Poultry Resource Book

Wayne County Ohio 4-H

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Introduction: Wayne County Poultry Resource Book

Raising poultry is a popular 4-H project that will be fun for you and your whole family! There are several different poultry projects you can enroll in through Wayne County 4-H. By completing a 4-H poultry project we hope you learn how to properly management poultry, produce and exhibit healthy birds, develop awareness for managing a small business and take pride in your accomplishments! Enjoy your poultry project this year!

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Selection

Chapter 1

Wayne County Poultry Resource Book

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COOPERATIVE EXTENSION SERVICE • UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, LEXINGTON, KY, 40546

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Selecting the Right Chicken Breed

Jacquie Jacob and Tony Pescatore, Animal and Food Sciences

Many factors should be considered before selecting a chicken breed for your flock, whether you are planning to start a new flock or to add to an existing one. You might be looking for a meat breed, an egg breed, or perhaps a breed that performs reasonably well at both (referred to as a dual-purpose breed). Perhaps you just want a pet or chickens to show at exhibitions.

While all breeds of chickens are descendants from the red jungle fowl of Southeast Asia, generations of genetic selection have developed breeds specializing in specific characteristics.

The mature weight of the jungle fowl is about 2 pounds, and a sexually mature hen will lay 10-12 eggs during the breeding season. Through generations of genetic selection, chicken breeds have been developed specifically for meat production, and they can reach a market weight of 6.6 pounds in eight weeks. Similarly, chicken breeds have been developed specifically for egg production, and the hens from these breeds lay year round and can produce more than 300 eggs in a year. For those interested in exhibition poultry, chicken breeds now come in many shapes, sizes, and colors.

Breed Characteristics

Meat Production

If you are looking for a meat-producing breed, the fast-growing Cornish cross—a "broiler" breed—is probably your best bet. They were developed by crossing the large-breasted Cornish and the white Plymouth Rock breeds. They can reach 4-5 pounds in six weeks and 6-10 pounds in 12 weeks, depending on the management conditions—especially housing and nutrition.

In Europe, a large market exists for slower-growing meat-type chickens. Some of these breeds have been imported into the United States and have recently become available for purchase. They are typically raised for 11-12 weeks and are therefore closer to sexual maturity than commercial broilers. Because they are slower growing than the typical commercial broiler chickens, they are said to have more flavor.

Dark-feathered, slower-growing breeds are popular in Asian cuisine. Although the Australorp was developed as an egg-producing breed in Australia, it is grown in many parts of the United States as a meat bird for sale in live-bird markets. An additional chicken breed popular in Asian cuisine is the silkie chicken. Silkie chickens, regardless of feather color, have black skin, black meat, and black bones. Chicken soup made from a silkie chicken is believed by some to have medicinal properties.

Egg Production

The single-comb White Leghorn is the breed (Leghorn) and variety (single-comb white) of chicken used in the commercial production of table eggs in most of the United States. They are prolific and highly efficient producers of a white-shelled egg. In the northeastern United States, however, brown-shelled eggs are preferred. Breeding companies have developed commercial egg-producing strains specifically to meet this market. Commercial breeds tend to be flighty and high strung and are not the best breeds for small flocks.

Most hatcheries in the United States have a sex-link cross available for chicken egg production purposes.

Black sex-link. The black sex-link (also known as Rock Reds) is produced by crossing a hen with a barred pattern in her feathers with a non-barred rooster. The male offspring typically have barred plumage like their mother while the female offspring are a solid color, typically black. Black sex-links are typically produced by crossing a barred Plymouth Rock hen with a Rhode Island Red or New Hampshire rooster. At hatch, both sexes have black down, but the male chicks can be identified by the white dot on their heads.

Red sex-link. The red sex-link (also known as Golden Comet, Gold Star, or Cinnamon Queen depending on the specific cross used) is produced by a number of different crosses. White Plymouth Rock hens with the silver factor (a gene on the sex chromosome that inhibits red pigmentation of feathers) are crossed with a New Hampshire rooster

Sex-linked Chickens

Specific breeds or strains of chickens can be developed where it is possible to tell male and female chickens apart based on their physical appearance, often plumage color.

For the matings to work, the physical characteristic must be carried on one of the sex chromosomes—thus the term "sex-linked"—and the correct male and female breeds selected. For example, a Delaware hen mated to a New Hampshire or Rhode Island Red rooster is a sex-link cross where the male offspring will have the Delaware feather pattern and female offspring will have a solid-red feather pattern. However, if you mate a Delaware rooster with a New Hampshire or Rhode Island Red hen, all the offspring will have the same Delaware feather pattern.

It is important to remember the offspring are hybrids and will not breed true.

to produce the Gold Comet. A silver-laced Wyandotte hen is crossed with a New Hampshire rooster to produce the Cinnamon Queen. Additional possible red sex-link cross combinations are the Rhode Island White hen and a Rhode Island Red rooster or a Delaware hen with a Rhode Island Red rooster. Male chicks hatch white and can feather out to pure white or with some black feathering, depending on the cross. Female chicks hatch buff or red, depending on the cross, and they feather out buff or red.

California White. The most popular sex-linked crosses produced for small flocks lay brown-shelled eggs. The California White is one sex-linked cross that produces white-shelled eggs. It is the cross between a White Leghorn hen and a California Gray rooster. It is basically a commercial Leghorn bred to handle the conditions of small flocks, including those in areas with colder temperatures.

Typically hens of breeds with white earlobes lay white-shelled eggs and those with red ear lobes lay brown-shelled eggs. But every rule has an exception. For example, hens of the Dorking and Red Caps breeds have red ear lobes but lay white-shelled eggs. Notable exceptions are the Arauncana and Ameraucana breeds. The Araucana is a breed from South America that lays a blue egg. Genetically, the blue egg color is a dominant trait and when the Araucana is crossed with other breeds the result is a chicken that lays a colored egg. If the coloring of the chicken meets the American Poultry Association Standard of Perfection, it is referred to as an Ameraucana. If not, the chicken is typically referred to as the "Easter Egger." The color of the eggshell produced by Ameraucana and "Easter Egger" hens varies from pink to green.

Additional options for egg production include the Minorca and Ancona for white-shelled eggs and the Australorp, Plymouth Rock, Dominique, Rhode Island Red, or New Hampshire for brown-shelled eggs.

Tables 1 and 2 give an indication of the color of the eggs laid by a variety of breeds of chickens. Some egg producers like to keep a variety of chicken breeds so they will get a wide selection of egg colors—adding a unique characteristic to the eggs they sell in the farmers market.

Can you tell a barred Plymouth Rock from a Dominique?

Chickens of both breeds have barred feathers. The barring in the Dominique is thinner than that of the Barred Rock, but the feature that easily distinguishes between the two breeds is the comb. Barred Rocks have a single comb while the Dominique has a rose comb.

Table 1. Egg Color of Good Egg-Producing Breeds.

Chicken breed		Egg color
Yellow-skinned breeds*	Anconas	White
	Barnevelders	Dark brown
	Leghorns	White
	Sicilian Buttercup	White
	Sumatras, Black	White or lightly tinted
	Welsummers	Dark brown
White-skinned breeds	Andalusians, Blue	Chalk white
	Campines	White
	Hamburgs	White
	Lakenvelders	White (sometimes tinted)
	Minorcas	Chalk white
	Naked Necks	Brown
	White Faced Spanish	Chalk white

* Useful in evaluating hens for past production levels. For more information, see Evaluating Egg-Laying Hens (4AJ-07P0).

How can you tell an Araucana and an Ameraucana apart?

The Araucana chicken has no tail (a condition referred to as "rumpless") and tufts of feathers protruding from its face. The Ameraucana has a tail and, instead of tufts, has muffs and a beard, terms used to describe fluffy collections of feathers on the face and neck. The terms "Easter egger" or "Easter egg chicken" are used for any chicken that carries the blue egg-color gene but does not meet the breed standards for the Ameraucana as listed in the American Poultry Associations Standard of Perfection.

Table 2. Egg Color of Dual-Purpose Breeds.

