

4-H POULTRY
LEVEL 2 - Layer flock

LEADER'S
GUIDE BOOK

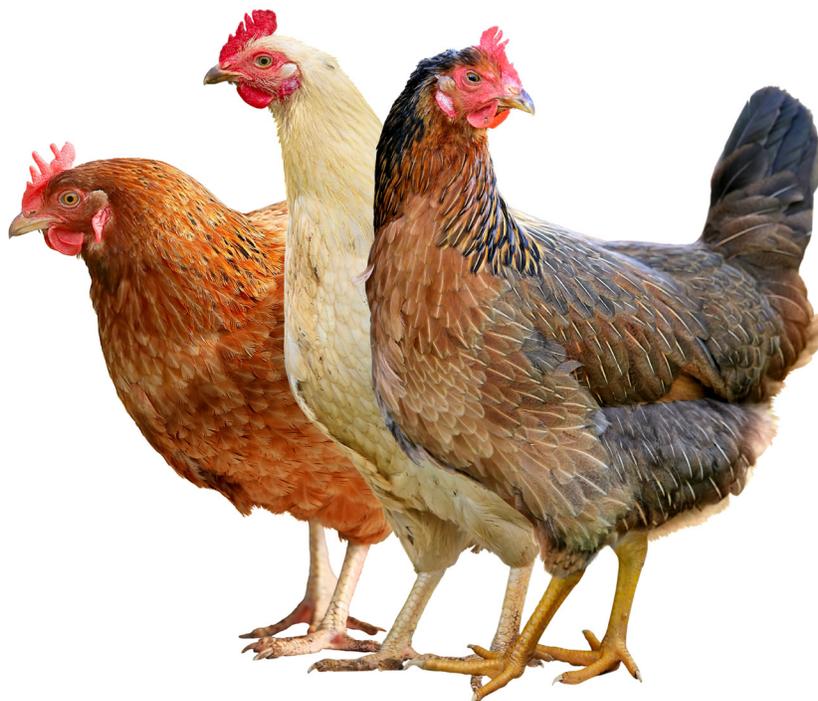
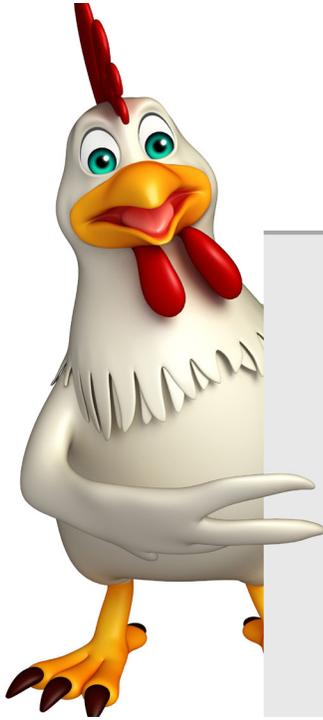


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INTRODUCTION



EGGS ARE:

- » Highly nutritious
- » Versatile
- » Economical
- » Can be included in any meal

Nutrition Facts	
12 servings per container	
Serving size 1 egg (50g)	
Amount per serving	
Calories	70
% Daily Value*	
Total Fat 5g	6%
Saturated Fat 1.5g	8%
Trans Fat 0g	
Cholesterol 185mg	62%
Sodium 70mg	3%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 6g	12%
Vitamin D 1mcg	6%
Calcium 28mg	2%
Iron 1mg	6%
Potassium 69mg	2%

*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

LARGE

The pullets are now full grown and ready to lay. The follow up is the 'Layer Project.' The objectives of this project are for the 4-H members to:

- Appreciate and use scientific information for poultry production and marketing
- Improve knowledge of grading, marketing and merchandizing chicken eggs Improve understanding of the nutritive value of chicken eggs and how they contribute to good health
- Understand the properties of eggs and how they can be used in the kitchen
- Develop techniques for cooking with eggs
- Develop desirable work habits, sportsmanship and ability to work with others and express ideas through participation in projects, discussions, demonstrations, judging teams, and exhibits

The basic factors to consider before starting the project it is important to consider:

- Member's interest(s)
- Home situation
- Available financing
- Market outlets
- Projects will vary with age and ability of 4-H member

MODULE 1

HOW ARE COMMERCIAL EGGS PRODUCED?

Most Americans like to eat eggs. In the United States, the table egg of choice is chicken eggs. In other countries, especially Asian countries like China and the Philippines, duck eggs are preferred. There are not many producers of duck eggs in the United States, and most duck eggs sold are produced by small flock owners.

On average, people eat about 250 eggs each year. That may sound like a lot of eggs for one person to eat, but some of the eggs we consume are found in processed foods like mayonnaise, cake mixes, etc.

The United States produces about 113 billion eggs every year. That takes a lot of hens to produce all those eggs. There are typically over 300 million hens spread around the United States. Most of those hens lay white-shelled eggs. There are other commercial strains of chickens that lay brown-shelled eggs. These are more popular in the New England area.

The discovery of vitamin D made it possible to move chickens indoors. Vitamin D can be added to the feed so that access to direct sunlight is no longer required. The temperature of the room in a poultry house can be kept at a comfortable level so the hens do not get too hot or too cold. In addition, it is easier to protect the chickens from wild animals when they are inside a chicken house.

The number of hours of light in a day stimulates a hen to start producing eggs. When the days start getting longer (that is, more hours of light each day) as happens in the spring and summer, it is a signal to a hen to start laying eggs. As the days start getting shorter (as happens with the fall and winter) the hen will stop laying eggs. If you want to keep a hen laying eggs year-round it is important to give them a constant number of hours of light every day. This is usually 14 hours of light (and 10 hours of dark) each day. If your chickens are running around outside, you need to give them some extra light, either in the morning or at night (or a little of both) to make sure they are getting 14 hours of light every day. Otherwise they may stop laying eggs.



Most of the eggs sold in the grocery stores in the United States are from hens kept in cages. There are large poultry houses with rows of cages that are sometimes incorrectly referred to as 'factory farms.' Keeping hens in cages allows the egg production industry to produce safe and nutritious eggs at low cost.

It is important to understand why industry puts hens in cages. There are many benefits to farmers and consumers by keeping hens in cages.

- Caged hens are kept separate from their poop, which helps to prevent the hens from getting sick
- It is easier to feed large number of hens using automated feeders
- It is easier to examine each hen daily to make sure that they are healthy
- Once the eggs are laid they roll away from the hen, keeping the eggs cleaner and reducing the food safety risk
- The eggs can be collected easier and quicker
- You can put more hens in a chicken house to produce more eggs per square foot of land

The disadvantage of cages is that the hens are unable to perform some of their natural behaviors

such as dustbathing, foraging, perching, and nesting. There are some 'enriched' cages that have been used in Europe that provide a dustbathing, scratching, perching, and nesting areas for the hens. The environment in a cage can be boring for the chickens so that some hens will peck at each other, causing injury for some cage mates.

Some people prefer to buy eggs from hens that are not kept in cages. These can be from hens that are allowed to roam around in a poultry house (called cage-free or free-roaming egg production), or those that are allowed to roam outside (free-range production).

'**Cage-free**' means that the hens are not kept in cages. It does not mean that they are allowed to go outside. They are free to roam inside the poultry house. You can buy cage-free or free-roaming eggs in the grocery store, but they can cost a lot more. This is because they are more expensive to produce. It is also important to make sure that the hens lay eggs in the nests. Eggs laid on the floors can get dirty and become a food safety problem. Commercial eggs from both cage-free or caged hens are equally safe and nutritious.

