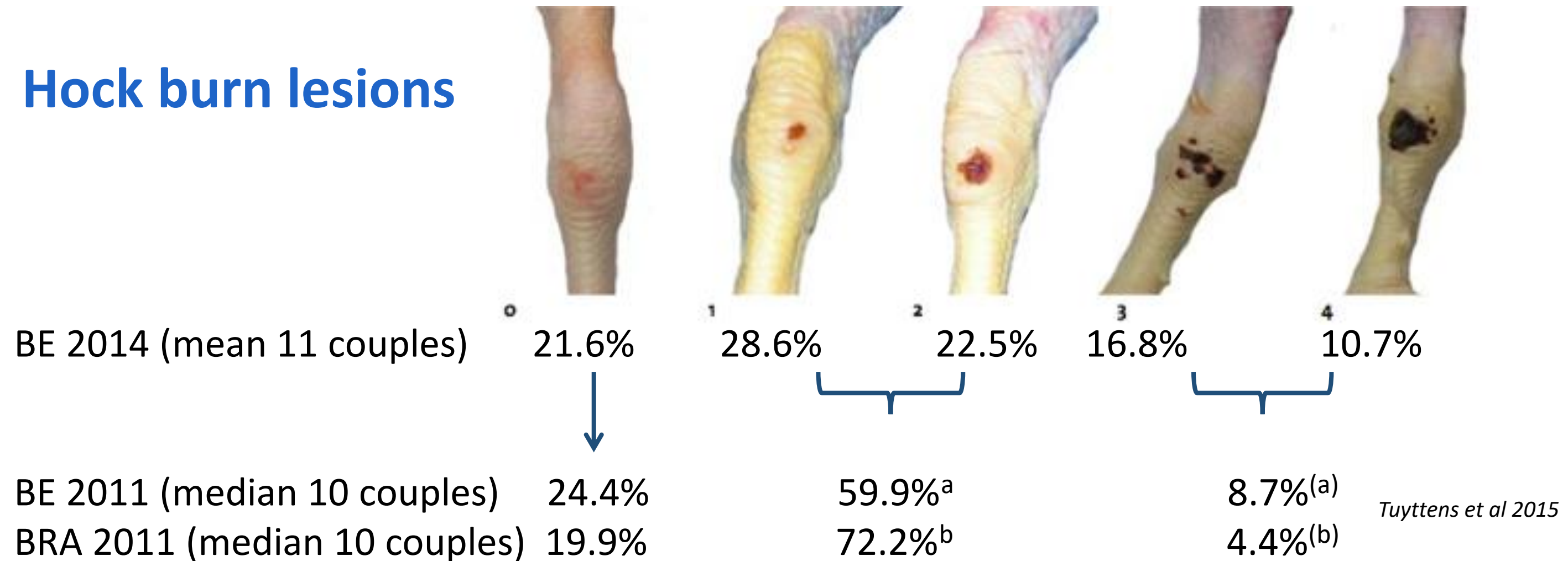
Sweden



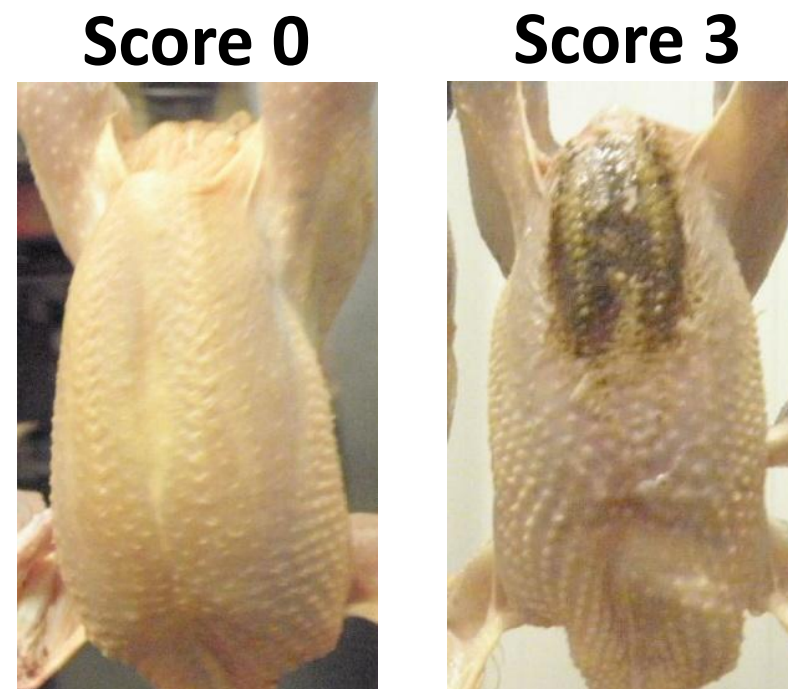
Denmark

D. LITTER & DERMATITIS

Hock burn lesions



Breast dermatitis



B. LITTER & DERMATITIS

Dermatitis of the Hock and Breast: RISK FACTORS

Additional risk factors

Individual

Ability to avoid contact between hock/breast and (wet) litter (leg health, weight, disease,...)

