

## Environment of broilers

Broiler management training, DIFS-Live Indonesia  
 31 May, 1 or 2 June 2016, Rick van Emous

**LIVESTOCK RESEARCH**  
WAGENINGEN UR

**DIFSLIVE**  
INDONESIAN - DUTCH PROGRAMME ON  
FOOD SECURITY, INDUSTRY & RURAL SCENE

## Outline of the presentation

- Need for warmth
- Water system
- Ventilation system

**LIVESTOCK RESEARCH**  
WAGENINGEN UR

## Need for warmth

**LIVESTOCK RESEARCH**  
WAGENINGEN UR

## Need for warmth

- Chicks cannot regulate their body temperature
- “Cold-blooded” = body temp varies with that of the environment
- Start regulating at 5 days of age:
  - Temperature in the house in that period crucial !
- Air temperature first days: 33-35°C:
  - Day and night !
  - Higher temp. for small chicks

**LIVESTOCK RESEARCH**  
WAGENINGEN UR

## Cold- and warm-blooded

Source: Broiler Signals®

**LIVESTOCK RESEARCH**  
WAGENINGEN UR

## Effect of house temp on chick temp

Time	Body Temperature at One Day (°C)	Ambient Temperature (°C)
0	38	32
30	35	32
60	32	32
90	30	32
120	28	32

Source: Hubbard manual

**LIVESTOCK RESEARCH**  
WAGENINGEN UR


### Climate tips at start-up

- House must be warm before chicks arrive
- Smaller area (1/3 – 1/4 of the total surface)
- Bamboo slats covered with bags and litter (rice hulls = approx. 1 kg/m<sup>2</sup> (or 2 cm))
- Litter over the total area (brooding area)
- After placing birds: chicks cloacal temperature must be 40.5 °C at least
- Chicks from young breeders (lower BW) need more heat: temp. +1 °C (first week)

LIVESTOCK RESEARCH WAGENINGEN UR

### Measuring cloaca temperature

- Measure gently inside the cloaca
- Must be between 40.4 and 40.6 °C
- Below 40.0 °C: too cold
- Above 41.0 °C: too hot

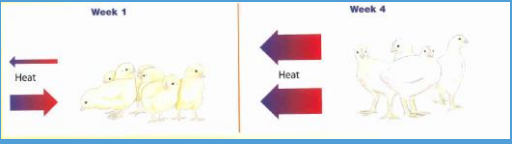


LIVESTOCK RESEARCH WAGENINGEN UR

Source: Cobb

### Changing need for warmth

- Thermoregulation
  - Begin: not able to control body temperature
  - End: produce a lot of heat



LIVESTOCK RESEARCH WAGENINGEN UR

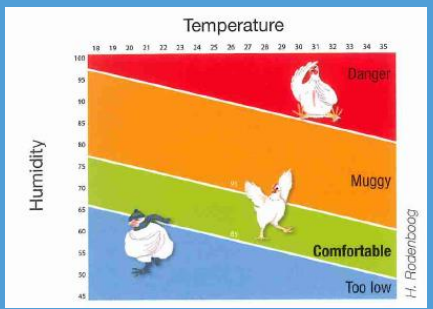
Source: Broiler Signals®

### Comfortable climate

- Ideal RH = 50-70%
- Temperature + moisture = **HEAT !**
- Rule of thumb:
  - 5 points about the comfortable value (95) = heat stress
  - Above 115 for a longer period: broilers die

LIVESTOCK RESEARCH WAGENINGEN UR

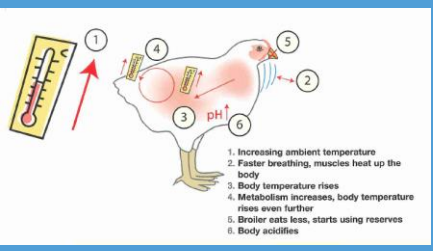
### Comfortable climate



LIVESTOCK RESEARCH WAGENINGEN UR

Source: Broiler Signals®

### Heat stress



1. Increasing ambient temperature
2. Faster breathing, muscles heat up the body
3. Body temperature rises
4. Metabolism increases, body temperature rises even further
5. Broiler eats less, starts using reserves
6. Body acidifies

LIVESTOCK RESEARCH WAGENINGEN UR

Source: Broiler Signals®

## Heat stress

- Especially in week 3 and 4:
  - Higher growth rate due to higher feed intake
- 25% of the energy via feed is used for:
  - Growth, movement, breathing, body temperature maintenance (41°C)
- 75% of the energy is lost in the form of heat:
  - Chicks can't sweat as human
  - Evaporating moisture during respiration: **Panting**

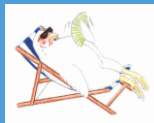
## Panting

- Broiler too hot:
  - Fast panting with its beak open
  - Raise its feathers
  - Hold wings slightly out from its body



## Getting used to heat

- They can "learn" to tolerate high temperature:
  - In case of constant high temperature (Indonesia)
    - Up to 38 °C
    - Night is colder!
  - Higher temp start growth period (5-6 days)