Cage-free or **free-roaming** does not mean that the chickens are able to go outside. Keeping chickens indoors makes it easier to control diseases that can be spread between flocks. It also keeps the flock away from wild birds which can carry disease. By keeping the chickens inside they are also better able to control the temperature of the chicken house. They can also control the light so that the hens will lay year round.



There is no legal term for **free-range**, but it is generally accepted that free-range chickens have access to the outdoors. Hopefully they also use that outdoor area. There is not indication, however, as to what the condition of that outdoor area has to be. If the chickens have limited access to the area around the poultry house, they will quickly consume all the vegetation and nothing will remain but bare ground. In rainy weather, the ground can easily become mud resulting in dirty feet, which can lead to dirty eggs.

In the photo on the right, the hens do not have a house with walls, so they are outside 24 hours a day. They do have a place they can get under to sleep at night and get away from the weather or hide from aerial predators like hawks and owls. The shelter can be moved to fresh pasture as needed. Predators can be a problem though, since there is no protection from coyotes, raccoons, or other animals that like to eat chickens. It is also important that the hens learn to lay in the nest boxes and the nest boxes are kept clean. Otherwise the eggs will get dirty which can be a food safety problem.



Another term that you may see is '**pasture-raised**'. In this case, the chickens must not only have access to the outdoors, but the outdoor area must contain pastures of some kind. The term '**naturally-raised**' is another term some people have used in the past to label their eggs. The term Naturally Raised is not currently allowed to be on meat and poultry labels because it can be confused with the **Natural** claim. The term "natural" is typically reserved for meat products. The term natural on a meat label, as defined by USDA FSIS, indicates that "the product does not contain artificial flavors, colorings, chemical preservatives or other synthetic ingredients" and that the product and its ingredients are minimally processed. An additional statement must be added to the label that explains this. For example, "no artificial ingredients; minimally processed."

To have eggs '**certified organic**' they must have been produced following the strict regulations set by the National Organics Program (NOP) of the USDA. The chickens must be fed certified organic feed starting from the second day of age, which means the feed ingredients were non-GMO and produced without pesticides, herbicides, fungicides, etc. No animal by-products can be included in the feed. No pesticides can be used on the land or the chickens. The hens cannot be kept in cages and they must have 'access to the outdoors.'

People typically chose to use free-range or cage-free range eggs because they feel that the hens that laid them are happier. They are willing to pay more for eggs produced from 'happy' chickens.

A new animal welfare rating program was developed in Europe for use with the production of animal products. It is referred to as the Global Animal Partnership or GAP. The criteria they set for egg production is as follows:

- Stage 1: Stocking Density 1.5 square feet per hen; Cage free, perches, and dust baths
- Stage 2: One enrichment; Pullets from a GAP-certified source
- Stage 3: Seasonal outdoor access; Complexity of the environment; Two enrichments indoors
- Stage 4: Pasture; No beak trimming
- Stage 5: Live continuously on pasture; Welfare evaluation of keel bone and hen cleanliness
- Stage 5 plus: Use breeds with the ability to lay through multiply cycles (at least two lay cycles) and at the end of lay, the hens are processed on the farm

ACTIVITY 1: Understanding labels on egg cartons

Materials required: A collection of egg cartons with different claims on them: Cage-free, Free-roaming, Free-range, Organic, Vegetarian-fed, No hormones, No antibiotics, etc. It would be good to have current prices for each of the cartons. I have included photographs of some egg cartons for those that do not wish to purchase egg cartons.

Activity. Go through each of the cartons and have the 4-Hers figure out what the labels mean. How do they think the hens that produced the eggs that were in each carton were housed, fed, etc.? Then have them try and figure out which price goes to which egg carton.

REFLECTION

To complete the experiential learning model, discuss these or similar questions with the youth:

Share:

- What did we do in this activity?
- What was the goal of this activity?
- What did you learn from this activity?

Process:

- What attributes did you feel were most important when buying eggs?
- What attributes do you want to be able to give to the eggs you sell?

Generalize:

- What was the most interesting thing you learned from the activity?
- What surprised you the most?

Apply:

- What will be the marketing plan for selling the eggs your hens produce as part of this project?



MODULE 2

CAN CHICKENS SWALLOW?

Animal projects can teach youth life skills, but can also teach them about science at the same time. All aspects of science are important in animal agriculture including anatomy and physiology, biochemistry, chemistry, ethology (study of behavior), virology, bacteriology, endocrinology (study of hormones), and many more scientific fields of study.

The most obvious science they have already used is anatomy. They looked at the external anatomy of chickens in the pullet project activities. Now they are going to start looking at the internal anatomy, and some of the physiology, that is important for the nutrition of the chicken.

The passage of feed through the chicken starts at the beak. The chicken picks up the feed with its beak. An important thing to remember about the mouth of a chicken is that the top of the hard palate is cleft, as shown in the left photograph below.



Top of a chicken's mouth showing the cleft palate



Chick lifting head for water to flow down its throat

LEARNING OBJECTIVES

Clover

- Observe the behavior of how chickens drink

Intermediate

- Understand why chickens need to lift their head to drink

Senior

- Understand why chicken drinking behavior and how that can be used in production systems

KENTUCKY ACADEMIC EXPECTATIONS

LS1.C: Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. (K-LS1-1)

LS1.A: Structure and Function: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.C: Organization for Matter and Energy Flow in Organisms: Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

LS2.A: Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. (5-LS2-1)

LS1.A: Structure and Function: All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (07-LS1-1) Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (07LS1-2) In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (07-LS1-3)

1.12 Students speak using appropriate forms, conventions, and styles to communicate ideas and information to different audiences for different purposes.

2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

TARGETING LIFE SKILLS

<i>Clover</i>	<i>Intermediate</i>	<i>Senior</i>
<ul style="list-style-type: none">• Critical Thinking• Problem Solving• Learning to Learn	<ul style="list-style-type: none">• Critical Thinking• Problem Solving• Learning to Learn• Decision Making	<ul style="list-style-type: none">• Critical Thinking• Decision Making• Communication• Contribution to Group Effort• Teamwork• Leadership

Materials needed: A live chicken

Activity: **Step 1.** Have the 4-Hers compare the top of the mouth of a chicken with the top of their own mouth. What is the difference? The difference will be the cleft palate in the top of the mouth of the chicken.

Step 2. Have the 4-Hers swallow. What is required for them to swallow? The mouth must be closed or they must make a vacuum in their mouth by putting their tongue on the top of their mouth.

Chickens are not able to make that vacuum because of the cleft palate. As a result, chickens are not able to swallow.

Step 3. Have the 4-Hers observe chickens drinking water. Instead, the chicken must lift its head and left gravity take the water down their through.

REFLECTION

To complete the experiential learning model, discuss these or similar questions with the youth:

Share:

- What did we do in this activity?
- What was the goal of this activity?
- What did you learn from this activity?

Process:

- What part of the activity taught you the most?

Generalize:

- What was the most interesting thing you learned from the activity?
- What surprised you the most?

Apply:

- How do nipple drinkers take advantage of the chicken's natural drinking behavior?
- What are the advantages of nipple drinkers?



MODULE 3

CHICKEN DIGESTIVE SYSTEM

Animal projects can teach youth life skills, but can also teach them about science at the same time. All aspects of science are important in animal agriculture including anatomy and physiology, biochemistry, chemistry, ethology (study of behavior), virology, bacteriology, endocrinology (study of hormones), and many more scientific fields of study.

