


Brooding Temperature and Bird Performance

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Getting chicks off to a good start

- ▶ Brooding temperature
- ▶ Air quality
- ▶ Litter quality
- ▶ Feed
- ▶ Water
- ▶ Light intensity



Cold weather


- ▶ In cold weather what are the two first things typically considered to reduce fuel costs?
 - ▶ Run heaters less
 - ▶ Do not exhaust the hot air



```
POWER mode sensors avg. 79.0  
Set temperature 73.5  
*Sensor 1 80.6 Sensor 4 76.0  
*Sensor 2 78.8 Sensor 5 77.0  
*Sensor 3 77.7 Sensor 6 76.8  
Static Pressure .08
```



Why is house temperature so important?

- ▶ Thermoregulation
 - ▶ Chicks are extremely easily to chill in the first few days




Chicks body temperature

- ▶ Dependent on environmental temperature to maintain body temperature
- ▶ As air temperature decreases, body temperature will decrease



Onset of thermoregulation

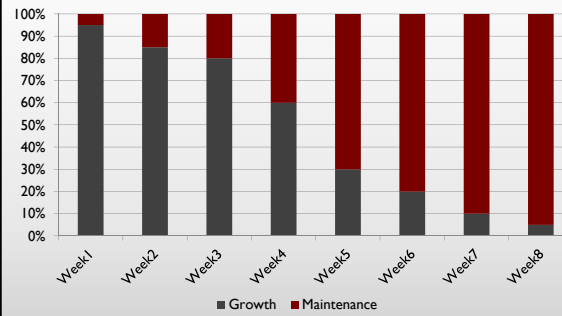
- ▶ Insulation – feathers
- ▶ Body mass
- ▶ Lowers body mass to surface area ratio
- ▶ Increase in thyroid function
 - ▶ T3



When is broiler feed conversion most efficient?



Feed energy distribution



If Birds are not exposed to stressors

Why is house temperature so important?



Advances in broiler growth

ACRBC (1957) with 2001 diet



Ross 308 (2001) with 2001 diet



Havenstein et al., 2003

When body temperature drops

- ▶ Chicks spend more time huddling
- ▶ Immune system impaired
- ▶ Digestive system less efficient
- ▶ Increases breakdown of carbohydrate and lipid reserves
- ▶ Impairs growth



Temperature sensitivity

- ▶ Broiler housing has to be dynamic
 - ▶ Young chicks are sensitive to cold
 - ▶ Older birds are sensitive to heat

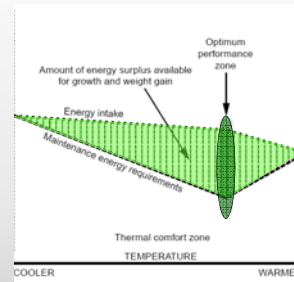


Performance

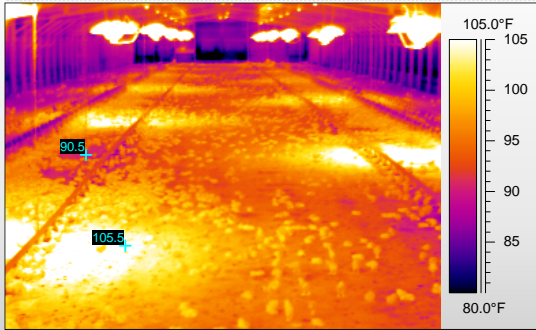
- ▶ Optimum performance can not be achieved if the proper brooding temperature can not be maintained.