Same risk factors as for footpad dermatitis

Individual/Flock

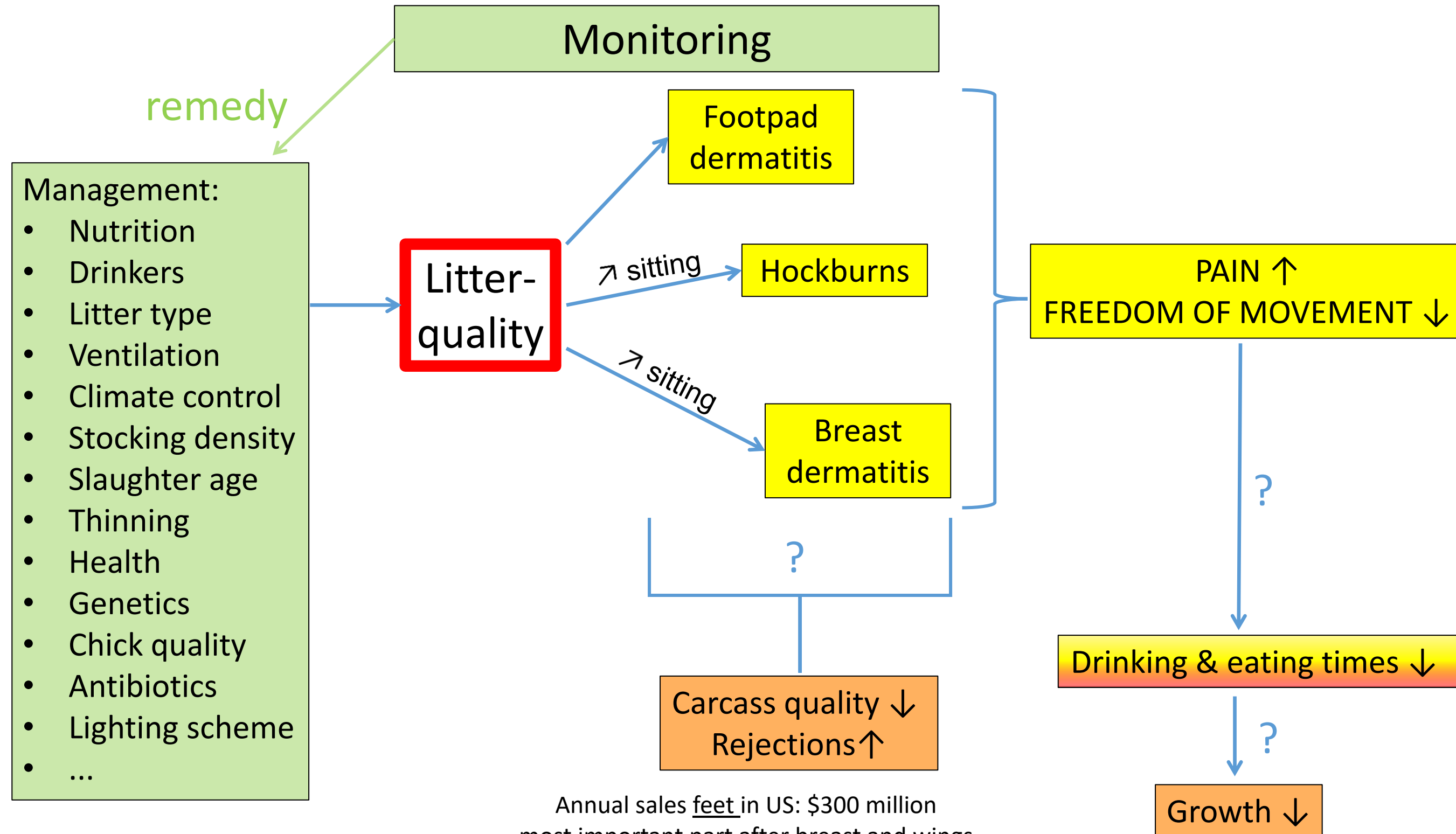
Age/weight
Genetics
Occupancy density
Illness (digestion, diarrhoea,...)
Feed & water consumption (manure)
Thinning
(gender: males < females)
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Environment

Litter type, quantity, management
Feed (amount and viscosity of manure)
Ventilation & climate control
Season
Drinkers (leakage and spillage)
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Disease control (Ab) & hygiene
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D. LITTER & DERMATITIS

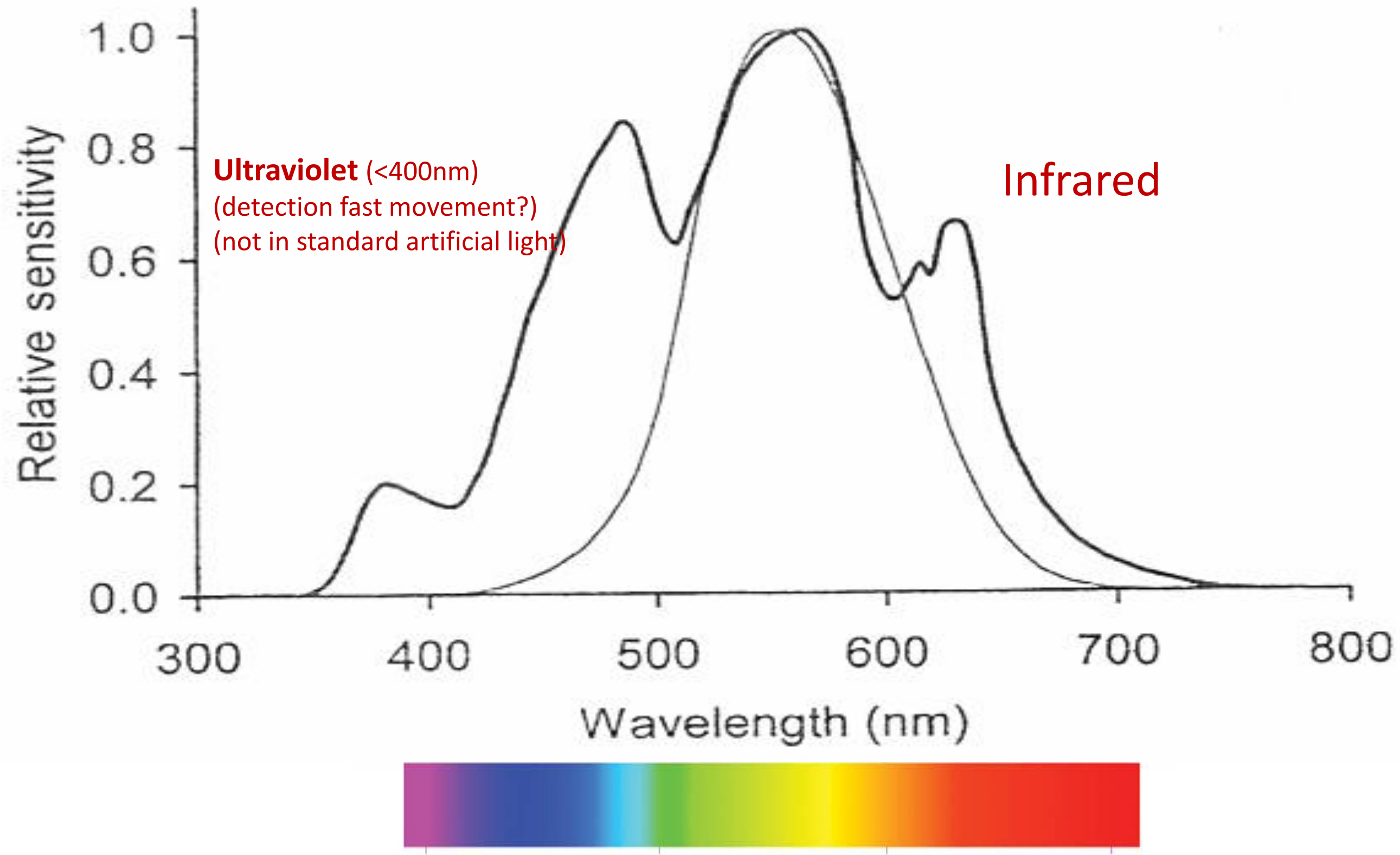
Remedying Contact Dermatitis: Cost-Benefit



6. HOUSING BROILERS

- a. Conventional
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- c. Enrichment
- d. Litter & dermatitis
- e. Lighting

Chicken colour vision: 5 types of light-sensitive cells: blue, green, red (=human) + violet + ultraviolet



Difference in perception of light intensity of different light colours (0.1 W/m²) in humans vs poultry

WAVELENGTH (NM)	LIGHT COLOR	LIGHT INTENSITY HUMANS (LUX)	LIGHT INTENSITY POULTRY (GALLILUX)	RELATIVE LIGHT INTENSITY POULTRY ¹
340-360	UV-A	0	1.2	-
360-380	UV-A	0	10.7	-
380-400	Violet	0	12.4	-
400-420	Violet	0.1	11.7	85.8
420-440	Violet	1	23.6	23.6
440-460	Blue	3	39.8	13.3
460-480	Blue	7.1	52.4	7.3
480-500	Blue	16.4	53.1	3.2
500-520	Green	38.1	45.6	1.2
520-540	Green	60.2	59	1
540-560	Green	67.8	66.9	1
560-580	Yellow	63.5	66	1
580-600	Yellow	49.5	44.1	0.9
600-620	Orange	32.3	37.9	1.2
620-640	Orange	16.7	42.7	2.6
640-660	Red	6.6	20.7	3.1
660-680	Red	2	10.9	5.5
680-700	Red	0.5	5.8	11.3
700-730	Red	0.1	2.3	22.8

1: light intensity poultry divided by light intensity humans.