The most obvious science they have already used is anatomy. They looked at the external anatomy of chickens in the pullet project activities. Now they are going to start looking at the internal anatomy, and some of the physiology, that is important for the nutrition of the chicken.

In order to understand what chickens eat, it is important to understand the anatomy and physiology of the digestive tract. A photograph of the digestive tract of a chicken is laid out below. Inside the hen, of course, it would be compact and packed inside the abdomen of the hen.



The chicken's tongue

The passage of feed through the chicken starts at the **beak**. The chicken picks up the feed with its beak. We already learned that chickens cannot swallow, so how does the feed they eat get to the rest of the digestive system? They use the **tongue** to push the feed to the back of the throat. The tongue is forked at the back to help push back the feed consumed. Gravity, together with the muscles of the digestive tract carries the feed down the chicken's throat.

The tube that the feed passes down is called the **esophagus**. There is an outpocket from the esophagus called the crop. Feed that is consumed is stored here. Chickens, like most non-raptor birds, are prey animals. The **crop** allows birds to consume a lot of food and then go to a safe place to digest what they ate. The crop allows them to do that.

important that the body be compact with a low center of gravity. If the feed was stored in the body cavity like we store food in our stomachs, the body couldn't not be compact and it would be difficult for the birds to fly.

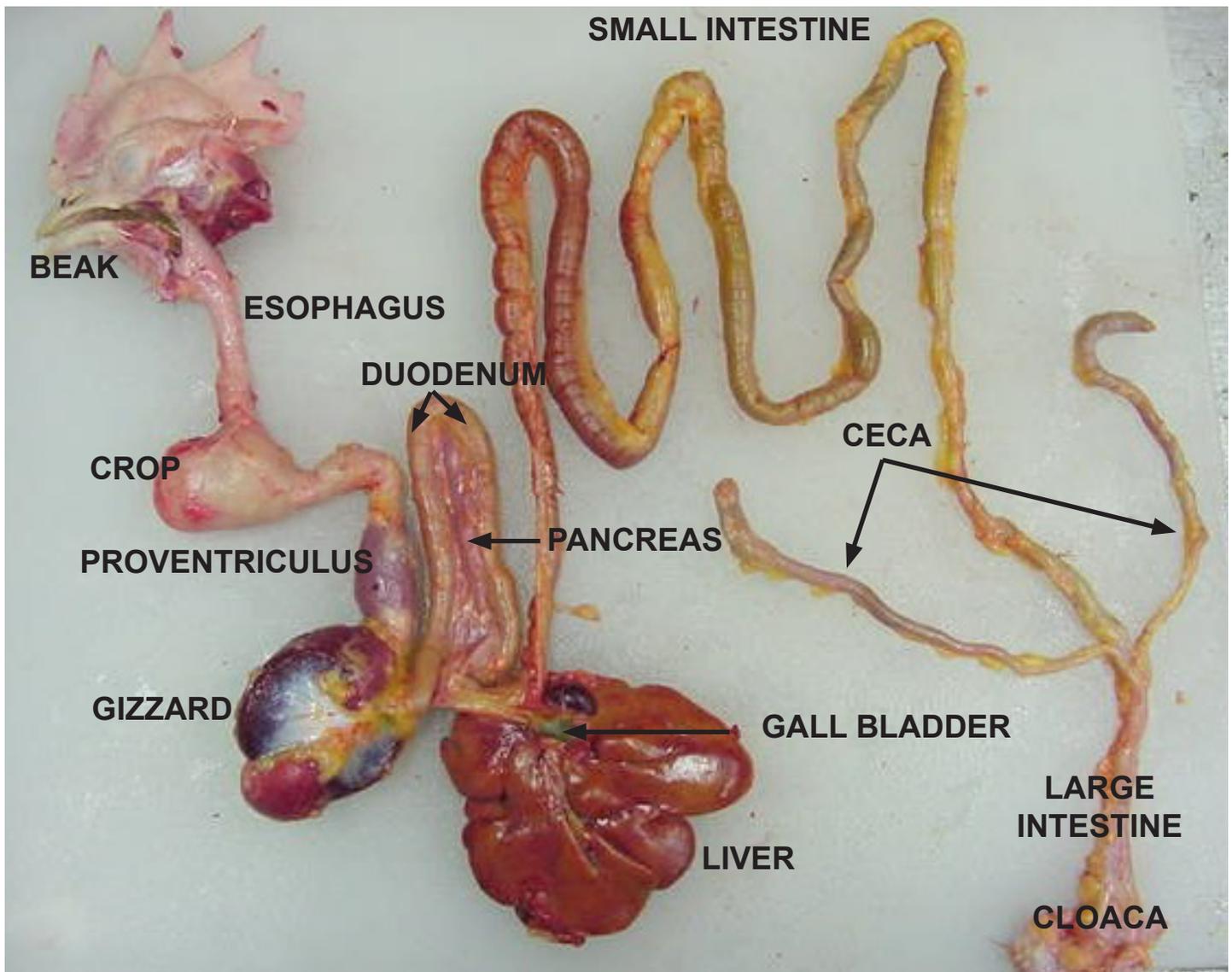
Having the crop on the outside of the body, we are able to feel the crop to make sure that each chicken is eating. It is important in evaluating the health of the flock, especially when the chicks are small or when the flock receives a change in feed type.

After the crop, the consumed feed passes to the proventriculus. The **proventriculus** is the 'true stomach' of the chicken. Like our stomach, the lining the proventriculus secretes pepsin (enzyme for protein digestion) and hydrochloric acid. The hydrochloric acid makes the content acidic, and the enzyme works best in an acidic environment.

The crop is located outside of the body cavity, at the base of the neck. This is important for birds. For those birds that fly it is



Location of the crop in a chicken (as indicated by the arrow) - on the outside of the chicken at the base of the neck



The digestive tract of a chicken

The feed then passes into the **gizzard**. Chickens do not have teeth. The gizzard plays the role of teeth in that it grinds up the feed. Chickens will often eat small pebbles to help with the grinding action of the strong muscles of the gizzard.

The contents of the digestive tract then moves into the **duodenum**, which is the first segment of the small intestine. It is a loop with the **pancreas** in the middle. While the pancreas is important in maintaining blood sugars (as any diabetic could tell you) it also secretes pancreatic juices into the duodenum. These juices have enzymes for the break down of the carbohydrates, proteins and fats in the feed. The juices also help to change the pH, since these enzymes function best at neutral pH.

The duodenum also receives bile from the **gall bladder**. The bile was produced by the liver and is stored in the gall bladder until it is needed. Bile is important in fat digestion. In the photograph of the digestive system above, the gall bladder (green in color because of the bile) is very small since the chicken was eating before it died. If the chicken hadn't been eating, the gall bladder would have been very full.

The protein in the feed is broken down into the individual amino acids that make up the proteins. The carbohydrates are broken down to glucose or other sugars depending on the carbohydrate source.

The fats are broken down into fatty acids. These products of digestion are then absorbed into the blood stream in the rest of the *small intestine*.

Any undigested feed is then passed to the *ceca*. A cecum (singular) is a blind pouch that starts at the junction of the small and large intestines. There are two of these - ceca (plural). The ceca contain a population of micro-organisms similar to that of the rumen of a cow. There is some fermentation of the undigested material arriving there. The result of the fermentation is the growth of bacteria and the production of some of the vitamins. This fermentation occurs near the end of the digestive tract so not much is absorbed by the chicken, but some is.