Chicken breed		Egg color
Yellow-skinned breeds*	Brahmas	Light to dark brown
	Buckeyes	Brown
	Chanteclers	Brown
	Cochins	Brown
	Delawares	Brown
	Dominiques	Brown
	Hollands	White
	Javas	Brown
	Jersey Giants	Brown to dark brown
	Lamonas	White
	New Hampshires	Brown
	Plymouth Rocks	Very light to dark brown
	Wyandottes	Very light to rich brown
White-skinned breeds	Araucana/Ameraucana	Blue to light green
	Australorps	Brown
	Catalanas, Buff	White or very light tint
	Crevecoeurs	White
	Dorkings	White
	Faverolles	Light brown
	Houdans	White
	LaFleche	White
	Langshans	Very dark brown
	Orpingtons	Light to dark brown
	Redcaps	White
	Rhode Island Reds	Brown to dark brown
	Rhode Island Whites	Brown to dark brown
	Sussex	Brown

* Useful in evaluating hens for past production levels. For more information, see Evaluating Egg-Laying Hens (4AJ-07P0).

Dual-purpose Breeds

Dual-purpose breeds are those breeds in which hens lay reasonably well and roosters are large enough for meat production. Many breeds in the American and English classes—including the Plymouth Rocks, Sussex, and Wyandottes—meet these standards.

Broody Breeds

Some breeds of chickens rarely go broody and incubate their eggs. They include the white-faced Black Spanish, Blue Andalusians, Anconas, Sicilian Buttercups, Hamburgs, Campines, Lakenvelders, Welsummers, Polish, and Houdans. These breeds should be avoided if you want to use them to brood eggs from different species (such as duck or guinea fowl). Their classification as non-sitters also makes it difficult to breed them without the use of artificial incubation or a surrogate hen willing to incubate the eggs naturally.

Commercial single-comb White Leghorn strains are also unlikely to ever go broody. Bantam chickens are more likely to go broody and are often used as surrogate mothers. Other possible breeds include the Araucana, Australorp, Brahma, Cochin, Faverolles, Javas, Orpingtons, Sussex and Wyandotte.

Winter-hardy and Pasture Breeds

If you are looking for a breed that can handle harsh winters, possible choices include the Australorp, Brahma, Buckeye, Cochin, Delaware, New Hampshire, Plymouth Rock, and Rhode Island Red. The last three breeds are common dual-purpose chickens on farms in the United States.

Most pastured poultry producers in the United States use Cornish cross chickens. The breed selection is related more to their availability than anything else. Many of the characteristics that make the Cornish cross strains good for commercial production reduce their suitability for pasture production.

National Poultry Improvement Plan (NPIP)

The National Poultry Improvement Plan was established in the 1930s and is a collaboration between the poultry industry and state and federal programs. It was originally developed to eliminate pullorum disease, which is caused by *Salmonella pullorum*. The bacteria can be passed from mother to hen through the egg. The program tests breeder flocks to certify they are pullorum-free. The program was later expanded to include testing for other diseases, including *Salmonella typhoid, Salmonella enteritidis, Mycoplasma gallisepticum, Mycoplasma synoviae, Mycoplasma meleagridis,* and avian influenza. The program includes commercial poultry, turkeys, waterfowl, exhibition poultry, backyard poultry, and game birds.

A number of breeders are working on the development of a breed of chicken more suited to pasture conditions. For example, a breeder in Delaware has crossed a Cornish cross with a Delaware and sells them as "Pastured Peepers." They are slower growers than the conventional Cornish cross, but are better suited to pasture production.

Some of the slower-growing breeds of chickens developed in Europe have been imported to the United States and sold as Freedom or Red rangers.

Raising Rare or Unusual Breeds

The Society for Preservation of Poultry Antiquities (SPPA) maintains a list of chicken breeds—both bantam and large fowl—in danger of disappearing. The list includes breeds that are old and have historical significance and documentation prior to the modern poultry show era. Not all of them are considered rare. The breeds designated "rare" reflect the organization's observations of breeds in need of more breeders to avoid genetic limitations and ultimately disappearance of the breed. The list also includes breeds with a recorded history that are not listed in the American Poultry Association or American Bantam Association's Standard of Perfection.

SPPA officers evaluate the breeds and varieties reported by its members for the Breeders Directory listings. They assess trends as to which ones are gaining or losing ground. Breeds not available commercially and seldom seen at poultry shows are considered rare. It is important to note that although a breed may be in healthy supply, certain varieties within that breed may not be.

Poultry Exhibition

Exhibition poultry shows are popular in most states. The American Poultry Association publishes the Standard of Perfection, which describes the ideal body type, color, weight, and other characteristics of recognized breeds. Chickens are judged according to these standards.

Most chicken breeds come in a standard and a bantam size. Bantams are typically a quarter the size or less of their standard counterparts, however some bantam breeds have no standard-size version. Bantams are easier for young poultry fanciers to handle, and they eat less feed and take up less space. They do lay a smaller egg, however.

The American Bantam Association produces a Standard of Perfection specifically for bantam versions of the breeds.

Where to Buy Chickens

Once you have decided on the characteristics that most suit your needs, look for a hatchery approved by the National Poultry Improvement Plan (NPIP) to see if a suitable breed or variety is available. For most hatcheries, the manager is able to advise producers on the breeds available that most satisfy their needs. Day-old chicks can be sent through the mail using Priority Post.

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UK UNIVERSITY OF KENTUCKY College of Agriculture, Food and Environment

Selecting Ducks

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As with many domesticated species, ducks are selected for different purposes, primarily meat or egg production. They are also valued for their feathers and down. It is important to choose a breed of duck that best suits your particular needs.

The different breeds of ducks are believed to have originated from the wild Mallard (*Anas platyrhynchos*). The male Mallard has a couple of curled tail feathers referred to as the sex feathers (Figure 1). No other wild duck has these sex-feathers. All the males of the domesticated duck have the curled tail feathers as well.

Figure 1. Male sex feathers on a duck. *Jackie Jacob*

Wild Mallard ducks are protected by the 1918 Migratory Bird Treaty Act in the U.S. and Canada. It is illegal to remove Mallard ducks or their eggs from the wild or to keep wild birds as pets.

The Muscovy (Figure 2) is often referred to as a duck, but it is actually a different species. It is hard to categorize Muscovies since they have a body like a duck; they nest, attack predators and hiss like a goose; they roost like a chicken; and they have a plump breast like a turkey. Muscovies are believed to have originated in South America. They are still found wild in the warm regions of South America and are raised domestically throughout the world. In southern Europe and North Africa they are referred to as the Barbary duck. In Brazil they are the Brazilian duck, and in the Guianas the Guinea or the Turkish duck (because of the caruncles on the face). The Spanish call them Pato, as do some handlers in the U.S. They are also known as Cairon duck, Indian duck, Musk duck, and the Turkey duck.

Figure 2. Male Muscovy duck. *Jackie Jacob*

Exhibition

Fourteen breeds of duck are recognized by the American Poultry Association (Table 1). They are divided into four classes: heavy, medium, light weight and bantam. The large and medium weight ducks are typically raised for meat production.

Table 1. Comparison of breeds of ducks recognized by the American Poultry Association

Breed	Weight/lb		Eggs/ year
	Female	Male	
Aylesbury	8-9	9-10	40-60
Buff	6-7	7-8	60-100
Call	1.12-1.25	1.38-1.62	20-50
Campbell	3.5-4.0	4.0-4.5	200-300
Cayuga	6-7	7-8	60-100
Crested	5-6	6-7	60-100
East Indie	1.38-1.50	1.62-1.88	20-50
Magpie	4.0-4.5	4.5-5.0	30-60
Mallard	1.88-2.25	2.25-2.50	20-50
Muscovy	6-7	10-12	60-120
Pekin	8-9	9-10	100-180
Rouen	8-9	9-10	40-60
Runner	3.5-4.0	4.0-4.5	100-150
Swedish	5.5-7.0	6.5-8.0	60-100

All of the breeds that will be mentioned can be raised as exhibition birds. The bantam ducks are particularly good for exhibition because of their small size. The bantam breeds included in the APA Standard of Perfection are the Calls, East Indie and Mallard.