Human
(trichromatic)



Bird
(tetrachromatic)

UV LIGHT (DAY LIGHT)



With UV light:

- Broiler parent stock: ↗ mating and prior inspection time
- ↘ corticosterone (stress)
- ↗ plumage condition
- ↘ duration Tonic Immobility
- ↘ lameness

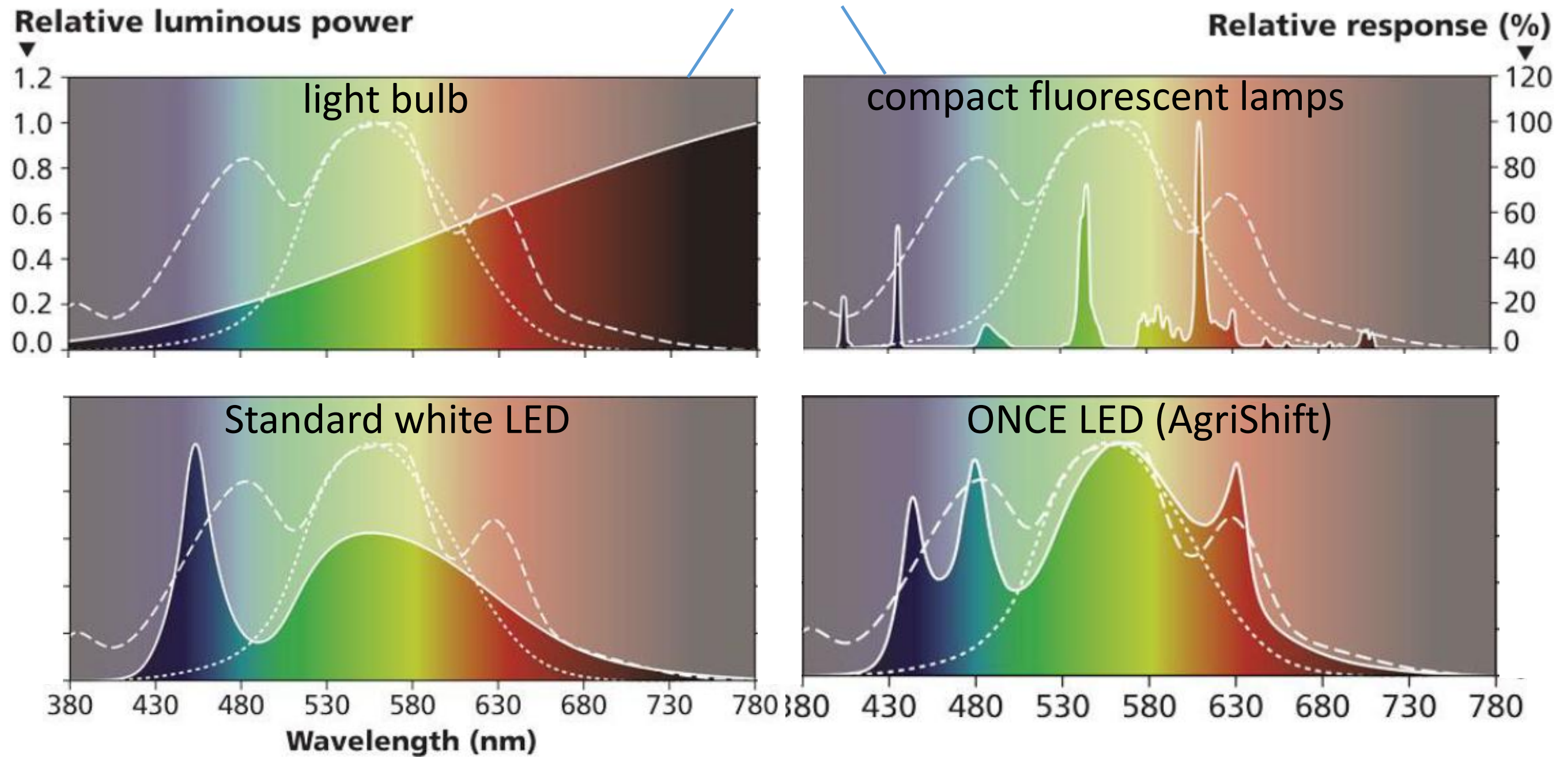
→ **Daylight lamps** that imitate daylight as much as possible:
effects on welfare and production?

(Without UV, they can no longer recognise different individuals)

Fig. 2.3. Dorsal view of a 7-day-old turkey poult illuminated by ultra-violet (UV) light and photographed through a filter that removes frequencies below 415 nm. Under normal fluorescent light, the poult appeared uniformly yellowish-white, whereas, under UV, two types of marking were present: dark patches on the shoulder, while the primary feathers were a violet colour to the unaided eye (from Sherwin and Devereux, 1999, with permission from Taylor & Francis Ltd).

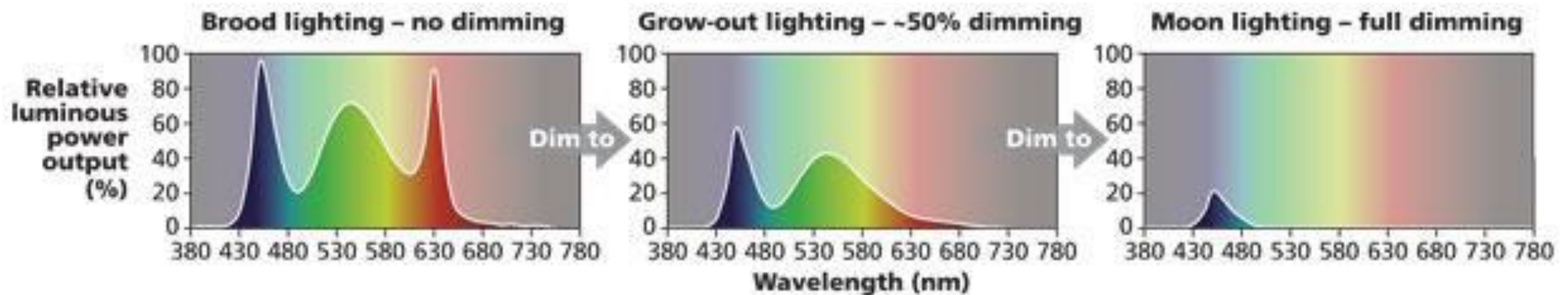
Modern barn lighting systems try to approximate daylight spectrum:
continuous spectrum with all colours without gaps

tailored to human vision



AgriShift VOBF (Variable Output Broiler Fixture) poultry lamp

Adjust the colour palette by dimming



Full spectrum

Ideal to stimulate growth in early development (brood)