The water in the intestinal contents are also re-absorbed in the ceca. This re-absorption of water continues in the *large intestine* and the *cloaca* so that when the fecal matter passes out of the chicken via the *vent*, it is relatively dry.

The photograph on the right is typical of the fecal material deposited by a healthy adult chicken. The white material on the fecal material is uric acid. Uric acid is the end-product of nitrogen metabolism in chickens. The end-product of nitrogen metabolism in mammals, like us, is urea which is water soluble. Uric acid is not soluble in water so is

excreted as crystals. This helps birds conserve water.

LEARNING OBJECTIVES

Clover

- Identify some of the key components of the digestive tract of a chicken: Beak, Tongue, Esophagus, Crop, Gizzard

Intermediate

- Identify all the parts of the digestive tract of a chicken

Senior

- Identify all the parts of the digestive tract of a chicken
- Indicate the purpose of each of the parts of the digestive tract of a chicken

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Materials needed: The diagram of the digestive tract of the chicken and the list of parts

Activity: Have the 4-Hers work together to place the labels of the various parts on the image of the digestive tract of the chicken. Have the seniors describe what happens to a kernel of corn as it is picked up by and chicken and passes through its digestive system.

REFLECTION

To complete the experiential learning model, discuss these or similar questions with the youth:

Share:

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- What was the goal of this activity?
- What did you learn from this activity?

Process:

- What part of the activity taught you the most?

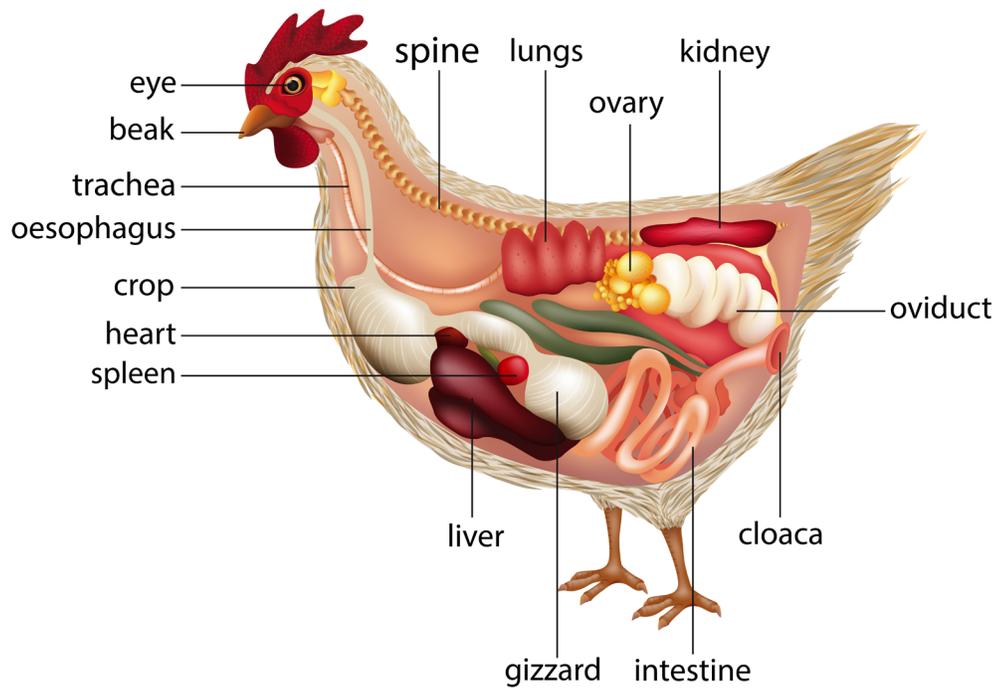
Generalize:

- What was the most interesting thing you learned from the activity?
- What surprised you the most?

Apply:

- We will take what we learned about the digestive tract of a chicken to discuss what a chicken eats.

Chicken Anatomy



MODULE 4

WHAT DOES A CHICKEN EAT?

Chickens, like us, are omnivores. They can eat both plant and animal materials. They are not cows so cannot digest forage.

Animals eat to acquire the energy and building materials that they need to live and grow. Animals use energy to perform normal body functions such as breathing, walking, eating, digesting, and maintaining body temperature. Nutrients provide poultry the energy and material needed for the development of bone, flesh, feathers, and eggs. Each of these compounds is important in providing poultry the nutrients they need, and a deficit of even one can have serious health consequences for poultry.

Feed has six major components:

- Water
- Carbohydrates
- Fats
- Proteins
- Minerals
- Vitamins

WATER

Water is often overlooked, but it is one of the most important nutrients. An animal can live without food longer than it can live without water. In a laying flock, a shortage of water for just a few hours can result in reduced egg production, so clean water should be available at all times. If you do not use automatic waterers, fill the drinkers twice a day. If the drinkers are filled only in the morning, birds can run out of water by midday. A laying hen drinks about 25% of her daily water intake during the last two hours of daylight.

Water plays an important role in the body of an animal. Water softens feed and carries it through the digestive tract. As a component of blood (90% of blood content), water carries nutrients from the digestive tract to cells and carries away waste products. Water also helps cool the bird through evaporation. (Birds do not have sweat glands, so their heat loss occurs in the air sacs and lungs through rapid respiration.)

A baby chick is composed of about 80% water. Even though this percentage decreases as a chicken gets older, the need for water remains. There is no precise quantity requirement for water because there are several factors that affect the amount of water a bird needs: age, body condition, diet, temperature, water quality, and humidity. As a rule of thumb, poultry consume twice as much water as feed.

CARBOHYDRATES

Carbohydrates (compounds with carbon, hydrogen, and oxygen) are an energy source for animals and make up the largest portion of a poultry diet. Carbohydrates are typically eaten in the form of starch, sugar, cellulose, and other non-starch compounds. Poultry typically do not digest cellulose and the non-starch compounds, referred to as crude fiber, well. However, poultry are able to use most starches and sugars well. Important sources of carbohydrates in poultry diets include corn, wheat, barley, and other grains.

FATS

Fats have two and one-quarter times the calories of carbohydrates by weight. Fat provides nine calories of energy per gram, while carbohydrates provide only four. At room temperature, saturated fats are solids and unsaturated fats are liquid. Examples of saturated fats that can be used in poultry diets include tallow, lard, poultry fat, and choice white grease. Examples of usable unsaturated fats include corn oil, soy oil, and canola oil. Common sources of supplemental fat in commercially produced poultry feeds include animal fat, poultry fat, and yellow grease. The high cost of vegetable oils makes including these fats in poultry diets uneconomical.

Fats are composed of smaller compounds called fatty acids. Fatty acids are responsible for cell membrane integrity and hormone synthesis. Although there are many different fatty acids, poultry have a specific requirement for one—linoleic acid—so it must be included in the diet. Linoleic acid is considered an essential fatty acid because poultry cannot generate it from other nutrients (for example, by converting one fatty acid to another).

Fat must be present in the diet for poultry to absorb the fat-soluble vitamins A, D, E, and K. In addition to its role in nutrition, fat is added to feed to reduce grain dust. Fat addition also improves the palatability of feed (that is, makes the feed more appetizing).

Fats, including those incorporated in feed, have a tendency to go bad or become rancid. This is a year-round problem, but the risk of feed going rancid is even greater in the summer. To prevent feed from going rancid, antioxidants are added to poultry diets containing added fat. A common antioxidant listed on feed labels is ethoxyquin.