Thermal comfort zone & performance



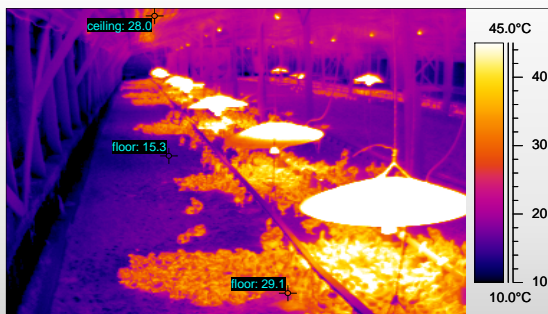
Chicks will find their comfort zone



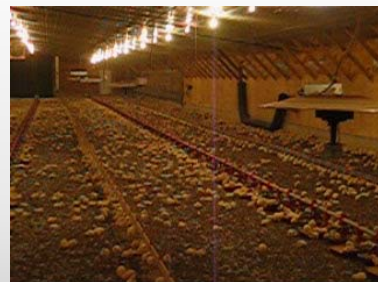
Whether it be closer to the brooder



Cool and drafty conditions



Or further away



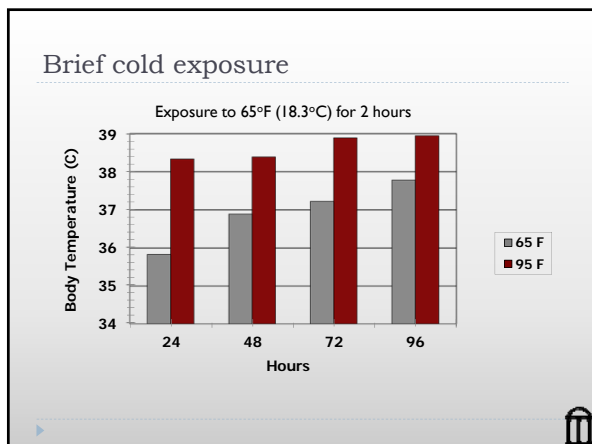
What is meant by brooding temperature?

Air temperature? or Floor temperature?

Brooding temperatures

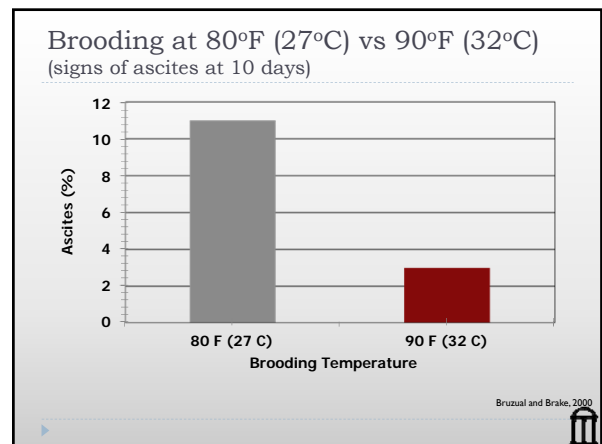
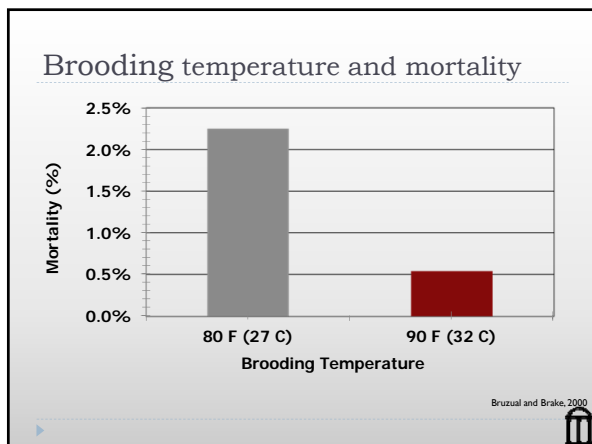
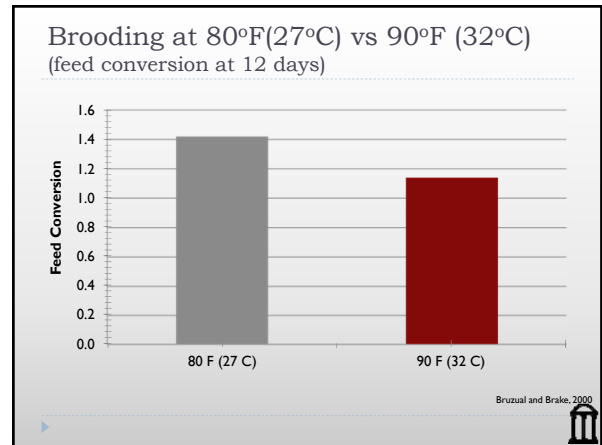
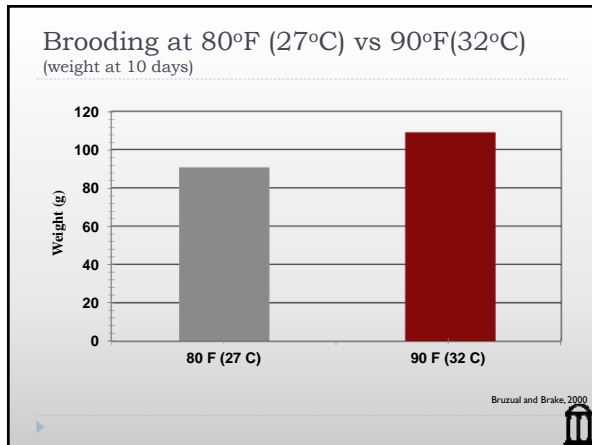
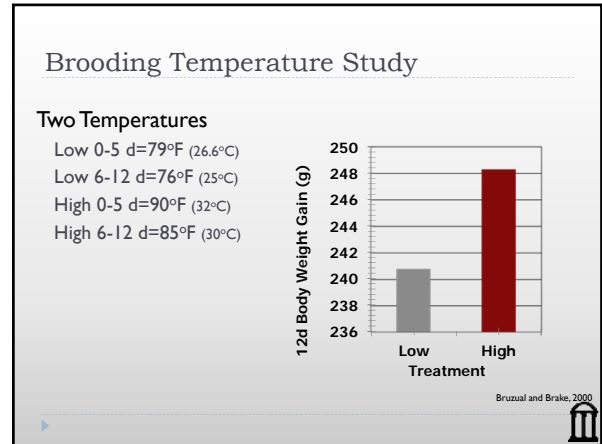
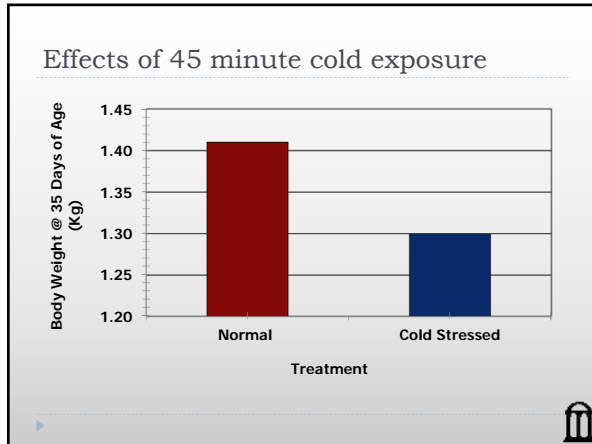
Brooding temperatures