Partial dimming

Blue & green stimulate muscle growth; red removed to reduce locomotion

Fully dimmed (moonlight)

Monochromatic blue to calm chickens, reduce aggression and facilitate catching

E. LIGHT

- **Previously** (and many countries outside EU): almost continuous (≥ 23 h/d) low-intensity light:
 - ↗ feed & ↘ activity (↗ growth) + ↘ E! cost
- Adverse effects on **behaviour and welfare**:
 - ↘ diurnal rhythms
 - ↘ synchronisation
 - ↘ activity → ↗ leg problems
 - ↗ disturbance of rest during dark phase
 - ↘ preening & foraging
 - ↗ mortality
- **EU 2007/43/CE (broiler chicken)**:
 - ≥ 6 h dark/d of which ≥ 4 h continuous (excl. <d8, 3 last days before slaughter)
 - needed for rest & sleep, melatonin production and recovery
 - Light period: >20lx (>80% of usable area)

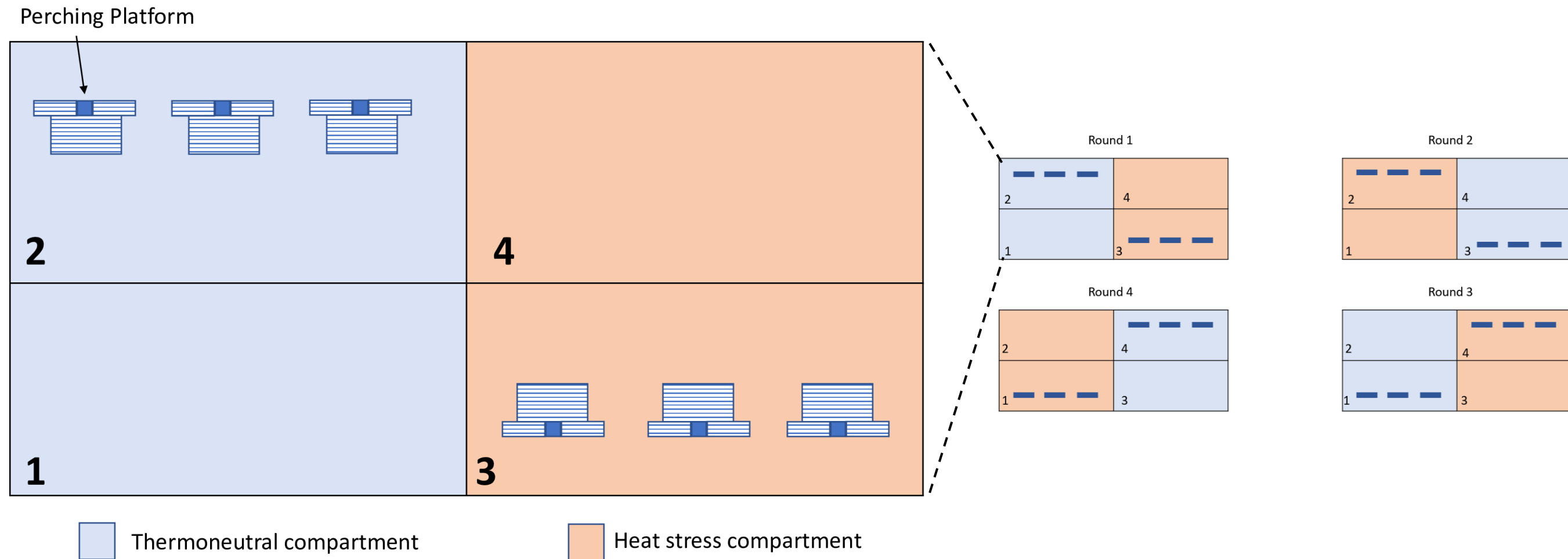
WISH PROJECT: WHICH LIGHT COLOURS DO BROILERS PREFER PER FUNCTIONAL ZONE?

OBJECTIVES

- To evaluate the light colours preferences for:
 - Feeding
 - Drinking
 - Resting
 - Scratching

- To investigate if the preferences are affected by:
 - Age
 - Enrichment (elevated platforms)
 - Heat stress

METHODS



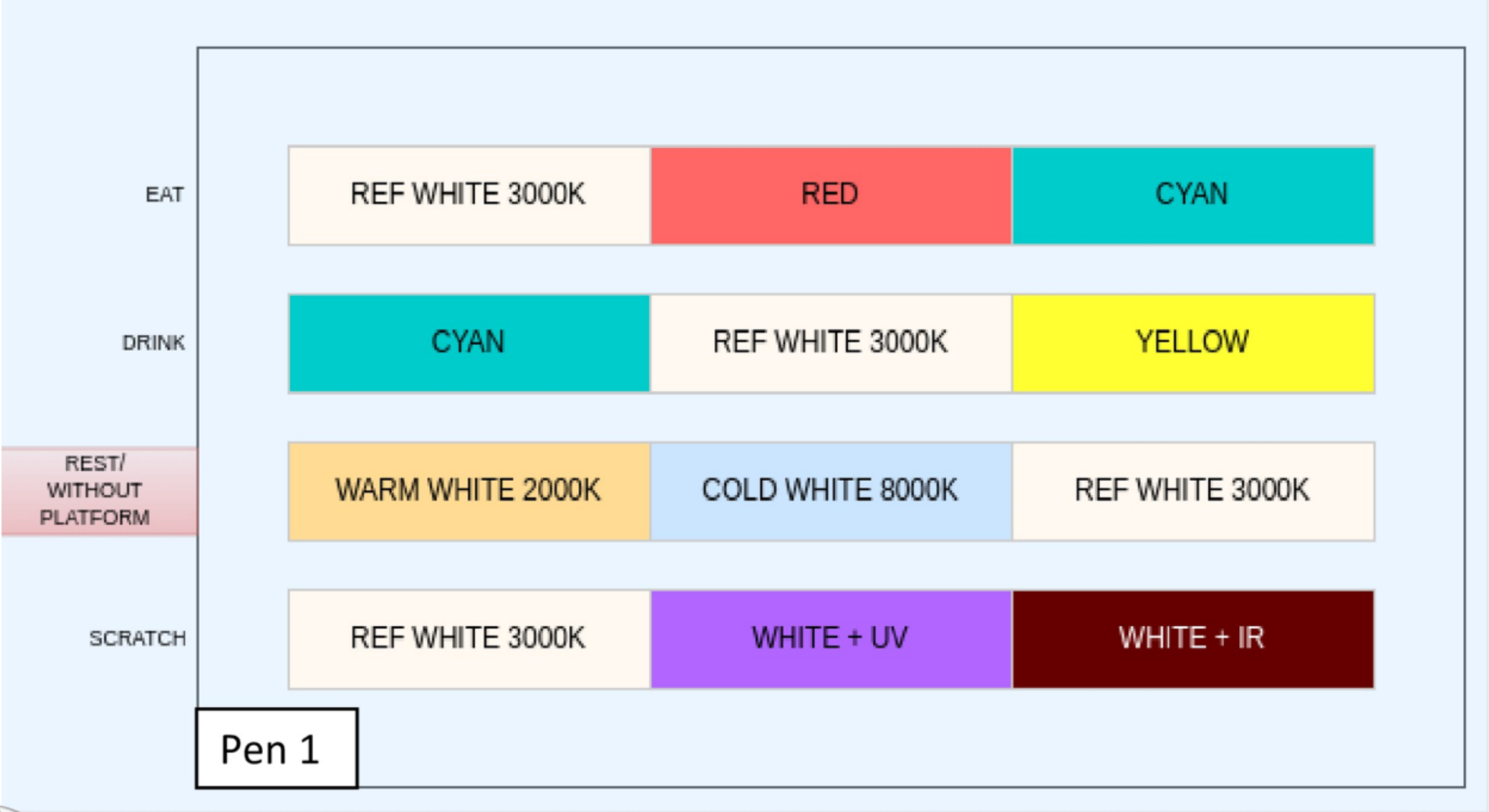
- Birds per pen: 140
- Breed: Ross 308
- Density: 3.8 birds/m²
- Rearing period: 43 days
- Rounds: 4

