Building Robustness in Birds through Genetics, Breed Selection and Industry Interaction

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September 2016
Agenda

• We have come a long WAY
• Genetics, building a stronger bird
• Industry Interaction
  – Breeder
  – Hatchery
  – Broiler
• Summary.
1 Bird does not fit all RWA, ABF, Organic, slow growing...
<table>
<thead>
<tr>
<th>Year</th>
<th>Body Weight (lb)</th>
<th>Adj FCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2.050</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>1.900</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>1.850</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>1.800</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1.750</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>1.700</td>
<td></td>
</tr>
</tbody>
</table>

FCR adjusted changed from a 5 lb. target to 6 lb. target in 2011
The US started seeing a rise in ABF programs after 2012
The US started seeing a rise in ABF programs after 2012.
Contribution from Genetics

• BUILDING ROBUSTNESS
Genetics vs. Environment

- **Performance**
  - LWT, FCR, BR%, etc
  - Health
  - Welfare

- **Genetics**
  - IMPROVEMENT
  - 5 – 20%

- **Environment**
  - 80 – 95%

- **Interaction**
  - Feed Form and quality
  - Management
  - Housing
  - Health
  - Gut Function
  - Immune Function

**Aviagen**
Starts with the breeder!

NUTRITION
HEALTH
MANAGEMENT
<table>
<thead>
<tr>
<th>All Things Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Appetite</td>
</tr>
<tr>
<td>• Feed form &amp; formulation</td>
</tr>
<tr>
<td>• Feed distribution</td>
</tr>
<tr>
<td>• Uniformity</td>
</tr>
<tr>
<td>• Rearing profiles</td>
</tr>
<tr>
<td>• Frame size</td>
</tr>
<tr>
<td>• Peak feed</td>
</tr>
<tr>
<td>• Post-peak reductions</td>
</tr>
<tr>
<td>• Photostimulation response</td>
</tr>
<tr>
<td>• Lighting programs</td>
</tr>
<tr>
<td>• Body composition – flesh &amp; fat</td>
</tr>
<tr>
<td>• Maintenance requirements</td>
</tr>
<tr>
<td>• Seasonal factors</td>
</tr>
</tbody>
</table>
Male Assessment in Production

**The Head**
- Males should have a uniform intense red colour around the comb, wattle and eye area. The beak should be uniform in shape.

**The Legs & Feet**
- Legs should be straight with no bent toes. Footpads should be clean and free from abrasions. Pigment around the hocks reflects a good working male.

**Feathering**
- A good quality male that is working well will exhibit some partial feather loss especially on the shoulders and thighs.

**Bodyweight & Fleshing**
- Male condition/fleshing and body weight should be monitored weekly.

**The Vent**
- The vent should show some feather wear and be large and moist.

Library photographs for teaching purposes.

www.aviagen.com

August 2010
Starts on Farms

- Clean eggs
- Clean nest mats
- Clean litter

Floor Eggs ?
Immature wet cuticle
Liquid filled pores

41°C

House temperature

Microbes

Microbes

Microbes
To Hatchery
35% of the growing life of the bird is during the incubation!

(39 day growing period)
What is a good quality hatching egg?

**Good quality hatching eggs**
- Good quality egg
- Good quality egg
- Good quality egg
- Good quality egg

**Eggs with an increased risk of lower hatchability or contamination**
- Floor egg
- Faecal soiling that should be gently wiped off
- Blood on shell
- Slight soiling
- Rough shell
- Yolk on shell
- White shell
- Hairline crack
- Small egg
- Difficult to see which end has an air cell

**Reject eggs like these**
- Cracked
- Puncture hole
- Missnape
- Thin shell
- Wrinkled shell
- Gross soiling
Temperature: Setter

Good quality chicks?
Embryo heat production

Based on Janke, Tzschtentke and Boerjan, 2004  XXII World’s Poultry Congress, Istanbul, Turkey
Aviagen guidelines in practice

Optimal: 100.0°F

Range: 99.5°F - 101.0°F
High Incubation Temperature

- 5% Smaller Chick
- 29% Smaller Heart
- 13% Smaller Proventriculus and Gizzard
- 16% Decrease Small Intestines

Leksrisompong et al., 2007
Temperature: Hatcher

Good quality chicks?
## Effect of Hatcher Temperature on hatchability and Embryo Development

**Note:** * means eggshell temperature

<table>
<thead>
<tr>
<th>EST: E19-hatch</th>
<th>99.1-100.4*</th>
<th>101.1-102.2*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchability, %</td>
<td>97.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>90.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>BW hatch, g</td>
<td>44.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>42.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Heart weight, g</td>
<td>0.54&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.42&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bursa Fabricius, g</td>
<td>0.07&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.04&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Culls, %</td>
<td>0.36&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.88&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Sozcu and Ipek, 2015
Effect of **Hatcher Temperature** on hatchability and **Broiler Performance**

<table>
<thead>
<tr>
<th>Eggshell Temperature E19 – hatch (°F)</th>
<th>99.1 - 100.4</th>
<th>101.1 - 102.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW (d) 42, 9</td>
<td>2710&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2524&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>FCR (d) 1-42</td>
<td>1.78&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.13&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mortality (d) 1-42, %</td>
<td>2.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>13.3&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ascites mortality (d) 1-42, %</td>
<td>2.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12.9&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Sözcü and Ipek, 2015
**HOW TO... Measure Eggshell Temperature**

**WHY MEASURE EGGSHELL TEMPERATURE?**
- Correct setter temperature is critical for hatching good quality chicks.
- Setter temperature is what is experienced by the embryo inside the egg, it is not the air temperature of the setter.
- Eggshell surface temperature is closely related to internal egg temperature (see graph below). It is therefore a useful tool for determining whether or not setter temperature is correct.
- Shell temperature can be easily measured using a medical infrared thermometer.

