Lesson # 7

Turkey Production

Core Area: Animal Science

Unit: Poultry Industry

Lesson # 7: Turkey Production

National Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards:

AS.01.01 Evaluate the development and implications of animal origin, domestication and distribution.
AS.03.01 Prescribe and implement a prevention and treatment program for animal diseases, parasites and other disorders.
AS.05.03 Apply scientific principles in the selection and breeding of animals.
AS.07.01 Design animal housing, equipment and handling facilities for the major systems of animal production.
FPP.01.01 Evaluate the significance and implications of changes and trends in the food products and processing industry.
FPP.03.01 Apply principles of science to food processing to provide a safe, wholesome and nutritious food supply.
FPP.04.01 Utilize harvesting, selection and inspection techniques to obtain quality food products for processing.
FPP.04.03 Process, preserve, package and present food and food products for sale and distribution.
**Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

1. Students will be able to describe the production and consumption of turkey in the United States.
2. Students will be able to describe the breeding process of turkey production as well as describe why natural breeding cannot be used.
3. Students will be able to list the six key factors in incubation and describe the importance of each.
4. Students will be able to compare and contrast the breeding and market pathways of turkey production.

**List of Resources.** The following resources may be useful in teaching this lesson:


**List of Equipment, Tools, Supplies, and Facilities.**

- Computer and Data Projector
- Internet Connection
- Power Point Presentation
- Copies of Student Handouts
- Copies of Student Worksheets

**Terms.** The following terms are presented in this lesson (shown in bold italics):

- Artificial Insemination
- By-product
- Consumption
- Hatchability
- Humidity
- Incubation
- Shell Tooth
- Molt

**Interest Approach.** Use an interest approach that will prepare the students for the lesson.

*With the guidance from the instructor have students discuss the traditions of the Thanksgiving holiday. Discuss what is typically eaten on this holiday. Once turkey arrives as a common food, ask students if they have ever thought of how a Thanksgiving turkey gets to their table. Then introduce the objectives of this lesson.*
SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Students will be able to describe the production and consumption of turkey in the United States.

Anticipated Problem: What U.S. states produce the most turkey? How much turkey does the average American consume each year?

(Distribute Turkey Production Student Note Sheet, refer to PowerPoint slides 2-4)

I. U.S. Turkey Production
   a. Turkeys produced in 2008
      i. 273 million turkeys
      ii. 7.9 billion pounds
   b. 2008 Top States by number produced
      i. Minnesota 48 million
      ii. North Carolina 40 million
      iii. Arkansas 31 million
      iv. Missouri 21 million
      v. Virginia 18 million
      vi. California 16 million

II. Turkey consumed in U.S.
   a. U.S. 17.6 lbs per person
   b. 29% of turkeys produced consumed during holidays.

III. Worldwide turkey consumption (2008)
   a. Israel 28 lbs per person
   b. US 17.6 lbs
   c. Europe 8 lbs
   d. Russia 1.5 lbs

IV. Uses for turkey
   a. Meat
      i. Bacon, lunch meat, ground meat, hot dogs, fillets, drumsticks.
      ii. Whole birds
   b. By-products
      i. Feathers ground into animal feed.
      ii. Quill fibers used in nylon and yarn.
      iii. Grow-out house litter used as fuel source in electric power plants, fertilizer, and mulches.
Activity/Teacher Notes: Using graph paper or computers, have students create graphs illustrating the top U.S. states in turkey production. Students should utilize the information presented in the class for their graphs. After completing graphs, the instructor may pose questions to students to guide them in analyzing the data presented in their graph. For example, what can be concluded about the location of the top turkey production states? Why might these states lead the nation in turkey production?

Objective 2: Students will be able to describe the breeding process of turkey production as well as describe why natural breeding cannot be used.

Anticipated Problem: What are the desired traits when selecting turkeys? Why are turkeys artificially inseminated?