- Heat stress: d29-d43
- Temperature: 32°C (6h/day)
- Cooling: 10°C

METHODS



LED SPECTRA EXPLORENTIS (30 LUX)

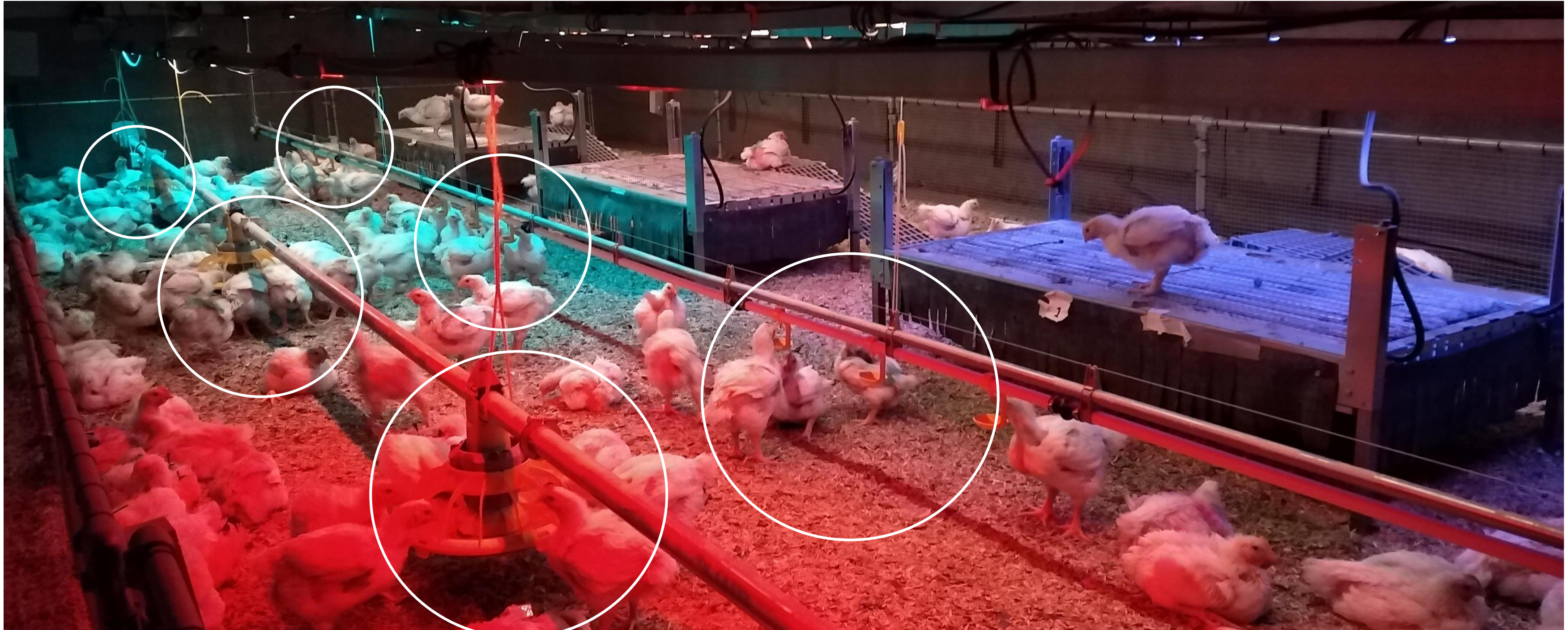


METHODS

LED SPECTRA EXPLORENTIS (30 LUX)

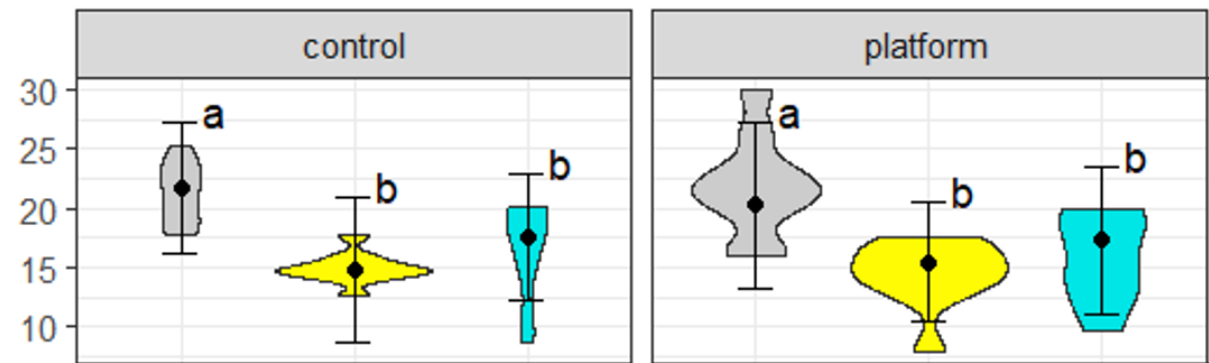


METHODS (IMAGE ANALYSES)