Meat

The main duck breeds raised for meat production are the Pekin and the Muscovy. Approximately 90 percent of the duck meat produced in the U.S. is from the Pekin. Commercial producers are able to obtain a 7 to 8 pound duck in seven weeks. Under small farm conditions they typically reach 6 to 7 pounds in seven to eight weeks. The commercial duck producer raises strains of ducks genetically selected for high meat production.

Such strains would not be available for small producers. Duck sold in stores is meatier than ducks raised in smaller flocks.

The Pekin (Figure 3) is popular because of its fast growth rate and yellow skin. Pekins should not be raised past ten weeks of age or they will become extremely difficult to pluck because of pin feathers. Also, the feed efficiency declines sharply at this age. Pekins can be considered a general purpose breed since they also lay approximately 200 white eggs per year.

Figure 3. Female (left) and male (right) Pekin ducks. *Jackie Jacob*

In many areas the Muscovy is the meat breed of choice. Since the Muscovy originates from the southern hemisphere the meat is leaner than the meat from other ducks. Muscovies must be butchered by 16 weeks of age or the meat becomes firm.

The incubation period of the Muscovy is 35 days compared to 28 days for other ducks. If a Muscovy is crossed with another breed of duck the offspring will be sterile and are often referred to as Mule or Moulard ducks depending on the cross. Many commercial duck operations in Europe raise Mule or Moulard-type ducks.

The male Muscovy can become very large (10-12 lb); the female is smaller (5-6 lb). The male has characteristic fleshy outcrops around the eyes called caruncles. The Muscovy is the predominant waterfowl in Africa and Latin America as it thrives well under free-range conditions.

If you want more colorful ducks and can accept a slower growth rate there are other breeds that can be used. The Aylesbury, an 8 to 10 pound duck, originated in England, where it is popular because of its white skin. The yellow-skinned Pekins were never popular in England, and the white-skinned Aylesburies where never popular in the U.S. Like the Pekin, the Aylesbury will reach a market weight of 7 pounds in eight weeks. The deeper keel and loose feathers of the Aylesbury makes it look bigger than the Pekin.

The Cayuga is the only duck breed developed in America, near Cayuga Lake in New York state. Unlike Aylesbury and Pekin ducks, which reach 7 pounds in eight weeks, other heavy breeds such as the Cayuga take 12 to 16 weeks to finish as a market bird. Today they are mainly raised for exhibition.

The Buff Orpington was originally considered an egg breed, but is sometimes raised for meat. They are slightly smaller than the Aylesburies and Pekins. They will lay very well if not allowed to get too heavy.

The Rouen is a meat bird reaching 6 to 8 pounds in 12 to 15 weeks. The Rouen is popular for decorating ponds since they are colored like the wild Mallard but are too heavy to fly away. Young Rouens reach 7 to 8 pounds, but the bulk of the weight gain happens after 12 weeks of age. They can lay a blue-tinted egg every other day.

The Crested duck (Figure 4) is named for the ball of feathers on its head, but it is not simply a white duck with a crest but a defined breed. A Crested duck typically does not breed true. The gene responsible for the crest is lethal when there are two copies present. As a result, one-fourth of the fertile eggs will not hatch. Only two-thirds of the remaining fertile eggs will develop into ducks with crests. The other one-third will not have a crest and will not carry the gene necessary to produce a crest in further generations. Many raise the Crested duck for exhibition purposes only, but they do lay well, and their growth rate, though not as good as the heavy breeds, is good.

Figure 4. Crested duck. *Jackie Jacob*

Eggs

The Runner and Campbell breeds of ducks are excellent egg layers, often attaining levels of production higher than egg-laying chicken breeds. The Runner duck (Figure 5) is often referred to as the Leghorn of the duck family. Both breeds tend to be nervous and flighty and will stampede when startled. Both breeds are good foragers but also do well in confinement when a good layer ration is provided. Typically the Runner duck lays four eggs per week for about eight months. The Campbell can lay an egg a day for ten months.

Runner ducks are light weight and stand upright like penguins. They run rather than waddle, thus the name. They scare easily but are very hardy. The level of egg production will vary depending on whether they are exhibition or utility strains. Some utility strains have produced over 300 eggs in a year. Runner ducks cannot fly and rarely form nests. The ducks will drop their eggs wherever they happen to be. If raising Runners for egg production it is best to keep them confined overnight to make egg collection easier.

Runners are good at foraging. They will eat worms and slugs and have even been seen to catch flies. Only the females quack. All drakes are limited to a hoarse whisper. Because of their small size, Runners eat less feed than meat ducks. Of course it is important to provide them with sufficient calcium and protein-rich food to maintain egg production during the extensive laying season. The darker varieties lay blue-tinted eggs.

Figure 5. Female Runner duck.
Jackie Jacob

The Campbell breed of duck was developed by Adele Campbell in the late 1800s. She crossed the Runner with a Rouen duck in an attempt to create a breed of ducks that would lay well but have bigger bodies. The offspring were then crossed with Mallards to increase their hardiness. There is only one variety of Campbell ducks: khaki. Campbell ducks are the closest thing to a dual purpose breed.

Campbell ducks become sexually mature at approximately six months of age. They seldom become broody as this characteristic was sacrificed in exchange for a high level of egg production. They lay an off-white colored egg. Using a lighting system, Campbells will lay throughout the winter months when daylight hours are naturally shorter.

The Golden 300 hybrids and the White Golden layers were developed by Metzer Farms, and both are excellent egg layers. They crossed the Campbell with other duck breeds to keep the high level of egg production while introducing calmness into their temperament.

Biological Control of Pests

For centuries ducks have been used as a biological control of insect pests in rice paddies in Asia. Today in many parts of Southeast Asia duck production has been integrated with both rice and fish farming. One advantage of ducks is that they normally lay most of their eggs within three hours after sunrise (compared with five hours for chickens). This practice makes it possible to confine ducks at night and allow them to range freely in the rice fields during the day.

All duck breeds help eradicate mosquito larvae from waterways. They will also eat slugs, snails and insect pests in gardens and will clean algae slime and duck weed from ponds. The best foragers are the Campbells, Magpies, Runners and various bantam breeds. Cayugas will do a good job but do not cover as large an area, preferring to stay closer to home.

Training Herd Dogs

Herding dogs such as Australian Shepherds are often trained with a group of ducks. In general, it is best to use lighter bodied breeds of ducks for herding. The heavier the body, the easier the duck tires. Herders tend to choose the less calm breeds so that dogs can move them by using less force. It may be more beneficial, however, to use calmer breeds. With neurotic ducks, all the dog does is cut off escapes rather than really moving the ducks. In such cases Runners or Campbells are not your best choices.

Some herders have had success with Swedish ducks. They are very calm and break easily. Cayugas are another possibility, but they take longer to break and can be frustrating early on. Before they are broken, there is a very fine line between not moving at all and moving in all directions. Once they are broke, they can be worked easily. It takes a very well trained dog to break in Cayugas.

Herding ducks should be exercised on a daily basis. If not they will not have much stamina and will not be suitable for working regardless of the breed.

Feathers and Down

Feathers are the principal covering of birds. A feather has a hard quill shaft with a series of fibers joining together into a flat structure on each side of the shaft. Down is the light, fluffy undercoating that geese, ducks and other waterfowl have to keep them warm. Land fowl such as chickens do not produce down.

Despite their light weight, down feathers are good insulation. Down is either natal or definitive. Natal down (Figure 6) is present on the bird when it hatches and shortly thereafter. Definitive, or body down, occurs in later generations of feathers and is a layer of small, fluffy feathers (Figure 7) that lie underneath the contour feathers (Figure 8). This type of down is harvested for use as insulation.