(Continue with Turkey Breeding Process Student Note Sheet, refer to PowerPoint slides 5-6)

I. Selecting
   a. Male turkeys selected for meat traits:
      i. Thicker thighs (no selection for thighs, this comes along with the selection for larger animals).
      ii. Plumper breast (higher % per carcass).
      iii. Meatier drumsticks (higher % per carcass).
      iv. Faster rate of growth.
      v. Improved feed efficiency.
   b. Female turkeys selected for:
      i. Fertility
      ii. Hatchability
      iii. Egg size
      iv. Meat conformation. This is part of the primary breeders selection criteria for Pedigree Stock.

II. Method of Breeding
   a. Artificial Insemination
      i. Due to the large breasts and mature size of males or toms, they cannot breed naturally.
      ii. Semen of 1 male or tom is collected for every 10 Hens inseminated.

Activity/Teacher Notes: Discuss with students how selective breeding of turkeys has caused the birds to grow so large that they can no longer mate naturally. Producers have had to adapt to artificially breeding all their turkey hens. The semen is collected from the male or tom and then moved into the hen house where it is immediately put into a hen. To view a video of semen collection and hen insemination, refer to an episode of the show Dirty Jobs on youtube.com.

Collecting toms: http://www.youtube.com/watch?v=qgf6h588v-I
Inseminating hens: http://www.youtube.com/watch?v=lhGGvcotHCh
Objective 3: Students will be able to list the six key factors in incubation and describe the importance of each.

Anticipated Problem: What are the six key factors to consider when incubating turkey eggs?

(Continue with Turkey Key Factors for Incubation Student Note Sheet, refer to PowerPoint slides 7-11)

I. Incubation
   a. An incubator is a box that holds and rotates eggs while maintaining appropriate temperature, humidity, and oxygen levels.
   b. Turkey eggs are incubated for 28 days.
   c. Incubators are monitored continually to ensure optimum environment is maintained.

II. Six Keys to Incubation
   a. Temperature (most critical)
      i. 99.5°F to 100°F
      ii. Inadequate temperature will lead to deformed poults (immature turkeys) and embryonic death.
   b. Humidity
      i. 60% to 65%
      ii. Improper humidity effects the development of the shell and the poults ability to break it.
   c. Position of eggs
      i. Extremely important, if placed incorrectly, poult will not be able to break the shell and hatch out.
      ii. Large end of egg should be facing up or horizontal.
      iii. Never with small end up, as poult will die.
   d. Turning of eggs
      i. Eggs must be turned periodically or poult embryos will become stuck to shell membrane.
      ii. Should be turned at least 5 times per day.
   e. Oxygen and Carbon Dioxide Content
      i. 21% Oxygen
         1. The closer to hatching, the more oxygen is needed.
      ii. .5% Carbon Dioxide; once CO₂ reaches 2%, embryos begin to die.
   f. Sanitation
      i. Must be kept disease free or new poults will contract disease.

III. Hatching
   a. Few days before (day 25), hatching eggs are moved from incubator to hatcher unit.
b. The eggs are removed from the egg trays and placed into hatcher baskets. The hatcher basket provides a solid flat surface for the poults as they come out of the shell.

c. Hatcher has increased humidity to assist in hatching process.

d. The tip of the poults’ beak, known as the **shell tooth**, will peck away at the inside of the eggshell until the shell is broken enough to push the shell apart.

e. Hatching usually takes 10 to 20 hours

**Activity/Teacher Notes:** Discuss with students how these six key factors are essential to the successful incubation of a turkey poult. To view a video of a poult breaking out of an egg, following this link on Youtube: [http://www.youtube.com/watch?v=JE532LGEeTU](http://www.youtube.com/watch?v=JE532LGEeTU)

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**Objective 4:** Students will be able to compare and contrast the breeding and market pathways of turkey production.