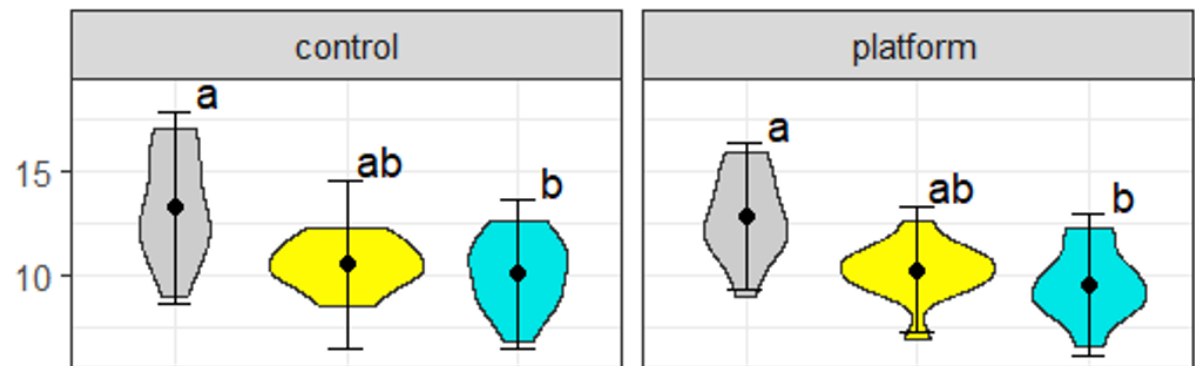
RESULTS: DRINKING ZONE

Starter (1-10d)



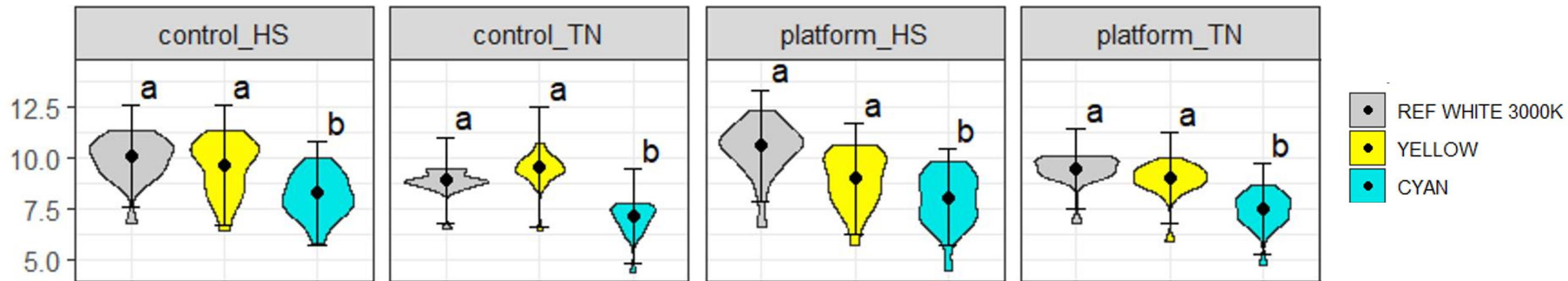
- **Starter:**
 - Prefer White
 - No effects of Platforms

Grower (11-24d)



- **Grower:**
 - Prefer White to Cyan
 - No effects of Platforms

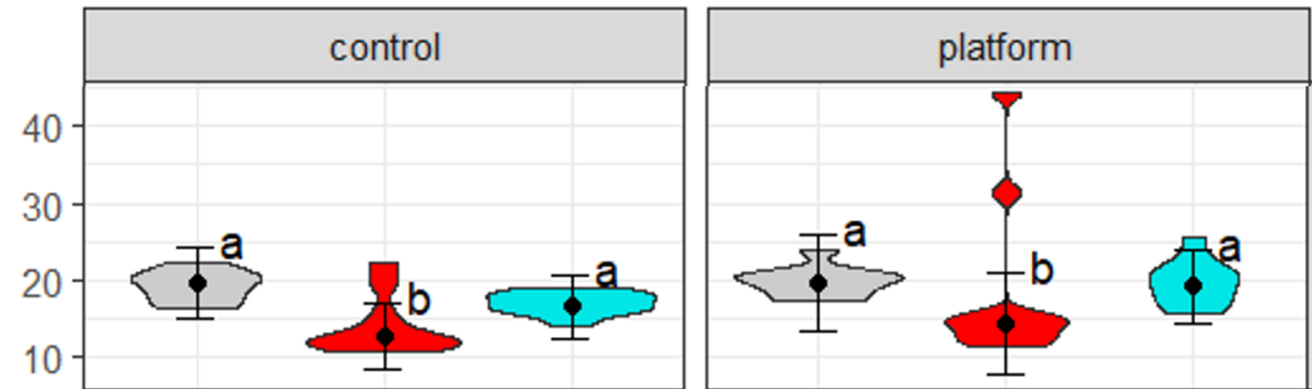
Finisher (25-43d)



- **Finisher:**
 - Avoid Cyan
 - No effects of HS and Platforms

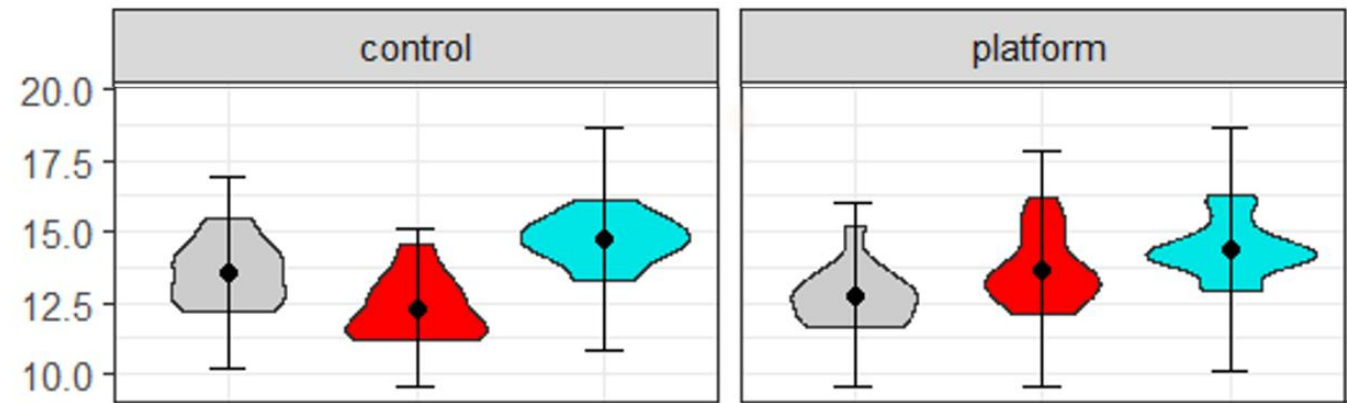
RESULTS: FEEDING ZONE

Starter (1-10d)