PROTEINS

Proteins are complex compounds made up of smaller units called amino acids. After a bird consumes protein, the digestive process breaks down the protein into amino acids. The amino acids are then absorbed by the blood and transported to cells that convert the individual amino acids into the specific proteins required by the animal. Proteins are used in the construction of body tissues such as muscles, nerves, cartilage, skin, feathers, beak, and so on. Egg white is also high in protein.

Amino acids are typically divided into two categories: essential and nonessential. Essential amino acids are those that cannot be made in adequate amounts to meet the needs of the animal. The nonessential amino acids are those that the body can generate in sufficient quantities as long as the appropriate starting material is available. There are 22 amino acids commonly found in feed ingredients. Of these, 11 are essential and must be supplied in the feed. Poultry diets typically contain a variety of feedstuffs because no single ingredient is able to supply all the necessary amino acids in the right levels.

Most feed tags indicate only the percentage of crude protein in a given feed. This information does not tell you about the quality of the protein used. Protein quality is based on the presence of the essential amino acids. For poultry, methionine and lysine are the two most critical amino acids. Deficiencies of either of these will lead to a significant drop in productivity and the health of the flock. Commercial poultry diets typically contain methionine and lysine supplements. Because of these supplements, the feed can contain less total protein; without supplements, the feed would have to contain excessive amounts of the other amino acids in order to meet the methionine and lysine requirements.

The main sources of protein in poultry diets are plant proteins such as soybean meal, canola meal, corn gluten meal, and so on. Animal proteins used include fishmeal and meat and bone meal. Fishmeal can be used only in limited quantities (less than 5% of the total composition of the diet) or it will give poultry meat and eggs a fishy flavor.

MINERALS

Minerals play a role in bone formation, but minerals are also needed for several other important functions, including the formation of blood cells, blood clotting, enzyme activation, and energy metabolism and for proper muscle function.

Minerals are typically classified as macro- or microminerals. Poultry require higher levels of macrominerals and lower levels of microminerals in their diets. The microminerals include copper, iodine, iron, manganese, selenium, and zinc. Although poultry have lower requirements for microminerals, these minerals play essential roles in the body's metabolism. Iodine, for example, is required to produce thyroid hormones that regulate energy metabolism. Similarly, zinc is involved in many enzyme-based reactions in the body, and iron aids oxygen transportation within the body.

The macrominerals include calcium, phosphorus, chlorine, magnesium, potassium, and sodium. Many people are familiar with calcium's role in proper bone formation and eggshell quality, but calcium's important role in blood-clot formation and muscle contraction is less well known. Phosphorus is important in bone development, and it is part of cell membranes and is required for many metabolic functions. Chlorine is important in the formation of hydrochloric acid in the stomach and thus plays a role in digestion. Sodium and potassium are electrolytes important for metabolic, muscle, and nerve functions. Magnesium also assists with metabolic and muscle functions.

Grains are low in minerals, so mineral supplements are added to commercial poultry feeds. Limestone or oyster shell are common sources of calcium. Dicalcium phosphate is a common source of phosphorus and calcium. The microminerals are usually supplied in a mineral premix.

VITAMINS

Vitamins are a group of organic compounds that poultry require in small quantities. Despite the low requirement levels, vitamins are essential for normal body functions, growth, and reproduction. A deficiency of one or more vitamins can lead to a number of diseases or syndromes.

Vitamins are divided into two categories: fat-soluble and water-soluble. The fat-soluble vitamins are A, D, E, and K. Vitamin A is required for normal growth and development of epithelial tissue (skin and the linings of the digestive, reproductive, and respiratory tracts) and reproduction. Vitamin D3 is required for normal growth, bone development, and eggshell formation. Vitamin K is essential for blood clot formation.

The water-soluble vitamins include vitamin C and the B vitamins. The B vitamins include vitamin B12, biotin, folacin, niacin, pantothenic acid, pyridoxine, riboflavin, and thiamin. The B vitamins are involved in many metabolic functions, including energy metabolism. Poultry can make vitamin C, so there is no dietary requirement established for this vitamin. Vitamin C supplementation, however, has been shown to be useful when birds are stressed.

Some vitamins are produced by microorganisms in the digestive tract. Vitamin D can be produced when sunlight hits the bird's skin. Other vitamins must be supplied because they are not formed by the birds. Many essential vitamins are partially supplied by feed ingredients such as alfalfa meal and distillers' dried solubles. A vitamin premix is typically used to compensate for the fluctuating levels of vitamins found naturally in food and to assure adequate levels of all vitamins.

FEED INGREDIENTS

The major ingredients in poultry diets provide the protein and energy required for poultry to maintain health, grow, and produce eggs.

LEARNING OBJECTIVES

Clover

- Identify two protein sources and two energy sources for use in chicken feed.

Intermediate

- Identify three possible protein sources and three possible energy sources for use in chicken feed.

Senior

- Identify five possible protein sources and five possible energy sources for use in chicken feed.

KENTUCKY ACADEMIC EXPECTATIONS

LS1.C: Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. (K-LS1-1)

LS1.A: Structure and Function: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.C: Organization for Matter and Energy Flow in Organisms: Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

LS2.A: Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. (5-LS2-1)

LS1.A: Structure and Function: All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (07-LS1-1) Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (07LS1-2) In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (07-LS1-3)

1.12 Students speak using appropriate forms, conventions, and styles to communicate ideas and information to different audiences for different purposes.

2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.



TARGETING LIFE SKILLS

<i>Clover</i>	<i>Intermediate</i>	<i>Senior</i>
<ul style="list-style-type: none"> • Critical Thinking • Problem Solving • Learning to Learn 	<ul style="list-style-type: none"> • Critical Thinking • Problem Solving • Learning to Learn • Decision Making 	<ul style="list-style-type: none"> • Critical Thinking • Decision Making • Communication • Contribution to Group Effort • Teamwork • Leadership

Materials needed: Examples of several feed ingredients including:

ENERGY SOURCES	PROTEIN SOURCES	MINERAL SOURCES
<ul style="list-style-type: none"> • Corn • Wheat • Barley • Sorghum • Animal fat • Vegetable oil • Flax (for omega-3 fatty acids) 	<ul style="list-style-type: none"> • Soybeans and/or soybean meal • Canola and/or canola meal • Fish meal • Meat and bone meal • Sunflower seed meal • Field peas 	<ul style="list-style-type: none"> • Limestone • Trace mineral premix

If the local feed mill is not able to provide samples of different feed ingredients, use the included photographs provided.

Activity: Have the 4-Hers work together to learn the different types of feed ingredients that can be used in poultry feeds as energy, protein, or mineral sources.

REFLECTION

To complete the experiential learning model, discuss these or similar questions with the youth:

Share:

- What did we do in this activity?
- What was the goal of this activity?
- What did you learn from this activity?

Process:

- What part of the activity taught you the most?

Generalize:

- What was the most interesting thing you learned from the activity?
- What surprised you the most?

Apply:

- We will take what we learned about different feed ingredients and use this knowledge to understand a feed tag.

MODULE 5

READING A FED TAG

When the hens are mature enough to start laying eggs (18-24 weeks depending on the breed), it is important to make sure they have the right feed. Otherwise, the flock may not produce well or the eggs will be of poor quality. The proper diet also ensures that the hens are healthy and able to fight off any diseases that they may encounter.