Performance When Temperatures are Too Low?

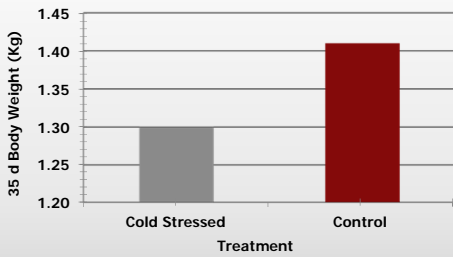


Long term effects of cold temperature

- Chicks exposed to 55°F (12.8°C) for 45 minutes were compared to chicks at normal brooding temperatures.
- Birds were grown at normal temps for the remainder of the grow-out



Birds never catch up



Bruzual and Brake, 2000

Optimum brooding temperatures?

- ▶ High gas prices in the 70's many people lowered brooding temperatures
- ▶ Later work implicated low brooding temps in ascites

Brooding temperature study

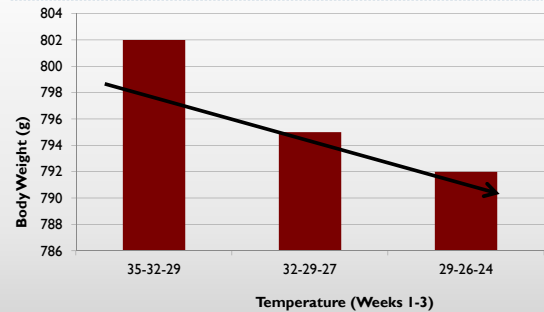
▶ Treatments

Week 1

- 95°F (35.0°C)
- 90°F (32.2°C)
- 85°F (29.4°C)
- 80°F (26.7°C)

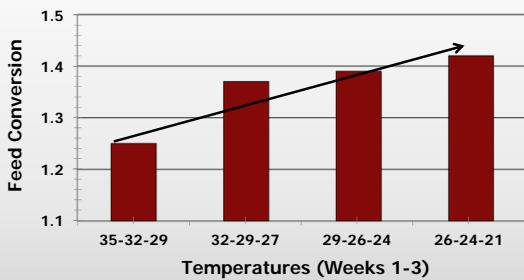
Deaton et al., 1996

Body weights (21 d)



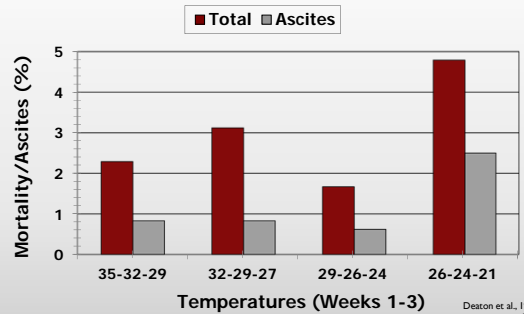
Deaton et al., 1996

Feed conversion (21 d)



Deaton et al., 1996

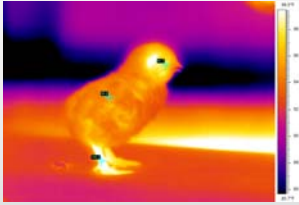
Mortality and ascites (42 d)



Deaton et al., 1996

What affects chick body temperature

- ▶ Air temperature
- ▶ Floor temperature
- ▶ Feed consumption
- ▶ Bird density
- ▶ And
- ▶ Relative humidity (RH)



104°F (40°C)

Target temperatures

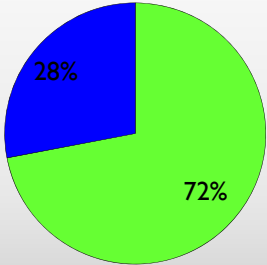
Age	Temperature
Day old	30°C
3	28°C
6	27°C
9	26°C
12	25°C
15	24°C
18	23°C
21	22°C
24	21°C
27	20°C

@ a specific Rh!