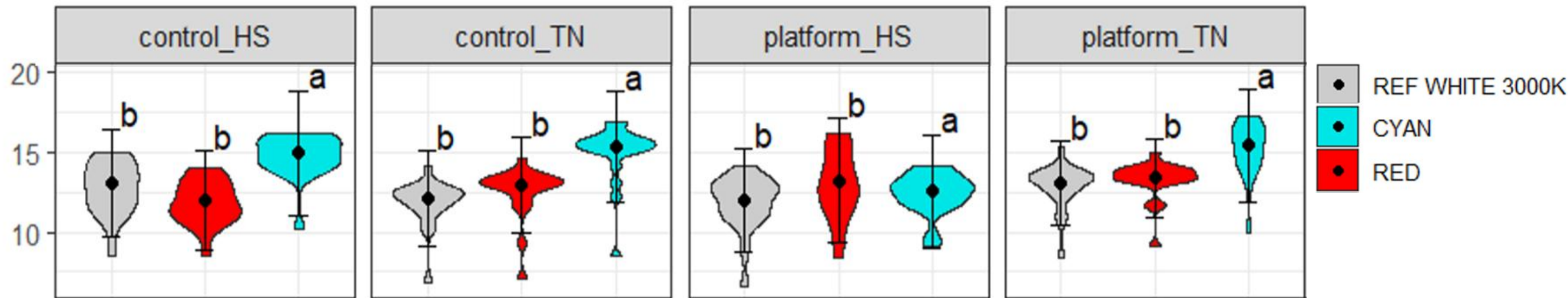
- Starter:
 - Avoid Red
 - No effects of Platforms

Grower (11-24d)



- Grower:
 - No preferences

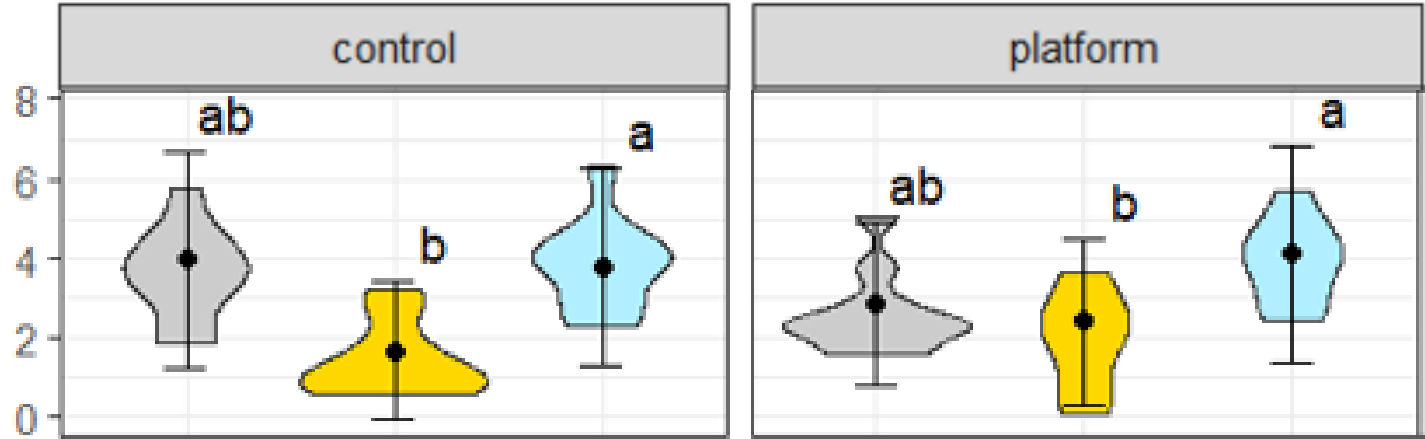
Finisher (25-43d)



- Finisher:
 - Prefer Cyan
 - No effects of HS and Platforms

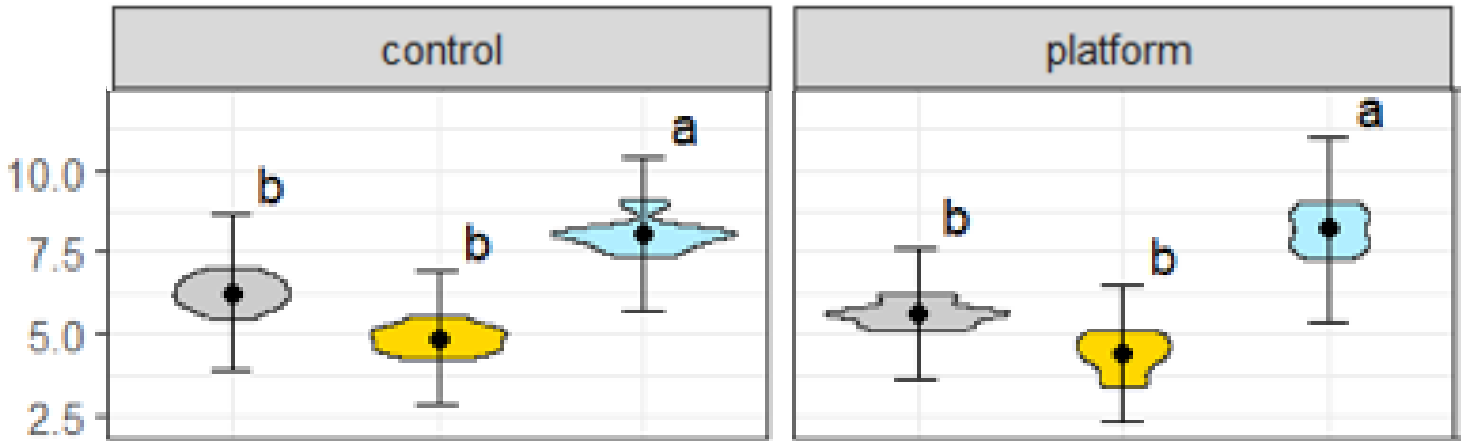
RESULTS: RESTING ZONE

Starter (1-10d)



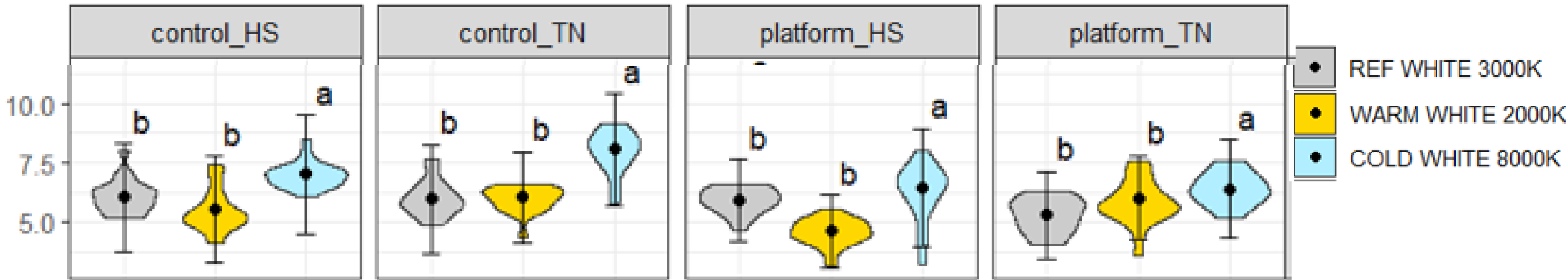
- **Starter:**
 - Prefer Cold White to Warm White
 - No effects of Platforms