Down feathers have the ability to "loft" so that each down cluster traps more air for its weight than any synthetic. Every ounce of quality down has about 2 million fluffy filaments that interlock and overlap to form a protective layer of still air that keeps warmth in and cold out. Down is very resilient; it can be scrunched up or flattened out, and after a good shake it fluffs up and bounces back to the form that keeps you cozy and warm.

The best down usually comes from larger, more mature birds. When age and maturity are equal, goose down is better than duck down. However, down from an older duck is better than down from a younger goose. Larger down has an extraordinarily high warm-to-weight ratio. Down from younger birds not only tends to have poor filling power, it will also tend to collapse in a relatively short time because its fibers are too fragile.

Climate does not affect the quality of the down, but it will affect the quantity produced. A bird in cold weather will grow more down to stay warm. Quality depends simply on the maturity of the bird.

Summary

Many options are available for those interested in starting a small flock of ducks. It is important to know the purpose of the ducks before selecting a breed. The heavier breeds are the best choice for meat production. The Khaki Campbell is your best choice for an egg-producing breed. If you just want to raise ducks as a hobby or for show your options are wide. A smaller bantam breed might be a good choice if you want to limit the space and feed required.

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Selecting Geese

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Domestic geese were raised in Europe long before the settlers brought them to America to provide both food and feathers. Since then very little selective breeding has been done to develop specialized types of geese. Size, behavior and egg production vary according to breed (Table 1), and the right breed of goose for your flock will depend on what you intend to use them for.

Exhibition

The American Poultry Association (APA) Standard of Perfection recognizes 11 standard breeds of geese, divided into three classes based on weight: heavy, medium and light. Although classes are broken by weight, weight should not be the only criteria for choosing a breed. For example, if you want to get as many hatching eggs as possible while using the minimum number of male geese (ganders), consider a lightweight breed. (Large breed males mate with only two or three females, but males of the lightweight breeds can mate up to six females.) If you are not concerned with eggs, Egyptian and Canada geese lay only a few per season. Each breed has merits and shortcomings. Proper breed selection can help you save on flock upkeep and cost.

When purchasing stock for exhibition purposes, be sure to distinguish between exhibition and utility strains. For example, an authentic Toulouse goose should have a dewlap, a long, deep keel and a smooth, low paunch under the abdomen. Some utility strains of geese sold as Toulouse are the same coloring, size and marking but do not have the required characteristics. These non-conforming geese are called farm goose, common gray goose, utility goose, business goose or simply gray goose.

Meat and Eggs

All the geese in the heavy and medium weight classes are good utility birds. The most common geese raised for meat are the Embden, Toulouse and Pilgrim. Dressed yields based on live weight vary according to breed (Table 2).

Table 1. Comparison of goose breeds

Breed	Weight (lb)		Eggs/ Season	Primary uses	Behavior
	Female	Male			
African	8-10	10-12	10-40	Meat; crossing with Toulouse goose	Very aggressive
American Buff	9-12	10-12	15-25	Meat	Calm and docile
Chinese	3.5-4.5	4.5-5.5	40-80	Eggs; meat; guard animal, "weeder"	Active forager; Not as aggressive as some of the other breeds
Embden	10-13	12-15	10-30	Meat	Can be aggressive; good forager
Pilgrim	5-7	6-8	20-40	Meat	Calm; good forager
Pomeranian	7-9	8-11	3570	Breast meat; eggs; guard animal	Mostly docile
Sebastopol	4.5-6.0	5.5-7.0	30-50	Exhibition	Not aggressive
Toulouse	10-13	12-15	20-40	Meat; crossing with Toulouse goose	Not a good forager
Tufted Roman	4.5-5.5	5-6	40-60	Meat	Generally calm

Figure 1. Toulouse goose.
Jacquie Jacob

Table 2. Typical dressed yields based on live weight

Live weight (lb)	Dressed weight (lb)	Percent
20	16	80
18	14-14.5	78-81
10	7	70
8	5.5	69

- **Embden** is the most popular of the heavy breeds. Purebred Embden geese have blue eyes. Commercial hybrids are available that look like Embdens but do not have blue eyes. A common cross for these commercial hybrids is an Embden gander mated with a Toulouse goose. The Embdens do not lay as many eggs as the Toulouse, but they tend to be better mothers. Embden goslings can be sexed at hatch on the basis of the down color. Both have gray down, but the color is darker in females. Embden geese mature early and dress out nicely because of their white plumage but have a tendency to produce a fatty carcass. Embden can be an aggressive breed so it is best to not keep them with more docile breeds because they will bully them. They are good foragers.
- **Toulouse** geese (Figure 1) come in two types: production and exhibition. The production strains have been bred for their ability to gain weight rapidly. In the past goose fat was a primary source of cooking fat and lubricants. Toulouse geese put on a lot of fat when plenty of feed is available and they have no room for exercise. One result is an oversized liver. Toulouse geese have been used in the production of foie gras. The exhibition strains are decorative show birds with an exaggerated dewlap and keel. Toulouse geese are not good foragers.
- **Pilgrim geese** are a sex-linked goose breed developed in the U.S. Unlike most goose breeds, the plumage of the male and female Pilgrim geese is different. As adults the ganders are white with a little gray feathering on the wings, back and tail, and they have gray-blue eyes. The females are completely gray with brown eyes. At hatch the male goslings have yellow-gray down and an orange bill; females have olive-gray down and a dark brown bill. Pilgrim geese make a medium-sized roasting bird. They are also good foragers and can be tame if hand reared.
- **African** geese are the largest of the domestic geese. They produce a high quality lean meat, making them excellent for roasting. They can withstand considerable cold weather but need shelter. They have a large knob on their head that is susceptible to frost bite. African geese are often crossed with Toulouse geese to develop another commercial hybrid for meat production.
- **Sebastopol** geese (Figure 2) are unique in that their feathers are curly rather than straight. Considered a novelty by many, they do dress out well and are relatively good egg layers. The flight feathers are also curved, making it impossible for these geese to fly. Sebastopol can be successfully raised in cold climates but they need more protection during wet, cold and windy weather. Their loose feathering does not provide as much warmth nor do they shed water as well as other breeds.

Figure 2. Sebastopol goose.
Jacquie Jacob

- **American Buff** breed was developed in the U.S. They are typically calm and docile and make good parents. They are moderately good for meat production but not very good for egg production.
- **Saddleback Pomeranian** geese were originally bred for their high breast meat yield. They have been used in the production of smoked goose breast. They can be very noisy and will react to anything out of the ordinary, making them good guard animals. They are usually docile, but some are quick to pick up on body language and will sometimes respond aggressively.
- **Chinese** geese have been kept for eggs and meat and as guard animals. They are relatively good egg layers. They actively forage and produce the least greasy meat of all but Pilgrim geese. They have been used in hybrid crosses with Embden geese, resulting in a goose that is more economical to raise than other pure breeds.
- **Tufted Roman** geese, despite their smaller size, produce a plump roaster bird. Roman geese do not have a keel, resulting in a high meat-to-bone ratio.

- **Canada** geese have been raised for meat production. It is important to note, however, that it is illegal to remove Canada geese or their eggs from the wild or to keep any wild bird as a pet. Canada geese, like all native birds, are protected by the 1918 Migratory Bird Treaty Act in the U.S. and Canada. Captive bred geese that have been properly marked may be kept with the proper permits. Other local and state regulations may also apply to the keeping of Canada geese. Check with your local Fish and Game department before trying to acquire any.

Feathers and Down

Feathers are the principal covering of birds. A feather has a hard quill shaft with a series of fibers joining together into a flat structure on each side of the shaft. Down is the light, fluffy undercoating that geese, ducks and other waterfowl have to keep them warm. Land fowl such as chickens do not produce down.

Despite their light weight, down feathers are good insulation. Down is either natal or definitive. Natal down is present on the bird when it hatches and shortly thereafter. Definitive, or body down, occurs in later generations of feathers and is a layer of small, fluffy feathers that lie underneath the contour feathers. This type of down is harvested for use as insulation.