Target temperature /Rh

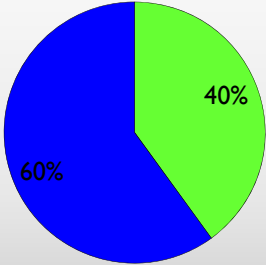
Age	Temperature	Rh
Day old	30°C	50 – 70% Rh
3	28°C	50 – 70% Rh
6	27°C	50 – 70% Rh
9	26°C	50 – 70% Rh
12	25°C	50 – 70% Rh
15	24°C	50 – 70% Rh
18	23°C	50 – 70% Rh
21	22°C	50 – 70% Rh
24	21°C	50 – 70% Rh
27	20°C	50 – 70% Rh

Human heat loss



72% air
28% evaporation


Poultry heat loss



60% evaporation
40% air

How Rh affects effective temperature

- ▶ For a 2.2 Kg broiler (at 25°C) increasing the relative humidity from 50 to 70% feels roughly the same as increasing the air temperature 5°C (30°C).



Humidity is equally important to birds



Effective temperature for day-old chicks

Is 30°C, 60% Rh = 30°C, 20% Rh?



Target temperature as a function of Rh

Age	Temperature	Dry Bulb Temperature at Rh%				
		40%	50%	60%	70%	80%
1	30°C	36	33.2	30.8	29.2	27
3	28°C	33.7	31.2	28.8	27.3	26
6	27°C	32.5	29.9	27.7	26	24
9	26°C	31.3	28.6	26.7	25	23
12	25°C	30.2	27.8	25.7	24	23

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12	25°C	30.2	27.8	25.7	24	23

Relative humidity & body temperature

- ▶ At hatch the chick environment is
 - Temperature 95°F (35°C)
 - RH 80 %



Relative humidity and body temperature

- ▶ Poultry House Brooding
 - ▶ Effective Temperature
 - ▶ Temperature 90°F (32°C)
 - ▶ RH 25%
- ▶ Chicks will be colder



Factors that affect broiler chick temperature

- ▶ Floor moisture content
 - ▶ Damp or wet bedding material will chill chicks



Chilled chick symptoms

- ▶ Pile under brooders
- ▶ Huddle in feeder pans and trays
- ▶ Increased mortality
- ▶ Reduced growth rates
- ▶ Poor uniformity
- ▶ Increased incidence of Ascites
- ▶ Fecal droppings wet
- ▶ Pasty vents



Brooding temperature

- ▶ Low brooding temperatures
 - ▶ Less movement
 - ▶ Reduce body weight gains
 - ▶ Increased feed consumption
 - ▶ Poor feed conversion



Low brooding temperatures = problems later

- ▶ Metabolic Disorders
 - ▶ Ascites
 - ▶ Sudden Death Syndrome (flip over)
 - ▶ Leg problems
- ▶ Bacterial Diseases
 - ▶ Gangrenous Dermatitis
 - ▶ E. Coli
 - ▶ Salmonella
 - ▶ I.P

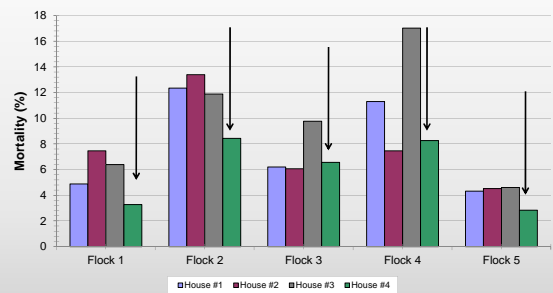


UGA field study (Foam insulation)

- ▶ Four house farm
- ▶ Houses ~ 14 years old
- ▶ Renovated
- ▶ Foam used to totally enclose one house



Good environment = less stress



Keeping birds warm with propane & feed



What is the correct temperature?

- ▶ Watch the birds and let their behavior guide you



Summary

- ▶ Birds more sensitive to relative humidity
- ▶ Floor temperature during brooding important
- ▶ Proper house temperature is key to getting full genetic potential from broilers
 - ▶ Critical to good feed conversion



poultryventilation.com