Once any hens in your flock lay an egg, it is time for the whole flock to be put on a layer feed. Layer feeds have higher calcium levels so that the hen has the calcium she needs to make eggshells. You also want to make sure that the protein levels in the diet are correct. You don't want to feed your laying hens too much protein. While growing chickens have relatively high protein requirements, laying hens only need 16% or less protein. If higher levels of protein are fed, you are wasting your money because the hen will pass the un-needed protein in her manure. In addition, a hen that has to deal with excessive protein levels can have serious health issues.

It is important to know how to read a feed label. Share the publication 'ASC216-Reading a feed tag' with the club. Have the members identify the different parts of a feed tag and make sure they understand what information they are able to get from the tag.

Product Name	→	TRUE-BLUE CHICK STARTER Medicated Complete Crumbs for Chicks
Purpose Statement	→	True-blue Chick Starter is formulated for the development of active immunity to Coccidiosis and for increased rate of weight gain and improved feed efficiency in replacement chickens.
Active Ingredients	→	ACTIVE INGREDIENTS
		Amprolium 113.5 g/ton Bacitracin Methylene Disalicylate 10 g/ton
Guaranteed Analysis	→	GUARANTEED ANALYSIS
		Crude Protein Min 18.00% Lysine Min 0.85% Methionine Min 0.25% Crude Fat Min 2.50% Crude Fiber Max 7.00% Calcium Min 0.75% Calcium Max 1.25% Phosphorus Min 0.70% Salt Min 0.25% Salt Max 0.75%
List of Ingredients	→	INGREDIENTS
		Grain Products, Processed Grain By-Products, Plant Protein Products, dl-Methionine, Calcium Carbonate, Mono calcium Phosphate, Dicalcium Phosphate, Salt, Ferrous Carbonate, Ferrous Sulfate, Copper Sulfate, Manganous Oxide, Manganese Sulfate, Zinc Oxide, Zinc Sulfate, Cobalt Carbonate, Calcium Iodate, Sodium Selenite, Vitamin A supplement, Vitamin D3 supplement, Vitamin E Supplement, Menadione Sodium Bisulfite Complex, Menadione Dimethylprimidinol Bisulfite, Thiamine Mononitrate, Riboflavin Supplement, Niacin Supplement, Choline Chloride, Calcium Pantothenate, Pyridoxine Hydrochloride, Folic Acid, Biotin, Vitamin B12 Supplement.
Directions for Use	→	FEEDING DIRECTIONS
		Feed True-Blue Chick Starter-Medicated continuously as the sole ration to chicks from 0 to 8 weeks. Provide fresh, clean water free choice at all times. CAUTION: Do not use amprolium in feeds containing bentonite WARNING: Use as the sole source of amprolium
Warnings and Cautions	→	WARNING: Do not offer any feed that is spoiled, moldy, rodent-or insect-infested, or abnormal in appearance or odor, as it may cause illness or death WARNING: This product contains supplemental copper. DO NOT feed to sheep or other copper-sensitive species IMPORTANT: Feed is perishable. Store this product in a cool, dry area away from rodents and insects.
Manufacturer	→	TRUE-BLUE FEED COMPANY Lexington, KY

LEARNING OBJECTIVES

Clover

- Be able to identify the type of feed and its use from reading the feed tag

Intermediate

- Be able to identify the type of feed and its use from reading the feed tag
- Be able to tell if a feed is medicated by reading the feed tag
- Understand the list of ingredients

Senior

- Be able to identify the type of feed and its use from reading the feed tag
- Be able to tell if a feed is medicated by reading the feed tag
- Understand what the list of ingredients does and does not tell you
- Understand what the guaranteed analysis does and does not tell you

KENTUCKY ACADEMIC EXPECTATIONS

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TARGETING LIFE SKILLS

<i>Clover</i>	<i>Intermediate</i>	<i>Senior</i>
<ul style="list-style-type: none">• Critical Thinking• Problem Solving• Learning to Learn	<ul style="list-style-type: none">• Critical Thinking• Problem Solving• Learning to Learn• Decision Making	<ul style="list-style-type: none">• Critical Thinking• Decision Making• Communication• Contribution to Group Effort• Teamwork• Leadership

Materials needed: Handout on reading a feed tag and examples of different feed tags. You can use your own feed tags or included examples. It would be good if the 4-Hers can bring in tags from the feeds they have for their flock.

Activity: Have the 4-Hers work together to identify what can and cannot be learned from reading a feed tag.

REFLECTION

To complete the experiential learning model, discuss these or similar questions with the youth:

Share:

- What did we do in this activity?
- What was the goal of this activity?
- What did you learn from this activity?

Process:

- What part of the activity taught you the most?

Generalize:

- What was the most interesting thing you learned from the activity?
- What surprised you the most?

Apply:

- What did you learn from reading tag from your feed?
- Did any of the ingredients surprise you?
- Did you know what all the ingredients were in the feed for?
- Were there any special claims regarding feeds?



MODULE 6

PARTS OF AN EGG



To understand how the hen assembles an egg, it is important to know the different parts of the egg.

There is PowerPoint presentation on the parts of an egg, the female reproductive tract, and how a hen assembles an egg.

Review the handout on grading eggs for exterior and interior egg quality.

LEARNING OBJECTIVES

Clover

- Be able to identify the main parts of an egg: Shell, Yolk, Albumen, Chalazae

Intermediate

- Be able to identify the main parts of an egg: Shell, Yolk, Albumen, Chalazae, Shell membranes, Air cell
- Understand the functions of the different parts of the egg

Senior

- Be able to identify the main parts of an egg: Shell, Yolk, Albumen, Chalazae, Shell membranes, Air cell
- Understand the functions of the different parts of the egg
- Understand how to grade eggs by candling

KENTUCKY ACADEMIC EXPECTATIONS

LS1.A: Structure and Function: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.A: Structure and Function: All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (07-LS1-1) Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (07LS1-2) In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (07-LS1-3)

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TARGETING LIFE SKILLS

<i>Clover</i>	<i>Intermediate</i>	<i>Senior</i>
<ul style="list-style-type: none">• Critical Thinking• Problem Solving• Learning to Learn	<ul style="list-style-type: none">• Critical Thinking• Problem Solving• Learning to Learn• Decision Making	<ul style="list-style-type: none">• Critical Thinking• Decision Making• Communication• Contribution to Group Effort• Teamwork• Leadership

Materials needed: PowerPoints on the parts of an egg and putting an egg together. Worksheets on the part of an egg and the female reproductive tract. Egg candler or flashlight and eggs of different ages so that they will have different size of air cells and thus different egg grades.

Activity:

1. Give the presentation on the parts of the egg and putting an egg together.
2. Have the 4-Hers work on the worksheets on the parts of an egg and parts of the female reproductive tract.
3. Have the 4-Hers work in groups to grade a collection of eggs.

REFLECTION

To complete the experiential learning model, discuss these or similar questions with the youth:

Share:

- What did we do in this activity?
- What was the goal of this activity?
- What did you learn from this activity?

Process:

- What part of the activity taught you the most?

Generalize:

- What was the most interesting thing you learned from the activity?
- What surprised you the most?