Down feathers have the ability to "loft" so that each down cluster traps more air for its weight than any synthetic. Every ounce of quality down has about 2 million fluffy filaments that interlock and overlap to form a protective layer of still air that keeps warmth in and cold out. Down is very resilient; it can be scrunched up or flattened out, and after a good shake it fluffs up and bounces back to the form that keeps you cozy and warm.

The best down usually comes from larger, more mature birds. When age and maturity are equal, goose down is better than duck down. However, down from an older duck is better than down from a younger goose. Larger down has an extraordinarily high warmth-to-weight ratio. Down from younger birds not only tends to have poor filling power, it will also tend to collapse in a relatively short time because its fibers are too fragile.

Climate does not affect the quality of the down, but it will affect the quantity produced. A bird in cold weather will grow more down to stay warm. Quality depends simply on the maturity of the bird.

Guard Animals

Geese are able to distinguish regular, everyday noises from unusual noises, which makes them good watch animals. They were used by the Romans to detect the approach of enemies and were found to be more reliable than human guards. Roman geese sounded the alarm when the Gauls tried to invade Rome. During the Vietnam War, U.S. soldiers used flocks of geese to warn of enemy infiltration. Pens with geese encircled entire camps.

Along with the Tufted Roman, the Saddleback Pomeranian is a good watch animal. They can be very noisy and will react to anything out of the ordinary. Chinese geese can also be used as guard animals; they are alert and vocal when a threat is perceived.

Weed Control

Geese can be raised for biological control of weeds, although geese are not efficient feeders. They are able to survive on a pasture-based diet because they are ferocious feeders who spend seven to eight hours a day eating.

The Chinese breed is most suited to this management system. They are good foragers and eat mainly grasses and herbaceous plants. If properly managed, Chinese geese make good "weeders" for crops. The number of geese needed to weed a crop depends on the crop and the quantity of weeds; usually two to three geese are sufficient for each acre.

Summary

Many options are available for those interested in starting a small flock of geese. The choice of geese should be made based on the purpose of the flock, the menagement system that will be used, and the general preference of the owner. Geese can be raised for many reasons, from meat production to weed control.

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Selecting Turkeys

Jacquie Jacob and Tony Pescatore, Animal and Food Sciences

There are two species of turkeys, both native to the Americas: the North American (*Meleagris gallopavo*) and the Ocellated (*Meleagris ocellata*) turkey. The North American wild turkey is the species from which all domesticated varieties of turkeys originated. The Ocellated turkey, sometimes called the Mexican turkey, is native to the Yucatan Peninsula of Mexico. Raising wild turkeys is illegal in some states, including Kentucky. The prohibition includes domestic strains of wild birds. The law is meant to protect native populations of wild turkeys.

The wild turkey was first domesticated by the Aztecs. Turkeys provided a source of protein (meat and eggs) and the feathers were used for decorative purposes. Very little genetic selection was used with these early domesticated turkeys. The explorers took these turkeys back to Europe with them. After some early genetic selection in Europe, these genetically selected turkeys were re-introduced into America with the first settlers. The initial genetic selection of domesticated wild turkeys occurred in Europe, but the different varieties were developed in the United States, with the possible exception of the White Holland.

Technically there is only one breed of turkey. What are often referred as breeds are actually varieties of this single breed. The varieties included in the American Poultry Association's Standard of Perfection are Bronze, Narragansett, White Holland (sometimes referred to as the Broad-Breasted White), Black, Slate, Bourbon Red, Beltsville Small White, and Royal Palm (Table 1). Within the eight standard varieties there are various strains. Strains are developed when certain characteristics are bred into a particular variety by different breeders.

Table 1. Comparison of the eight varieties of heritage turkeys

Breed	Appearance	Typical market weight (lb)	
		Female	Male
Beltsville Small White	White plumage and pinkish-white shanks. Small weight is an important characteristic.	10	17
Black	Black plumage with a slight tinge of bronze, mainly on the back and tail. Shanks initially slaty black shanks but become pink with age.	14	23
Bourbon Red	Main plumage is dark chestnut; wings and tail are white. Shanks are reddish-pink.	14	23
Bronze	Markings are similar to the wild turkey but the Bronze has a tail tipped in white and is not as sleek and slender as a wild turkey.	16	25
Narragansett	Plumage is a rich metallic black with steel-gray. Shanks are salmon colored. Penciling and banding of tan and white on the tail and wings.	14	23
Royal Palm	Plumage is white with the breast and body feathers tipped in black and the back primarily black. Shanks are pinkish-white to pink.	10	16
Slate	Plumage is ash blue. Shanks are deep pink.	14	23
White Holland	White plumage. Shanks are pinkish-white.	16	25

Source: Livestock Breed Conservancy - http://www.livestockconservancy.org/

Eight varieties of turkeys are recognized by the American Poultry Association (APA), and the American Livestock Breeds Conservancy (ALBC) recognizes others not included in the APA Standard of Perfection, including the Jersey Buff and White Midget. Some hatcheries carry a number of other varieties including Crimson Dawn, Calico and Red Phoenix.

Turkeys are primarily kept for meat production. Most American consumers prefer the breast, or white meat, of a turkey. Commercial strains of turkeys were developed through several generations of genetic selection, resulting in broad-breasted varieties that have rapid growth and high feed efficiency. Many small flock owners have continued to use the commercial-type turkey because of their high performance and high breast yield. In the past few decades the other varieties were kept primarily for exhibition purposes, but recently there has been an increased interest in the commercial production of "heritage" turkeys.

Most of today's commercial turkeys are the result of artificial insemination because commercial turkeys are too big to breed naturally. To be considered a heritage variety of turkeys, natural matings must be possible. The turkeys must also have a long, productive, outdoor lifespan and a slow growth rate.

Several turkey varieties are classified as heritage. Most are well adapted to the small flock management system. They are usually more disease-resistant and are good foragers. They can mate naturally and raise their young, though mothering abilities vary from variety to variety.

When raising heritage breeds, remember that the slower growth rate will increase the cost of production, especially the total amount of feed consumed. Heritage breeds also have less breast meat. For example, a typical Broad-Breasted White turkey has nearly 70 percent breast meat, while the heritage breeds have about 50:50 white to dark meat. These factors should be taken into consideration when marketing heritage turkeys.

The Standard Bronze variety was developed in Rhode Island. It is a large bird with dark pin feathers that prevent it from dressing out well. They are good layers but do not go broody as easily as some of the other varieties. The Bronze variety was developed by crossing the turkeys brought to America by the settlers with Eastern wild turkeys. The resulting offspring showed hybrid vigor. They were larger than European turkeys but had a tamer disposition than the wild turkey.

The Bronze variety does not include the Broad-Breasted Bronze, which is a non-standardized commercial strain that does not qualify as a variety and is only used in commercial meat production. Similarly, the Broad-Breasted White turkey is a non-standardized commercial strain raised for meat.

The Beltsville Small White was developed in the 1930s at the United States Department of Agriculture (USDA) research station in Beltsville, Maryland. For many years the Beltsville Small White was the most popular turkey variety grown commercially. The development of the broad-breasted turkey resulted in a decline in the production of Beltsville Small Whites. The Beltsville Small Whites produce a nice table bird but are not as flavorful as other varieties.

The Beltsville Small White was developed in response to market research that indicated consumers were interested in a small- to medium-sized turkey with no pin feathers. The smaller breed, however, did not satisfy the needs of restaurants, which wanted a larger bird from which they could get more slices. The result was the development of the Broad-Breasted White (Large White), a commercial variety not recognized in the APA Standard of Perfection. The Broad-Breasted White could be harvested at a young age to meet the need for small turkeys or could be harvested at a later age for restaurant use.

White-feathered turkeys are not new. They were raised by the Aztecs. The early explorers brought

Figure 1. Broad-Breasted Bronze tom turkey.
Jacquie Jacob

them back to Europe. The White Holland was initially developed in Holland (thus the name) and was re-introduced to the colonies by the early Dutch settlers. They are said to be the calmest variety. The white feathers reduced the visibility of any pin feathers that remain after plucking.

The Bourbon Red is named for Bourbon County, Kentucky, where they were developed in the late 1800s. They are said to be good natured, making them suitable for small flock production. They are also good setters and mothers.