## Prevention of heat stress (1)

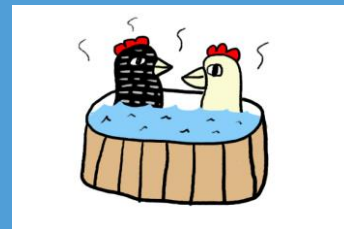
- Don't feed broilers during the hottest part of the day (e.g. between 12:00 and 16:00 hour)
- Quietly walk through the flock:
  - Spreading and drinking
- Extra Vit. C against stress:
  - Vit. C is needed to produce antistress hormones
  - Broilers can't make Vit. C by themselves



## Prevention of heat stress (2)

- Cold water (around 20°C is good, under 30°C):
  - Prevent water (system) from heating up
  - Fresh water at 12:00 (flushing)
- Feed:
  - Replace some carbohydrates with fat
  - Replace 1% CP with easily digestible protein
- Extra electrolytes:
  - Add to 0.5% KCl or NaHCO<sub>3</sub>

## Prevention of heat stress (3)



## Water system



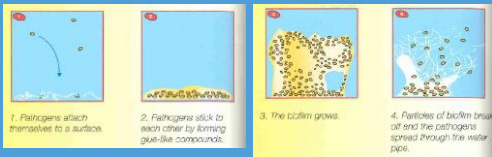
## Water quality

- Water: base of a healthy life and production
- Quality:
  - Chemical composition
  - Bacterial composition
- Regular testing program:
  - At the well
  - End of line:
    - Water container
    - End of waterline (bell drinker or nipple)



## Biofilm

- A slimy film consisting of bacteria, yeast and moulds
- Forms on the surface of the water lines or containers
- Affects also antibiotic treatments or vaccination



## Contributing factors for biofilms

- Dead ends
- Hanging pipes
- Open tanks
- High temperature
- Oxygen
- Light
- Use of additives like vitamins / sugar



## Examples in practice (hanging pipes)



## Examples in practice (open tanks)



## Examples in practice (additives)



## How to clean water pipes (within flocks)

- Fill the pipe with disinfectant
- Bell drinkers: touch every drinker
- Leave for 24 hours
- Check inside pipes and tanks
- Flush the pipes with high pressure



## Products to improve water quality

- Dual effect: removing biofilm and killing microorganisms
- Ultraviolet:
  - Less effective against viruses
  - Only effective were UV rays contact the water
- Chlorine:
  - Cheap
  - Less effective with pH >7 or organic material
- Hydrogen peroxide:
  - Cleans line efficiently
  - Kills moulds and bacteria

## Prevent water from heating up

- No direct sunlight on water reservoir and pipe lines
- Water reservoir:
  - Paint it white
  - Roof over a water tank
  - Insulated room
- Pipe lines:
  - Underground
- Bell drinkers:
  - Water keeps flowing smoothly at the end



## Example watertank



## Ventilation system



## Natural ventilation



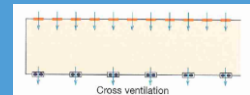
## Natural or mechanical ventilation

- Natural ventilation:
  - Simple and inexpensive system
  - In relation to broiler performance ??
- Mechanical ventilation:
  - Investment and energy use are higher
  - More control options
  - Good production performance
  - Under pressure in the house: no openings in addition to the air inlets!!

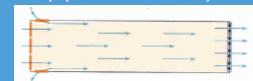
## Estimate results of natural / mechanical ventilation

Parameter	Natural	Mechanical	Difference
Mortality (%)	5.0	1.5	-70%
Body weight (kg)	1.7	1.9	+12%
FCR (kg/kg)	1.6	1.5	-6%
Cycle/year	6	7	+17%
Stocking density (#/m <sup>2</sup> )	8	15	+88%
Revenue/flock (mil. IDR)	400	460	+15%

## Types of mechanical ventilation

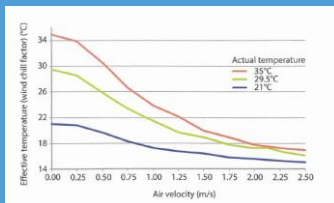


- Cross ventilation:
  - The air is expelled on one side of the house
  - Fresh air through inlets on the opposite side
- Tunnel ventilation:
  - Fans are placed in the back wall
  - Air inlets in the front wall
  - Relative high air velocity (wind chill effect)



## Wind chill effect

- Air velocity cool broilers



## Recirculation fans

- Cheap and simple system
- Chicks can seek for cooling area
- Effective on a limited surface (20-30 m<sup>2</sup>)
- Electricity sometimes a limiting factor
- Bevel angled installed



## Recirculation fans

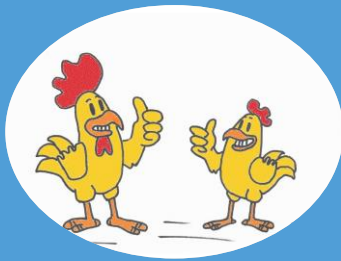


## Key factors in environment of broilers

- Chicks (5 days) cold-blooded: need for warmth
- Reduce heat stress (week 3-4)
- Avoid biofilm
- Prevent water from heating up
- Increase air velocity

## End

Questions ??



## Working in groups

1. What is more important for chickens? Water or feed?  
And why?
2. How can you improve the water system?
3. How can you improve air velocity at bird level in broiler houses?