Lesson # 7

Turkey Production

Core Area: Animal Science

Unit: Poultry Industry

Lesson # 7: Turkey Production

California CTE Standards (Agriculture):

C1.4 Understand the economic impact of leading California agricultural commodities.
C4.3 Understand the modern-day uses of animals and animal by-products.
D1.1 Understand appropriate space and location requirements for habitat, housing, feed, and water.
D1.2 Understand how to select habitat and housing conditions and materials (such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters) to meet the needs of various animal species.
D4.4 Understand the role of artificial insemination and embryo transfer in animal agriculture.
D10.1 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of large and small animals.
D12.2 Understand the relative importance of the major meat classifications, including the per capita consumption and nutritive value of those classifications.
D12.3 Understand how meat-based products and meals are made.
D12.4 Understand how non-meat products (such as eggs, wool, pelts, hides, and by-products) are harvested and processed.
D12.6 Understand the value of animal by-products to non-agricultural industries.
FS 5.3 Use critical thinking skills to make informed decisions and solve problems.

California Academic Standards

Mathematics (Grade 7)
Statistics, Data Analysis, and Probability
1.0 Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

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:

1. Field, Thomas G., and Robert E. Taylor. Scientific Farm Animal Production: An Introduction to Animal Science. 8th ed. New Jersey: Pearson, 2004.
2. United State Department of Agriculture (USDA) – http://www.usda.gov
3. University of California, Davis Poultry – http://animalscience.ucdavis.edu/avian

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 ruminant animal feed.
      ii. Quill fibers used in nylon and yarn.
      iii. 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 led 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. 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=qqf6h588v-I
Inseminating hens: http://www.youtube.com/watch?v=IhGGvcotHCk

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 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 CO_2 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 poult's 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

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 cost too much.
         1. $ .50 more per egg than chicken eggs.
      iv. Unlike chickens, breeder turkeys are generally reared in litter 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 36.5 to 44.7 pounds
    ii. Hens marketed at 14-16 weeks of age.
        1. Weigh 18.3 to 21.3 pounds
    iii. Free fed to allow faster weight gain.
    iv. Fed high protein feed for breast muscle development.
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

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

G	1. Artificial insemination
H	2. By-product
F	3. Consumption
E	4. Hatchability
A	5. Humidity
B	6. Incubation
C	7. Shell Tooth
D	8. Molt

Part Two: T / F

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

Part Three: Incubation Keys

Temperature	Humidity	Egg Position
Sanitation	Egg Turning	Oxygen/Carbon Dioxide

Turkey Production Student Note Sheet

- U.S. Turkey Production
  - Turkeys produced in 2008
    - _____ million turkeys
    - _____ billion pounds
  - 2008 Top States by _____ _____
    - _____ 48 million
    - North Carolina ___ million
    - Arkansas 31 million
    - _____ 21 million
    - Virginia ___ million
    - _____ 16 million
- U.S. Turkey Consumption.
  - U.S. _____ lbs per person
  - _____% of turkeys produced consumed during holidays.
- Worldwide turkey consumption (2008)
  - _____ 28 lbs per person
  - US _____ lbs
  - _____ 8 lbs
  - Russia _____ lbs
- Uses for turkey
  - _____
    - Bacon, lunch meat, ground meat, hot dogs.
    - _____ birds
  - _____ 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.
    - ____ 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 CO_2 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.