University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service
4-H Youth Development

CHICK EMBRYOLOGY – LESSON 12

Time Needed

- Flexible depending on the age of the students and level of discussion: 10-60 minutes

Skill/Grade Level

- Can be adapted for K-12 students

Core Area

- Agriculture
- Animal production
- Family and Consumer Sciences

Life Skills

- Participation in group discussion
- Sharing experiences and ideas

Educational Standards

- AA-2: Participate in conversation, discussion and group presentations
- AD-1: Perform basic and higher-level math operations
- AD-2: Solve problems using measurement skills

Objectives/Outcomes

- The students will get to pull the chicks out of the incubator and place them in the brooder.
- The students will get to open the unhatched eggs and see why they didn't hatch and try to troubleshoot the problem.
- The students will learn to calculate percent fertility and percent hatchability.

Introduction to Content

It is important to look at the overall hatchability. This is calculated using the equation below:

$$\% \text{ Hatchability} = \frac{\text{\# of chicks hatched}}{\text{\# of total eggs set}} \times 100$$

If you have a poor overall hatch, there could be two reasons. The first is poor fertility in the breeder flock. The second is a problem with the hatch itself. It is typically a good practice to open any eggs removed during candling sessions as well as any unhatched eggs when the chicks are pulled. The eggs are then evaluated for fertility, early embryo development, and stage of death. This information can be helpful in troubleshooting the hatch.

Percent fertility is the percentage of fertile eggs of all eggs produced. It is calculated by the equation below:

$$\% \text{ Fertility} = \frac{\text{\# of fertile eggs}}{\text{\# of total eggs set}} \times 100$$

Percent hatch of fertile is the percentage of fertile eggs which hatch out as live young. It is calculated by the equation below:

$$\% \text{ Hatch of fertile} = \frac{\text{\# of eggs which hatch out}}{\text{\# of fertile eggs}} \times 100$$

Materials needed

- Worksheets
- Data from candling days
- Calculator
- Pencils
- Troubleshooting table

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Share/Process/Generalize (Reflect)

Share: What did you learn?

Process: What part of the activity taught you the most?

Generalize: What was the most important thing you learned?

Authors

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EVALUATE HATCH

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HATCH EVALUATION:

EGGS SET	PULLED EGGS DURING CANDLING		CHICKS
	INFERTILE	DEAD EMBRYOS	

Percent hatchability is the percent of eggs set that hatch as viable chicks.

$$\% \text{ Hatchability} = \frac{\text{\# of chicks hatched}}{\text{\# of total eggs set}} \times 100$$

Percent fertility is the percentage of fertile eggs of all eggs produced.

$$\% \text{ Fertility} = \frac{\text{\# of fertile eggs}}{\text{\# of total eggs produced or set}} = \frac{\text{\# of eggs set} - \text{\# of infertile eggs}}{\text{\# of eggs set}}$$

Percent hatch of fertile eggs is the percentage of fertile eggs which hatch out as live young.

$$\% \text{ Hatchability} = \frac{\text{\# of eggs which hatch out}}{\text{\# of fertile eggs}} = \frac{\text{\# of chicks}}{\text{\# of eggs set - \# of infertile eggs}}$$

TROUBLESHOOTING HATCH

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PROBLEM	POSSIBLE CAUSES
Eggs exploding	• Dirty eggs from nest • Improperly cleaned eggs • Water condensation on eggs • Water sprayed on eggs • Contaminated from earlier exploders • Contaminations form handling with dirty hands
No embryonic development	• Infertile eggs • Rough handling of eggs • Incubation temperature too high • Incubation temperature too low
Blood ring	• Old eggs • Incubation temperature too high • Incubation temperature too low
Dead embryos, second week	• Incubation temperature too high • Incubation temperature too low • Electric power failure • Eggs not turned
Air cell too small	• Large eggs • Humidity too high days 1-19
Air cell too large	• Small eggs • Humidity too low days 1-19
Chicks hatch early	• Small eggs • Temperature too high
Chicks hatch late	• Large eggs • Old breeding stock or inbreeding • Eggs stored too long • Temperature too low
Chicks dead after pipping shell	• Eggs not turned first two weeks • Thin-shelled eggs • Incorrect temperature days 1-19 • Temperature too high days 1-19 • Humidity too high days 1-19 • Humidity too low days 19-21
Malformed legs and toes	• Improper temperature days 1-21 • Improper humidity days 1-21
Slow, drawn out hatch	• Mix of eggs (different sizes, different aged breeding stock, different storage times) • Poor egg handling • Hot or cold spots in the incubator • Incubator or hatcher temperature too high or too low
Sticky chicks smeared with albumen at hatch	• Low incubation temperature • High incubation humidity • Poor egg turning • Eggs stored too long • Very large eggs

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PROBLEM	POSSIBLE CAUSES
Sticky chicks smeared with albumen at hatch	• Low incubation temperature • High incubation humidity • Poor egg turning • Eggs stored too long • Very large eggs
Chicks stuck in shell; dry shell fragment stuck to feathers	• Low humidity in storage • Poor egg turning • Cracked shell or poor shell quality
Small chicks	• Small eggs • Low humidity • High incubation temperature • High altitude • Thin, porous shells
Unhealed naval, dry, rough down feathers	• High incubator temperature or temperature fluctuation • Humidity too high when hatching • Inadequate nutrition
Weak chicks	• High hatching temperature • Poor hatcher ventilation • Contamination
Chicks mal-positioned	• Eggs sat small end up position • Inadequate turning • Excessive turning at late stages • Too high or too low temperature • High humidity • Old breeders • Round shaped eggs • Nutritional deficiencies • Retarded development • Poor egg handling or storage conditions
Malformations	• Poor storage conditions • Jarring of eggs • Nutritional deficiencies • Inadequate turning • High or low temperature • Inadequate ventilation
Crooked toes, bent legs	• High or low temperature • Poor nutrition (especially vitamin B)
Short down, wiry down	• Nutritional deficiencies (especially riboflavin) • High incubation temperature
Eyes closed, down stuck to eyes	• Temperature too high in hatcher • Chicks remain in hatcher too long after hatching • Excessive air movement
Dwarf embryos, runts in growing chicks	• Egg contaminations • Breeder diseases • Nutritional deficiencies
Hemorrhage	• Incubator or hatcher temperature too high • Rough handling of eggs at transfer • Nutritional deficiencies (vitamin K or E) • Contamination

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PROBLEM	POSSIBLE CAUSES
Hemorrhage	• Incubator or hatcher temperature too high • Rough handling of eggs at transfer • Nutritional deficiencies (vitamin K or E) • Contamination
Swollen head or back of neck	• Nutritional deficiencies
Small air cell, egg weight loss under 10%	• High humidity • Very thick shells • Low temperature
Exposed brain	• High incubation temperature • Low oxygen levels