The Narragansett variety is named for Narragansett Bay in Rhode Island. It was developed from a cross between the Eastern Wild turkey and domestic turkeys brought over by the early colonists. The Narragansett was the foundation of the early turkey industry in New England. They are an excellent variety for small flocks since they have a calm disposition and are good foragers. They mature early, are good egg producers and have good maternal abilities.

The Slate variety, also known as the Blue Slate or Lavender turkey, is named for its color. The feathers are an ashy blue color. Although the Slate variety was recognized by the APA in 1874 there is still considerable variation in coloring making it difficult to breed consistently. It is gaining popularity in small flocks because of its survivability and flavor.

The Black variety, sometimes referred to as Black Spanish or Norfolk Black, was developed in Europe from the first turkeys brought there from the Americas. Blacks were crossed with the wild turkey to produce the Bronze, Narragansett and Slate varieties. Although the Beltsville Small White was the main turkey variety raised commercially, the Black variety of turkeys was also farmed commercially to some extent until the early twentieth century when the popularity of the Broad-Breasted White grew.

The Royal Palm turkey variety, also known as Crollweitz or Pied, is kept primarily as an ornamental variety. They have the least filled-out breast of the turkey varieties but have a calm nature. They are prolific layers and go broody quickly. They were one of the last turkey varieties to be included in the APA Standard of Perfection (1977). Royal Palm turkeys are used in some areas as a means of biological insect control.

The Midget White was developed at the University of Massachusetts in the late 1960s as a smaller complement to the Broad-Breasted White, but the anticipated demand never surfaced. Midget White turkeys are relatively friendly and well suited for small farms.

Summary

Many options are available for those interested in starting a small flock of turkeys. If fast growth and good feed efficiency are important, the commercial strains of turkey are your best option. The Midget White, a smaller version of the Broad-Breasted White, is well suited for small farms.

If you are looking at raising heritage turkeys there are several varieties to choose from. The Bourbon Red was developed in Kentucky and is suitable for small flocks. If you would like to enter your turkeys in Poultry Shows, purebred varieties are required. Choose one of the eight varieties recognized by the American Poultry Association in their Standard of Perfection.

The Royal Palm turkey is primarily an ornamental variety, but any of the other varieties are well suited to the small flock.

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Iowa State Fair 4-H Youth Poultry

WHAT IS THE JUDGE LOOKING FOR?

ANSWER: The judge is looking for what he believes is the pen that best represents the class he is judging whether it be a market class, a production class or a class of individual purebred poultry.

The real question is, "How do you, the 4-H'er, select and prepare a pen of poultry that will meet the judges expectations?" We will discuss all three of the basic poultry project areas and how you can prepare your poultry pen.

I. MARKET POULTRY – The meat bird pen

Normally, market poultry is shown in a pen of 3-5 birds. There are three main factors that a judge will be analyzing when he places a market pen.

1) Uniformity of the pen
   a. Uniformity in weight.
   b. Uniformity in shape and type.

2) Fleshing of the birds
   a. Fleshing on the breast, thighs, legs and back.
   b. The absence of physical defects that detract or diminish the birds marketability, such as a crooked keel or breast blister.

3) General appearance of the birds
   a. We recommend the birds be washed and clean
   b. The birds should leave a positive impression of poultry to anyone passing by your cage.

II. PRODUCTION POULTRY – The egg-production pen.

The production class, like the market class is normally judged in a pen of 1-5 birds, and like the market, uniformity is a key element in a good production pen.

1) Uniformity of the production pen
   a. Select a pen of birds with the same weight, shape and type.
   b. Select a pen of birds that are uniform in their maturity. Do not show a pen with two layers and one non-layer.
   c. Select a pen of birds that are near entering or are in production.

2) General appearance of the birds
   a. A pen of production birds should be mirror images of one another.
   b. Be sure that your production pen is free of external parasites.
   c. Be sure that your production pen is clean and promotes a positive image.

III. EXHIBITION OR PUREBRED POULTRY – Purebred poultry are normally judged by their breed type adherence to the APA-ABA Standard of Perfection. The birds can be judged as individuals or as breeding trios – one male and two females. Only purebred birds should be shown in this class. The following are elements that a judge will consider in placing birds.

1) Shape and type – it is imperative that shape and type be considered of greatest importance.
   a. Head – eyes, beak, wattles, earlobes, comb
   b. Back – length and width
   c. Body – abdominal capacity and heart-girth

2) Size and Weight
   a. Each breed has it's own weight and should be as close to that weight as possible.

3) Condition
   a. Vigor – The vigor and health of a bird is of great importance. There should be no evidence of disease, deformities or parasite infestations.

4) Color
   a. It is important to have the correct color pattern in colored varieties. It is also important to have white or black birds that do not have any foreign color in their feathering.

5) Feather quality
   a. The feather type and quality should be suited to whatever breed being shown as specified in the Standard of Perfection.

6) Disqualifications and Defects
   a. Birds exhibited should not have any disqualifying traits and a minimal number of defects.

A Reminder:

Preparation for and care of the birds during transportation to the show is a very important part of having birds that show well. For transporting in groups, make sure the coops are large enough, and never put more than four or five birds per coop. If possible place them in individual, small coops that measure 1 ft. wide X 1.5 ft. deep X 1.5 ft. high. Put about 3 to 4 inches of clean litter in each coop. Doing this will reduce the incidence of bruising and will help keep them clean. Handle the birds carefully, putting them in and taking them out of the coop head first to avoid injury and frayed or broken feathers.

Management

Chapter 2

Wayne County Poultry Resource Book

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UofA UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE
Cooperative Extension Service

Agriculture and Natural Resources

FSA8004

Raising Broilers and Turkeys for Competition

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Introduction

Before raising broilers for competition, you should ask yourself one question: "Am I up to the challenge of caring for broilers or turkeys for several weeks?"

Birds require regular care and feeding throughout their lives. It is virtually impossible to have birds "catch up" once they have fallen behind on weight or fleshing. Raising birds requires an extra commitment of time, patience, dedication and concern for the animals involved. Persons who cannot put forth the effort required should probably not begin the process.

Raising winning broilers and turkeys involves four general steps:

- Providing the birds with an environment conducive for growth and development,
- Feeding a diet which adequately supplies all of the bird's nutritional needs,
- Choosing the birds with the best potential to win and
- Keeping adequate records.

This publication outlines the process of producing winning broilers and turkeys.

Optimum Environment

Planning and preparing adequate facilities before the arrival of the birds allows birds to adapt to their new environment with a minimum amount of stress. Facilities should provide birds with ample space, plenty of ventilation, proper temperature and adequate protection from the elements and predators.

While good facilities and feed which meets the nutritional needs of the bird are crucial for rapid growth, poor management or bird care can undermine all the previous efforts. Checking the birds, particularly at times of the day when the temperature is changing, and making appropriate adjustments are the only ways a proper environment can be maintained.

The good flock manager will become familiar with the birds by watching and listening before disturbing the birds. Contented young birds are often active and chirp softly, while uncomfortable or sick birds vocalize loudly, huddle together or act listless.

A good manager will not tire new chicks or young poults since excessive handling and stirring will cause birds to be more susceptible to stress-related disorders. Young birds require more frequent and longer rest periods than older birds. A good rule of thumb is to allow new chicks (0 to 6 days of age) a minimum of two consecutive hours of undisturbed time four times a day followed by eight to ten hours of undisturbed nighttime rest.

Modern strains of broilers and turkeys are almost a biological phenomena because of their ability to achieve rapid growth with excellent

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feed conversion. However, genetic selection, particularly for broilers, has sacrificed normal early feather development and hardiness for rapid meat development. This means that birds remain more vulnerable to temperature extremes for a longer period of time. In addition, these rapidly growing birds have very high nutritional requirements, and there is little flexibility to overcome poor diets or extremes in temperature and ventilation even for short periods. Thus, it is essential that birds have everything they need in the way of environment and nutrients so that maximum performance can be achieved.