**Anticipated Problem:** What are the two different paths turkey take through the production cycle?

(*Continue with Turkey Production Pathways Student Note Sheet, refer to PowerPoint slides 12-15*)

I. Turkeys follow one of two commercial paths – breeders or market birds.
   a. Breeders
      i. Reach sexual maturity at 30 weeks old.
      ii. Capable of 25 week laying cycle.
         1. Lay 95-100 eggs, then they are “spent”.
         2. Usually after laying cycle, hens are harvested for meat.
         3. Hens can be molted and go through a second laying cycle
            a. Molting takes 3 months.
            b. Hens can then have another 25 week laying cycle.
            c. Produce fewer eggs in second cycle (75-80 eggs).
      iii. Turkey eggs are not used for human **consumption** as they are more expensive.
   iv. Breeder turkeys are generally reared in floor houses.
      1. These are open buildings with wood shavings covering the floor.
         a. Clean nesting boxes are provided for hens to lay their eggs.
   v. Feeding
      1. Must be limited as turkeys will eat until the food is gone (this applies only to turkey breeder males).
      2. Limited amounts – turkeys given a specific amount each day (this applies only to turkey breeder males).
b. Market (Commercial) Birds
   i. Toms marketed at 17 and 20 weeks of age.
      1. Weigh 26.4 to 32.3 pounds
   ii. Hens marketed at 14-16 weeks of age.
      1. Weigh 14.7 to 17.5 pounds
   iii. Free fed to allow faster weight gain.

c. Two types of housing
   i. Conventional (enclosed) housing
      1. Windowless houses with environmental control.
   ii. Pole barn
      1. Long houses with open sides, can be closed off with curtains.
   iii. Birds are provided at least 1 to 2 sq. ft. per bird.
   iv. Feeding and water systems are computer controlled on most modern facilities.

**Activity/Teacher Notes:** Discuss with students advantages of using conventional or a pole barn for turkey housing. Which would be best for climate control and which is the most inexpensive system? To view virtual tour of a conventional turkey house, follow this link to the California Poultry Federation virtual tour web site: [http://www.cpif.org/Virtual%20Tour/cpfvr.html](http://www.cpif.org/Virtual%20Tour/cpfvr.html)

**Review/Summary.** Focus the review of the lesson around the student learning objectives. Ask students to explain the content associated with each objective. Use their responses as the basis for determining any areas that need to be covered again.

**Application.** Recommend instructor refer to “Turkey Reproduction” lesson and the Teacher Resource – Hatching Eggs, which contains tips and instructions for incubating eggs. Consider incubating eggs in class so that students can monitor the six key factors needed for incubation. Students can collect data throughout the incubation period and analyze their data once incubation period ends.

**Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as a written test. A sample test is attached.
Answers to Sample Test:

Part One: Matching

<table>
<thead>
<tr>
<th>G</th>
<th>1. Artificial insemination</th>
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<tbody>
<tr>
<td>H</td>
<td>2. By-product</td>
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<tr>
<td>F</td>
<td>3. Consumption</td>
</tr>
<tr>
<td>E</td>
<td>4. Hatchability</td>
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<tr>
<td>A</td>
<td>5. Humidity</td>
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<tr>
<td>B</td>
<td>6. Incubation</td>
</tr>
<tr>
<td>C</td>
<td>7. Shell Tooth</td>
</tr>
<tr>
<td>D</td>
<td>8. Molt</td>
</tr>
</tbody>
</table>

Part Two: T / F

1. T 10. T
2. T 11. T
3. F 12. F
4. T 13. T
5. T 14. T
6. F 15. T
7. T 16. F
8. T
9. F

Part Three: Incubation Keys

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Humidity</th>
<th>Egg Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitation</td>
<td>Egg Turning</td>
<td>Oxygen/Carbon Dioxide</td>
</tr>
</tbody>
</table>
Turkey Production Student Note Sheet

• U.S. Turkey Production
  o Turkeys produced in 2008
    ▪ _______ million turkeys
    ▪ _______ billion pounds
  o 2008 Top States by ____________ ____________
    ▪ ____________ 48 million
    ▪ North Carolina ___ million
    ▪ Arkansas 31 million
    ▪ ____________ 21 million
    ▪ Virginia ___ million
    ▪ ____________ 16 million

• U.S. Turkey Consumption.
  o U.S. ______ lbs per person
  o _____% of turkeys produced consumed during holidays.