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**HOW TO... Measure Chick Yield**

**WHY MEASURE CHICK YIELD?**
- Chick yield (the weight of the chick at hatch as a percentage of egg setting weight) is a simple method of checking whether hatch timing and medium parameters are correct.
- Chicks with a low yield have either been:
  1. Hatched for a long time before they were removed from the hatchet or,  
  2. Incubated at a high temperature or a low humidity.
- These chicks are at risk of being dehydrated and perform poorly on the farm.
- Chicks with a high yield have either:
  1. Only just finished hatching when they were removed from the hatchet or,  
  2. Have been incubated at a low temperature or a high humidity.
- If placed on the farm quickly these chicks will not be ready to eat and drink and will tend to be lazy.

**OPTIMUM CHICK YIELD**

- **> 68%**  - High  
  This chick will be lazy and not ready to eat and drink when placed on farm.
- **> 67 - 68%**  - Ideal  
  This chick will be active and ready to eat and drink when placed on farm.
- **> 67%**  - Low  
  This chick will be dehydrated and have little yolk reserve. Often very active and noisy.

**WHY BREAK OUT AND ANALYSE HATCH DEBRIS?**
- It is normal for there to be some embryo mortality during incubation.
- Embryo losses tend to follow a consistent pattern (although it will vary slightly with flock age).
- Some embryo malpositions and abnormalities have known causes and can be the result of specific problems.
- Analysing embryo mortality patterns and abnormalities can help to identify which aspects of the incubation process need closer investigation in order to improve hatchability and chick quality.

Normal Pattern of Embryo Loss During incubation showing peaks in mortality during early and late incubation.
**Before Chick Arrival**
- Provide chicks with biosecure, clean housing.
- Arrange equipment to enable the chicks to access water and food newly upon arrival.
- Feed should be a shaved crumb with no dust.
- Chicks should not have to move more than 1m to find water or feed in the first 24 hours.
- Position supplementary feeders and drinkers near the main feeding and drinking systems.
- Pre-heat the house and stabilise temperature and humidity prior to chick arrival – achieve a floor temperature of 28-30°C.
- Unload and place chicks quickly.
- Ensure feed and water is available immediately.
- Light intensity should be >20 lux to stimulate chick activity.
- Allow chicks to settle for 1-2 hours then check behaviour.

**Chick Arrival**

**Environmental Targets**
- Chick placement targets:
  - Air temperature of 35°C (at chick height)
  - Light temperature of 30-35°C
  - Relative humidity of 60% - 70%
- Use chick behaviour to determine if temperature is correct.
- Ventilation (without draughts) is required to provide fresh air and remove waste gas, excess moisture, and heat.
- Chicks are susceptible to wind chill effects, therefore the air speed should be less than 0.15 m/s.

**Measures of Success**
- Chick crop fill:
  - When chicks start to feed, they tend to eat a good meal. If chicks are feeding and drinking properly the crop fills with a mixture of feed and water. Gentle handling within the first 24 hours can indicate the chick’s progress.
  - Check is a sample of chicks 5 hours after arrival to ensure all chickens have found feed and water.
  - Gently sample the crops of 35-40 chicks from 3 or 4 different places in the house.

  **Chick crop fill assessment:**
<table>
<thead>
<tr>
<th>Time of crop fill check after placement</th>
<th>Target crop fill (as % of chicks with full crop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hours</td>
<td>75%</td>
</tr>
<tr>
<td>12 hours</td>
<td>&gt;85%</td>
</tr>
<tr>
<td>24 hours</td>
<td>&gt;95%</td>
</tr>
</tbody>
</table>

May 2009
BROODING

“Building THE Wall Of Protection”

“GUT INTEGRITY”

“IMMUNE COMPETENCE”
Get the chicks pulled, processed, delivered & fed as quickly as possible
REMEMBER

• WHEN CHICKS ARE PLACED THE HEART AND LUNGS ARE FUNCTIONING
• WHAT IS NOT WORKING IS THE: GUT!
Get Chicks Fed!
The First 168 Hours: Feeding Modern Broilers
Feeding chicks within 6 hours

- increase the rate at which yolk is utilised
- improve crypt formation and villus growth to increase food absorption
- increase immune system
- improve growth to marketing age and breast meat by up to 10%
Early feeding and the immune system

• The delay on water and feed consumption promotes depression on immune response (Casteel et al 1994)

• Functional maturity of the gut is linked to the maturation of the local immune system (Bar-Shira, Israel Journal of Veterinary Medicine Volume 60 (2) 2005)
SEE THE DIFFERENCE?
Feeding and the Immune system

• Broilers that fasted for 24-48 hours had lower bursa weights and lower bursa / body weight ratio (http://www.novusint.com/Public/Products/OasisNeonatalFeeding.asp)

• Lower bursa weight – lower proliferation of lymphocytes (Dibner et al 1998)
Effect of Fasting for 48 hr on Day 7 Bursa Weight
Management for the Broiler

The Early Brooding Period

➤ Feed – The measure

— 24 hour Cropfill

Should be 95% (??)
How to Use the Infrared Thermometer

• 103°F (39.4°C) – 105°F (40.8°C)
Thanks to CWT
Thank you