Birds, like other animals, have a sense of whether the temperature in their environment is hot, cold or just right. When the birds sense that the temperature is just right, they are said to be in the middle of their "thermoneutral zone." In this thermoneutral zone, birds expend a minimal amount of energy keeping warm or cooling off. If the temperature is higher than their thermoneutral zone, birds expend energy keeping cool and can be heat stressed. If the temperature is lower than the thermoneutral zone, birds expend energy maintaining their body temperature. Research shows that birds, particularly broilers, perform best when kept at a temperature that is on the low end of their thermoneutral zone.

If all birds huddle under the brooder or huddle tightly together in small groups, the temperature is probably below their thermoneutral zone. If birds are on the edge near the brooder guard or they pant, they are probably above their thermoneutral zone. If birds are snuggled in small groups under the brooder and around the grow area, they are probably in their thermoneutral zone. Providing birds with an environment in their thermoneutral zone means that the energy they might have used adjusting their body temperature will now be used for growth and development.

Table 1 provides estimates for desirable temperatures during the development process. As birds age they develop the ability to regulate their internal temperature and, therefore, require less and less supplemental heat. Since supplemental heat is necessary for at least the first week for broilers, placing feed pans or the water source near but **not** directly under the heat source is important. Both water and feed can become too hot for the birds to eat. If feed or water is warm when touched with the wrist, then it is too warm for the birds to eat.

The rapid growth rate of the modern bird means that oxygen requirements are relatively high. Modern birds are very intolerant of stuffy, stale environments. **Good ventilation to provide fresh air is critical.** While day-old chicks should be protected from drafty environments, it is still important to provide birds with a source of fresh, clean air.

Table 1. Temperature Guideline for Broilers and Turkeys

Age (Days)	Broilers (F°)		Turkeys (F°)	
	Day	Night	Day	Night
0-4	88	90	90	92
4-8	86	88	90	92
8-14	84	86	88	90
14-21	82	84	86	88
21-30	80	82	84	86
30-35	78	78	82	84
35 on	76	78	80	82
Over ten weeks	--	--	76 or cooler	78 or cooler

These temperatures are targets. When possible give birds access to additional space which is up to ten degrees lower in temperature. This gives birds a chance to pick their own optimum environment.

High environmental temperatures combined with high relative humidity (RH) is a common detrimental environment particularly in broilers and turkeys over three weeks of age. Since birds do not sweat, they must rely on their respiratory system for evaporative cooling. If the RH is high, the air is nearly saturated with moisture, and poultry become unable to lose their heat-laden moisture. The ideal RH for birds is 50 to 60 percent. When dry bulb temperatures in the nineties combine with high humidity, birds cease feed consumption, increase water intake, sprawl across the ground, pant and act listless. Prolonged exposure to these conditions results in a reduction in growth which birds may never overcome. Heat stress can even occur in new chicks, but, generally, the larger, heavier birds are the most susceptible.

The effects of heat stress can generally be reduced by increasing the air flow or ventilation rate in the facility. A box fan blowing directly across the birds can be as effective as an elaborate ventilation system. As with temperature, the appropriateness of ventilation rates can be determined by bird behavior. Watch for signs of crowding around the air flow, indicating too little air flow or too hot. If there is too much ventilation, birds will move away from the air flow. Ventilation rate adjustments should be changed in small increments to allow birds to adjust and conditions to stabilize. The ventilation rate should be adjusted until birds are uniformly spread across the grow-out facility. Another sign the environment is ideal is birds eating and drinking.

NEVER make rapid or drastic changes in the environment unless birds are in danger of dying. When humidity is low and temperatures are high, evaporative cooling with cooling pads and fine mist foggers or sprinklers is a very effective way of

cooling the birds because water, as compared to dry air, can hold more heat. **HOWEVER**, it is important not to saturate the litter or floor with moisture since the excess moisture can increase the RH and, in turn, increase heat stress. In addition, wet litter can cause ammonia production, increase coccidiosis outbreaks, enhance disease transmission between birds, cause foot sores and possibly cause breast blisters.

Floor space and type can have an impact on bird performance. Raising birds on wire will not produce winning birds. Plan to provide a minimum of two square feet per broiler after four weeks of age, and provide turkeys with a minimum of three square feet after ten weeks of age. The quality and type of bedding material utilized in the grow area can have a tremendous impact on performance. A good bedding material should stay dry, provide a cushion for the feet and breast of the birds and not encourage the birds to consume it. Bedding material should also not be a source of disease. Bedding material that is wet, moldy or dusty can lead to respiratory problems and even death. Once birds become sick because of moldy bedding material, they cannot be cured. Kiln-dried pine shavings are the best material. Rice hulls work very well for broilers, but they may not be the best choice for turkeys because of their tendency to eat hulls instead of feed.

Good moisture levels for bedding are 20 to 35 percent. A good rule of thumb to determine when litter is becoming too wet is to squeeze a handful of litter material and, if the material sticks together, it is too wet. Good air movement across the bedding material can help minimize the moisture content. Do not place extra equipment or materials in bird pens. Birds do not require perches. Birds perform best if given as many hours of light as possible with at least one hour of darkness. The one hour of darkness is more of a safety factor. If the lights ever fail, the birds are used to a darkness and will not panic and pile on each other.

Feed

Raising poultry for competition involves providing the most appropriate feed so that the best bird can maximize its potential. Understanding which nutrients are critical for muscle, skeletal and immune system development helps in choosing the most appropriate feeding program.

Feed should supply balanced and adequate levels of protein, energy, calcium, phosphorous, vitamins, trace minerals and salt. Protein is required to build muscle tissue and to maintain the immune system. Energy is required for birds to eat, move and breathe as well as build and maintain muscle. Calcium and phosphorous are needed for proper skeletal development. Vitamins, minerals and salt are required for the birds to function and grow normally. As the bird ages, the growth rate begins to slow; therefore, protein needs begin to drop while energy needs increase, because now the bird must not only grow but must also take care of the tissue it has already made. Since growth often occurs in rapid spurts throughout the growth cycle, a continuous supply of clean and fresh feed and water is essential so that when growth occurs, the fuel is available.

A big key to successful show bird rearing is frequently stimulating the birds to eat. Birds that are rarely stimulated to eat will typically gorge, filling their crops to the maximum when feed is available. Yet maximum growth occurs when birds are trained to eat a series of small "meals." Training birds to be "meal eaters" should start at day one and be consistent throughout the life of the birds. Training can be as simple as shaking the feed or pouring a scoop of feed into the feed trough. Since poultry are creatures of habit, frequently stirring the birds in a calm quiet manner can also train the birds to eat several times a day. At first birds may be frightened, but if training is continued in a calm and consistent manner, birds quickly learn that the activity means fresh food.

Since eating and digesting feed can cause heat within your birds, avoid stimulating birds to consume feed when environmental temperatures become excessive or when birds show signs of heat stress. Research shows that what birds do eat during heat stress periods is poorly utilized for growth and development. During extreme heat, encourage birds to eat in the evening or early morning hours.

Excellent high protein game bird/turkey starter feeds are available and recommended for both broilers and turkeys for the entire grow-out period. For broilers, slowly add corn chops up to one-third of the ration for the last 10 to 14 days before the show. For turkeys, slowly add corn chops up to one-third ration for 18 to 21 days before the show. While commercial turkey and broiler feeds are ideal for industry production, they are designed to produce the most meat in an economical manner. Since the goal of raising birds for competition is to maximize the performance of the very best birds and not the entire flock, commercial diets may not be the best choice.