• Worldwide turkey consumption (2008)
  o ____________ 28 lbs per person
  o US _____ lbs
  o ____________ 8 lbs
  o Russia _____ lbs

• Uses for turkey
  o __________________
    ▪ Bacon, lunch meat, ground meat, hot dogs.
    ▪ ____________ birds
  o ______ Products
    ▪ Feathers ground into ________________ animal feed.
    ▪ Quill fibers used in ________ and ________
    ▪ House litter used as ________ ____________ in electric power plants.
Turkey Breeding Process Student Note Sheet

- Selecting
  - _________ turkeys selected for meat traits:
    - _________ thighs
    - Plumper breast
    - Meatier _________
    - _________ rate of growth
    - Higher _________ efficiency
  - _________ turkeys selected for:
    - _________
    - Hatchability
    - Egg _________
    - _________ conformation

- Method of _________
  - Artificial __________________
    - Due to the _________ breasts and mature size of ______ they cannot breed naturally.
    - Semen of ____ tom collected for every _____ hens inseminated.
Key Factors for Incubation Student Note Sheet

- Incubation
  - An ____________ is a box that holds and rotates eggs while maintaining appropriate temperature, humidity and oxygen levels.
  - Turkey eggs are incubated for ____ days.
  - Incubators are monitored continually to ensure optimum ______________ is maintained.

- 6 Keys to ______________
  - _______________ (most critical)
    - 99.5°F to ______ °F
    - Inadequate temperature will lead to ______ poults and embryonic death.
  - _______________
    - 60% to ______% 
    - Improper humidity effects the development of the _____ and the _______ ability to break it.
  - Position of ________
    - Extremely important, if placed incorrectly chick will not be able to ______ the shell and hatch out.
    - _________ end of egg should be facing up or horizontal.
    - Never with small end up, as chick will _______.
  - ___________ of eggs
    - Eggs must be turned periodically or chicks will become _______ to shell membrane.
    - Should be turned at least ___ times per day.
  - __________ & Carbon Dioxide Content
    - _____ % oxygen
      - The closer to hatching, the more oxygen is needed.
      - .5% Carbon Dioxide; once CO₂ reaches ____% embryos begin to die.
  - Sanitation
    - Must be kept _________ free or new chicks will contract.

- Hatching
  - ____ days before hatching eggs are moved from incubator to hatcher unit.
  - Hatcher has increased ______________ to assist in hatching process.
  - The tip of the chick's beak, known as the ______ ________, will peck away at the inside of the eggshell until the shell is broken enough to push the shell apart.
  - Hatching usually takes 10 to ______ hours.
Turkey Production Pathways Student Note Sheet

- Turkeys follow one of two commercial paths – breeders or market birds.
  - Reach sexual maturity at _____ weeks old
  - Capable of 25 week ________ cycle
    - Lay ____________ eggs, then they are “spent”.
    - Usually after laying cycle hens are ____________ for meat.
    - Hens can be ____________ and go through a second laying cycle.
      - Molting takes ______ months
      - Hens can then have another ______ week laying cycle.
      - Produce ____________ eggs in second cycle (75-80 eggs).
  - Turkey eggs are not used for _______ consumption as they cost too much.
    - $ _________ more than chicken eggs
  - Unlike chickens, breeder turkeys are generally reared in ________ houses.
    - These are open buildings with ________ shavings covering the floor.
      - Clean, ____________ boxes are provided for hens to lay their eggs.
  - ________
    - Must be ____________ as turkeys will eat until the food is gone.
    - Limited amounts- turkeys given a ____________ amount each day.
    - ________ other day – turkeys given food every other day.

- _______________ Birds
  - Toms _______________ at 17 and 20 weeks of age
    - Weigh 26.4 to _________ lbs
  - Hens marketed at ________ weeks of age
    - ____________ 14.7 to 17.5 pounds
  - Free fed to allow ____________ weight gain
  - Fed high ____________ feed for muscle development

- Two types of ________________
  - ________________ (enclosed) housing
    - Windowless houses with ________________ control.
  - Pole ________________
    - Long houses with ________ sides, can be closed off with curtains.
  - Birds are provided at least _____ to _____ sq. ft per bird.
  - Feeding and water systems are ________________ controlled.