Apply:

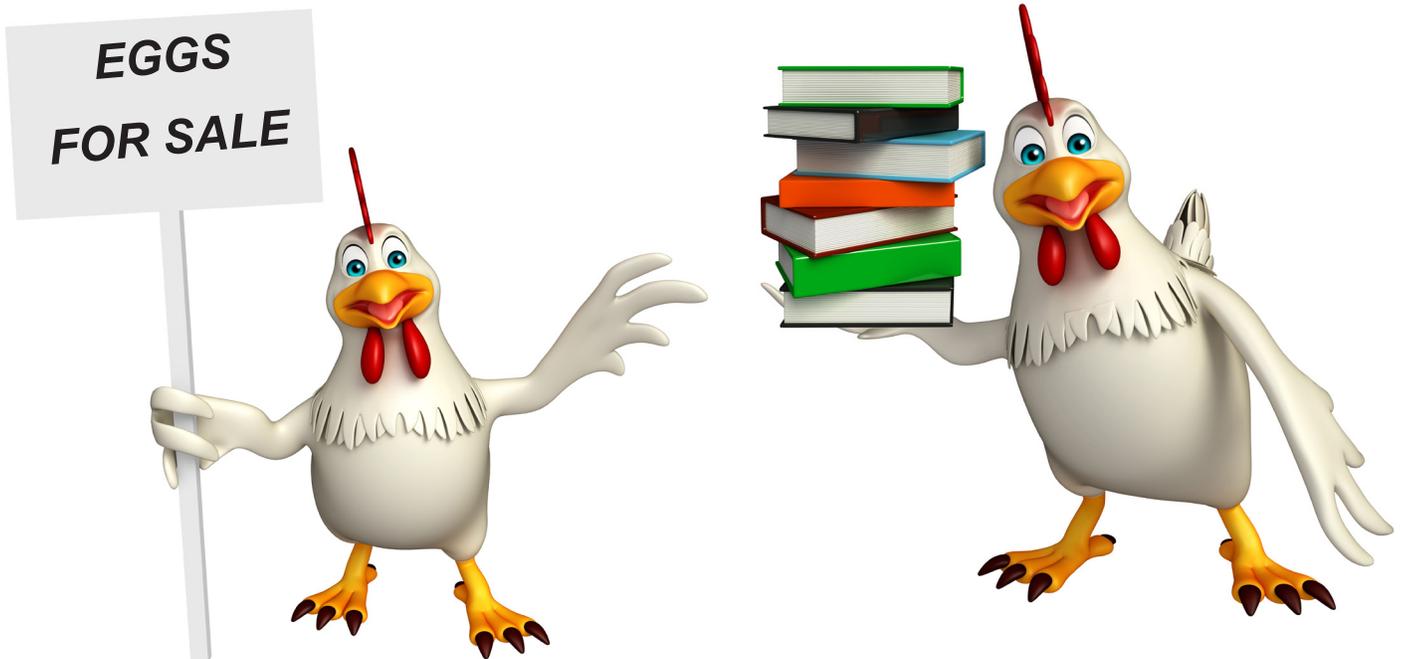
- What do you think causes blood spots in eggs?
- What do you think causes meat spots in eggs?
- If you are going to be selling eggs, do you think you will candle them for interior quality? To remove and blood or meat spots? Why would you want to candle the eggs before selling them? Why would you not want to bother candling the eggs? Would a customer be put off if they bought an egg with a blood or meat spot in it? What would you do if a customer complained they found one in the eggs you sold them?

THE 4-H EGG BUSINESS PROJECT

For the senior members of the club, the layer project can be expanded into a 4-H Egg Business Project. The project is intended to generate income for participating youth and their families as well as providing learning experiences in business, entrepreneurship, record keeping, documentation, problem-solving, food safety, and poultry husbandry. In addition, participants will learn how to follow state and local regulations for producing and selling chicken eggs.

Participant Responsibilities

- Perform a local market survey within their community to determine the approximate number of eggs and hens needed to meet that market.
- Provide appropriate feed and water daily to the laying hens.
- Obtain adequate number of egg cartons.
- Learn and follow the state and federal regulations for selling eggs.
- Gather eggs daily, and prepare for selling eggs in appropriate packaging.
- Take part in related educational opportunities when possible.
- Record all expenses and income related to this project.
- Record all production data related to this project.
- Keep a journal of the experience.



POULTRY SHOWS - BIOSECURITY

There are many puzzle pieces to a poultry project - and the culminating piece for a project is typically the poultry show. Daily care and nutrition of the laying hens, collection and consumption of the eggs produced, showmanship, and biosecurity are all key parts of the project.

It is important that the 4-Hers are able to identify any sick chickens, and not bring them to the poultry show. Sick chickens would be those that are acting droopy or unhappy, have a change in comb color, or have watery diarrhea. Such chickens should not be brought to the show where they could mingle with chickens from other members. In addition, chickens should be checked for any external parasites and washed before being brought to the poultry show.

With regards to poultry diseases, national and state agencies have identified biosecurity as a high priority. The USDA and Kentucky Departments of Agriculture have long term goals of safeguarding the poultry industry in the state from accidental outbreaks of disease. Disease control and surveillance and food security are high priorities in ensuring that people and poultry are protected.

Chickens that are exhibited at public venues can also illustrate some of the practices and concerns associated with the risk of disease outbreaks. Because disease outbreaks could have profound impacts on the agricultural economy of the state, it is important that issues related to biosecurity within 4-H programs are addressed.

In addition, the outbreak of highly pathogenic avian influenza a few years ago had devastating effect's on the country's poultry industry - making now the time to ensure that everyone with a poultry project is doing everything possible to keep their birds safe from the spread of disease.

4-H members, volunteers and staff should have an understanding of biosecurity practices and implementing good biosecurity protocols during poultry shows. This includes the importance of:

- Clean bedding and cages
- Having separate clothes and shoes while working with poultry
- Hand washing
- Quarantining new birds when they return to the farm
- Proper cleaning of equipment used during the show
- Proper cleaning of equipment before they return to the farm

By paying attention to their management, both on their own farms and during exhibition, 4-H poultry exhibitors can do their part to help safeguard the poultry production industry. Poultry barns at exhibits should have numerous hand and foot washing stations as well as instructions for proper washing of hands. Visitors to the barn should properly wash their hands upon entering the barn and then again upon exiting the barn in order to reduce the risk of spreading diseases from barn to barn.

Additionally, poultry waste is a risk. All poultry waste should be cleaned as the show occurs. This is as simple as having a show staff person with the responsibility of cleaning poultry waste as the show goes on. A simple wheelbarrow and manure scoop is all that would be needed. The scoop and wheelbarrow should be properly cleaned after each species show and manure should be dumped in approved temporary animal waste areas for permanent disposal.

The first principle of everyday biosecurity is having a separate pair of clothes and shoes to wear when you are interacting with your animals. You may wonder why this is important. The answer is simple: pathogens can be easily carried on clothing and shoes. Think of all of the places that you may walk in

a single pair of shoes in one day—it's probably a lot of different places! If you are wearing those same shoes into your barn, you can potentially be transporting disease into your animal facilities. Additionally, if you wear your barn shoes to other places, you could potentially be spreading a disease from your farm to new locations. Clothing acts the same way, as another carrier for disease.

By having a pair of shoes and clothes dedicated to using in the barn when working with your flock, you are greatly reducing the risk of cross-contamination in your area. Remember that clothing and shoes should be washed frequently to help decrease the transmission of disease across your farm.

In addition to wearing separate clothes and shoes in animal areas, another everyday biosecurity practice is proper and frequent hand washing. Our hands have the ability to touch a million different surfaces in a variety of locations each day. Washing our hands properly with soap and water can help reduce the spread of pathogens from various locations to others, animals and ourselves.

Always remember to wash your hands before and immediately after handling your birds. If you have sick birds, remember to care for healthy animals first, wash your hands, and then care for any sick birds in the flock.