Grower (11-24d)



- **Grower:**
 - Prefer Cold White

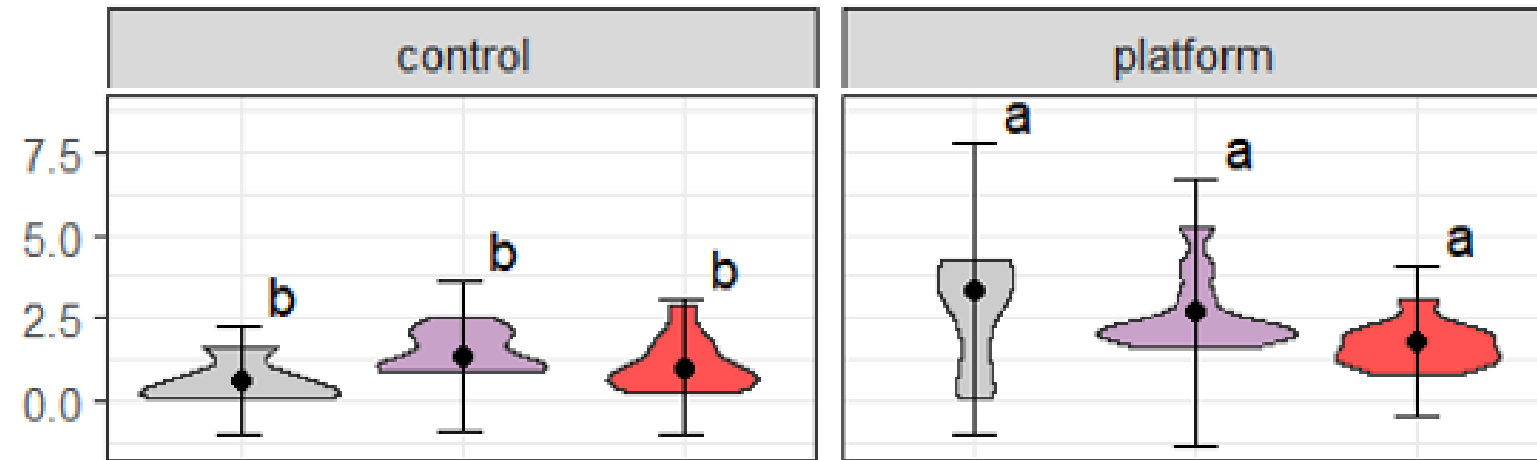
Finisher (25-43d)



- **Finisher:**
 - Prefer Cold White
 - No effects of HS and Platforms

RESULTS: SCRATCHING ZONE

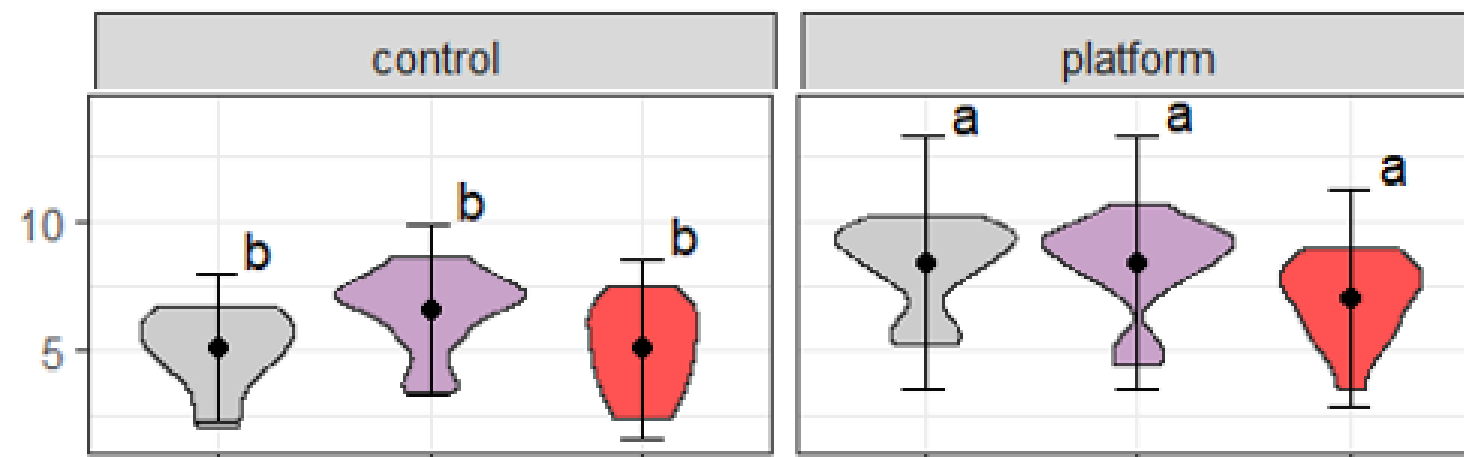
Starter (1-10d)



Starter:

— No Preferences

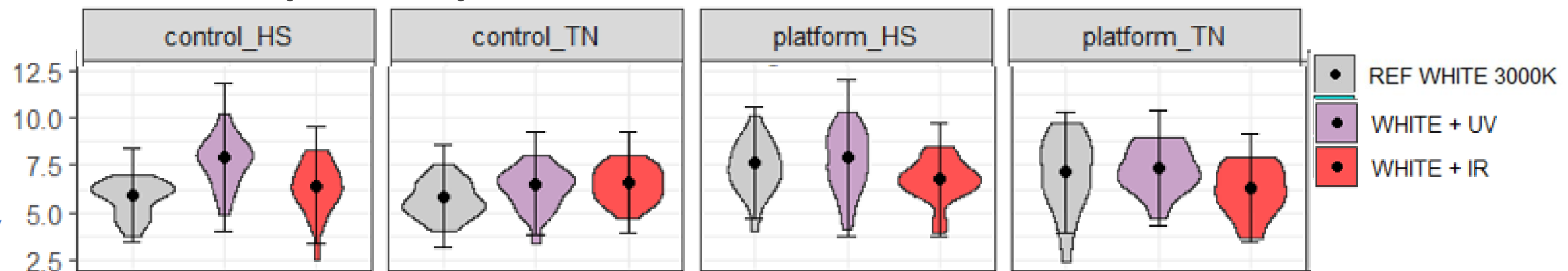
Grower (11-24d)



Grower:

— No preferences

Finisher (25-43d)



CONCLUSIONS

1

Light preferences differ per functional zone (e.g. prefer Cyan for feeding but not for drinking)

2

Some Light preferences change as birds age

3

Light colour preferences seem robust to various environmental conditions (enrichment and heat)

Prof. Dr. Frank Tuytens

Farm Animal Welfare & Behaviour

Flemish Research Institute for Agricultural, Fisheries and Food Research
Animal Sciences Unit

frank.tuytens@ilvo.vlaanderen.be