Another important biosecurity practice is to quarantine poultry that are new to your farm or returning from an exhibition or show for a minimum of 28 days. These birds have been exposed to other poultry at a different location, therefore, may be carrying disease and viruses that your home flock does not have. This 28-day quarantine time will allow time for your birds to show symptoms of any virus or disease they may have contracted.

Although this may be challenging with the resources that you have available to you, think about how you can best separate animals and how disease transmission occurs. First, we know that pathogens can spread through indirect means; sneezing, coughing and via hands and clothing. Do your best to keep poultry separated enough that they are not exposed to nasal discharge from sneezing or coughing. Unfortunately, pathogens can also be spread through the air. When quarantining animals, use your best judgment within the facilities you have to minimize the risks. In addition, it is recommended to care for your home flock first, before caring for your new or traveling animals, as not to transfer pathogens on your hands or clothes.

If you have purchased or received new birds to your farm, it is valuable to learn the history of the new animals. Ask questions about the management practices and flock health of the farm you are purchasing from, and know what vaccinations, if any, the birds on the farm have received. Although often overlooked, this is important to know as it will help evaluate any potential health issues that your new birds may develop after you get it to your farm. Remember, stress weakens the immune system of animals and a change in environment and location can potentially be stressful for your new birds. As a result, it may be more likely to show signs of sickness. If you know its history, you will be better prepared to work with your veterinarian to identify and treat any illness.

With fair season over, backyard poultry owners may feel the threat of avian influenza has weakened. To the contrary, poultry producers should remain vigilant year round, learning about the disease, and taking proper precautions to keep their flocks healthy.

POULTRY SHOWS - INTERACTING WITH THE PUBLIC

It is important that the 4-H members, leaders, volunteers and staff be prepared to positively interact with the public at poultry shows. During the summer season, many 4-Hers are preparing their animals and other projects for the fair as well as polishing their skills for the show ring. As this is time of high visibility for youth and 4-H, it is important to have strategies in place for professional behavior during interactions with the public at these events.

What does it mean to be professional? Being professional may sound like it only applies to adults who are established in their careers, but the skills of communication, respect and preparation can be valuable for youth in their fair projects as well as when they are preparing to enter the workforce.

Much of the preparation for the fair often revolves around getting an animal ready for show and learning what to say to judges. However, there is also a chance for the youth to explain their project to the public and people who have little to no knowledge about poultry but may have some curiosity. The conversation with the public usually involves explaining things in a different way than you would to a judge.

For instance, it is important for the youth (as well as leaders and volunteers) to avoid jargon (specific words that only people familiar with the topic area understand) in their descriptions and explanations and to clarify terms as they use them. Youth are also giving more of an overview of the work and engagement in their project instead of going as in-depth as they might with a judge and, at the same time, are encouraging questions from the other person in the conversation. Many people may feel intimidated to ask questions about something they don't know anything about, but if they are open to dialogue and encouraging curiosity, they can learn something about the topic area as well as about all of the care and preparation the youth put into their project.

It is helpful to remember that when members of the public are wandering around the barns of your fair, they will see you as the face of 4-H. For better or worse, you will be representing the organization with how you interact with them. Treating everyone who comes through the barns with respect can go a long way in those interactions. People don't want to feel like their presence in the barns is a nuisance or they may never come back. On the other side of that coin, if you are genuinely welcoming to visitors, you will certainly improve their immediate experience and you may even convince them to try out 4-H for themselves!

Learning how to communicate all the information they have learned over the course of their project should be part of youth's preparation for the fair. Have them practice talking about their projects to members of their family, 4-H club members, and any other groups they might be a part of (sports, church, etc.) before the event. Having them create a professional pitch or elevator speech is a great way to prepare for these short conversations with others about their project. They may also consider creating an educational poster to display in the barns during the fair as a way to help people learn even when the youth are not around.

It is often easy for youth to know what to expect in the show ring in regards to their appearance and demeanor, but remember that even outside of the show ring, they are representing your club and your county 4-H program any time people see them at the fair. They should consider what they wear, how they interact with members of the general public, how much they pay attention to their cellphones, and the words they use when they are on barn duty or hanging out with friends. Their level of professionalism can say a lot about their character!



BEHAVIOR OF ADULT LEADERS AND VOLUNTEERS

County fairs can be stressful and emotional for families. Parents can help make it a positive experience for their child by leading by example! Consider being intentional in your acts at the fair in the following ways.

Honor the judging process

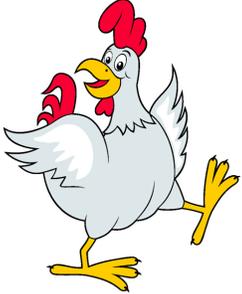
Judges only see what is in front of them in the ring. Judges are doing the best they can and we need parents to respect the process. Remember that this is a child's opportunity to show what they have learned and practiced at home. Will everything go perfectly? Probably not because animals have a mind of their own sometimes, but as soon as a child is in the ring, you are a spectator only.

As the class concludes, judges may provide oral feedback about the class. Make sure the youth take the opportunity to listen and learn from the judge. They are the person getting paid for their opinion on that day. If you don't agree with their opinion, don't disparage the judge. Instead, take the opportunity to teach the 4-Hers good conflict resolution skills and at the conclusion of the show, have the youth ask the judge why they placed a class a certain way. You still may not agree, but teaching youth that it is okay for people to have a difference of opinion is an invaluable lesson.



When the class is over, make sure to tell the 4-Her all the things they did right instead of focusing on what they did wrong. Every time they step in the show ring, it is a learning opportunity; treat it as such and help them grow and learn so they can continue to improve.

Always practice good sportsmanship in and out of the show ring

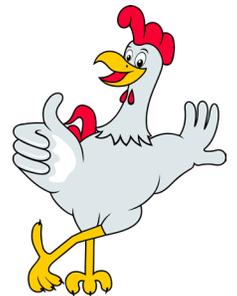


Period. End of discussion. Every family in the barn has different resources, different experiences and different priorities. Model good sportsmanship by congratulating everyone, offering a kind word and practicing compassion and grace, even when it is hard to do. Some great phrases to say are: "Good job! I can really tell you worked hard with your project and it shows!" "I know things didn't go as well as you would have hoped, but you did a great job keeping your composure! I admire that!"

We all have our own situations; you never know when a kind word makes all the difference in the world to someone else. The youth who seems to win all the time may feel like that is the only place they belong and can be successful. The youth who places at the bottom of the class every year may have no support system to gain the knowledge to progress in their project. We just never know what battles others fight; children are no different. Be kind and a good sport no matter what.

Encourage and support the program requirements

Record books, food stand shifts, and barn duty may be required in order to participate at the fair. Begrudging these tasks only sets a negative tone for things that are meant to help youth build their skill set. Instead, take the opportunity to teach youth that not everything in life is fun; sometimes we have to do the not so fun stuff in order to do the fun stuff. Encourage and support the 4-Hers in these tasks. They are learning new things and creating memories while they are doing them, and sometimes those required things can turn out to be memorable experiences.



Always model a good attitude

I guarantee someone or something will upset you or not go as you would hope during the fair. Remember that practicing patience, extending a lot of grace to others and paying attention to your own family's experience will eliminate unnecessary drama and hard feelings. Being intentional about finding the good in situations rather than the bad is a great life lesson to teach youth. Not everything is in your control, but you can always control how you respond.

A fair experience is probably the highlight of a 4-Her's summer. Make sure to enjoy it with them, make memories and have it be a positive experience.