A feed containing a coccidiostat (medication for the control and prevention of coccidiosis) is recommended, particularly if birds are grown on litter. A growth enhancer, such as probiotics and antibiotics, in the feed also helps birds reach their best performance by optimizing nutrient absorption and preventing the development of disease-causing microbes in the digestive tract. The use of steroids is prohibited

Table 2. Nutrient Values[1] of Four Commercially Available Game Bird/Turkey Starter Feeds and a Diet Formulated at the University of Arkansas

Nutrient	U of A Diet	Brand A	Brand B	Brand C[2]	Brand D
Protein, Crude minimum %	27.66	30.00	30.00	28.0	30.00
Crude Fat, minimum %	8.133	3.0	2.50	3.0	2.50
Crude Fiber, maximum %	2.095	3.50	6.00	6.00	6.50
Calcium, minimum %	1.28	1.25	NA	1.00	NA
Calcium, maximum %	1.377	1.75	NA	1.5	NA
Phosphorus, minimum %	0.872	0.900	NA	1.0	NA
Sodium, minimum %	0.210	0.250	NA	0.08	NA
Sodium, maximum %	0.213	0.750	NA	0.15	NA
Methionine, minimum %	0.50	0.50	NA	--	NA
Lysine, minimum %	1.68	1.70	NA	--	NA
Coccidiostat (Coban) gram/ton	60	--	--	--	--
Coccidiostat (Amprolium) %	--	--	0.0125	--	--
Bacitracin Methylene Disalicylate gram/ton	50	200	50	--	--

[1]Information is calculated values supplied by feed manufacturer.

[2]Also contains a dried extracted streptomyces fermentation soluble.

by law. In addition, research shows no growth benefits in modern broilers and turkeys. **WARNING: Never give turkeys feed containing the coccidiostats Sacox or Biocox.** Both these coccidiostats are commonly found in commercial broiler diets and can cause severe health problems and/or death in turkeys. Several game bird type feeds were evaluated as show turkey diets. Table 2 gives a nutrient comparison of the feeds, and Table 3 shows the average weight by week for turkey hens fed the diets in a feeding trial conducted at the University of Arkansas.

While certain water soluble medications or vitamins can be used, the use of medicated feeds minimizes the day-to-day preparations necessary to maintain drug activity in water soluble preparations. In addition, following label directions carefully when using any medication is crucial. The old adage "if a little is good, then a lot should be great" **never** applies to medications. If water soluble medications are used, discard the leftover water daily to prevent growth of bacteria and algae in the water container. Some medications should be changed out twice daily. This is particularly true of vitamin and sugar preparations. Scrubbing and disinfecting water containers with a mild chlorine rinse (2 tablespoons of bleach/gallon of water) also discourages bacterial and algal growth. Be sure that the residual chlorine is completely rinsed off prior to refilling the water container.

Table 3. Weight and Feed Consumption Estimates for Female Broilers

Age (Days)	Weight (lb)	Cumulative Feed Consumed (lb)
7	.35	.25
14	.89	.92
21	1.71	2.15
28	2.78	3.87
35	3.95	6.04
42	5.03	8.50
49	5.96	11.10

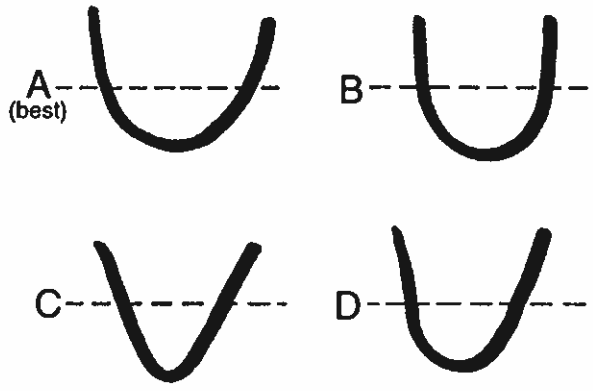
Using enclosed water systems, such as nipple drinkers, has saved labor and prevented the spread of numerous water-borne diseases within the poultry industry. However, nipple waterers are not recommended for competition birds because they may force the birds to work harder to get a drink. Under normal conditions, birds drink 2 pounds of water for every pound of feed eaten, so limiting water intake will likely decrease feed intake which will, in turn, decrease growth.

While exercise programs help firm muscle in beef and lambs, there is little evidence that exercise for broilers and turkeys enhances muscle growth particularly in the breast. Genetic selection is the factor responsible for increasing the breast meat size. Forcing birds to walk up ramps or raising the waterers and feeders above back height will not increase the size of the breast. Feeding the best birds so that all of their nutritional needs are met, encouraging the birds to eat often and providing the birds with an environment conducive for growth enhance bird growth more than exercise. Feeders and waterers should be raised as the birds grow. Just below back height is a good target for both.

Selection

The largest, heaviest birds with the most breast meat are generally judged best in competition. Defects, such as crooked legs, wounds or broken bones, disqualify birds. Keel bones, which are generally examined early in the judging process, should be straight and long. Breast shape should be as close to a rectangle as possible along the entire length of the keel bone. To determine the breast width and depth, place your palm on the breast bone, thumb on one side of the breast, fingers on the other, then slide your hand up and down, grasping the breast to determine the amount of total meat. The more the breast resembles a "U" the better. (See Figure 1.) The biggest, fastest growing birds at the beginning of the grow cycle may turn out to be males, so always have more than seven or eight potential show birds. Do not wash birds during grow-out or prior to show to minimize risk of injury.

Figure 1.



Closely associated with final selection of show birds is culling birds during the grow-out procedure. Birds that become ill or develop leg deformities will never be show quality. The best policy is to remove the birds from the flock to prevent them from jeopardizing the health of the entire flock. They can become a source of disease for the remaining birds and may jeopardize the health of the entire flock. Removing a few sick birds is more humane than allowing all the birds to become ill.

Transporting to Show

When the final selection for the show has been made, the last step is choosing a safe container for transporting the birds to the show. Pet crates or large cardboard boxes with new bedding material are ideal. Should your trip to the show grounds take more than two or three hours, place ice cubes in a small container so birds will have access to water during transport. Also, choose a container that will allow birds to remain cool.

Record Keeping

While record keeping may seem, at times, like so much busy work, the records you keep provide a basis on which to make decisions regarding your birds. Better records mean better decisions. In addition, documenting management procedures this year can mean that you improve the management of your birds next year.

Each participant should keep a daily diary about their poultry production experience. This diary should include documentation of facility particulars, high and low pen temperatures, humidity, feed consumption, weight gains, bird contact hours and a record of bird health.

High and Low Pen Temperatures

Thermometers are available for recording the highest and lowest temperatures occurring in the pen. Collecting and writing down this information daily provides information about the environment birds are subjected to when left unattended. Early detection and correction of "cool" nights or "hot stuffy afternoons" prevents heat or cold stress in birds which leads to poor performance.

Humidity

A wet bulb thermometer or hygrometer can be made or purchased at a local poultry supply store. To make a wet bulb thermometer, snip the end off a cotton shoe string and slide it over the end of a regular thermometer. Next dip the end of the wick in a pan of water that is room temperature. Water should wick up the string and cover the bulb. Take a reading after water has covered the bulb for 15 minutes. A comparison of wet bulb and dry bulb (regular thermometer) temperatures using a psychometric chart gives the relative humidity (RH) or the amount of moisture in the air.

Weekly Feed Consumption

Monitoring weekly feed consumption gives information on how much feed is required to produce show birds, and it allows the measurement of feed conversion. A comparison to standard feed conversion information also sheds light on how well birds are using the feed consumed and if feed wastage is excessive. Be careful when handling birds to minimize damage to birds.

Weekly Weight Gains

Measuring weight gain on a weekly basis provides accurate information on bird progress. By comparing weight gains to documented growth data, poor performance can be quickly detected and corrected. Growth monitoring should also include a cull plan so birds that begin to fall behind in performance are removed. This will reduce the competition for food among the remaining birds, and it may also remove a potential disease threat. The average weights and feed tool consumption estimates in Table 3 can be used to predict performance

Record of Bird Contact Hours

A daily log of time of visits and the duration of the visit or chores can provide an accurate measurement of the amount of work involved in caring for the birds. Generally, the more time spent with the birds, the greater the understanding of the needs of the birds and, in turn, the better the performance of the birds.

Record of Bird Health

Observations should be made daily to monitor bird health. Any symptoms or lesions such as lack of appetite, eye or nasal discharges, abnormal respiratory sounds (repeated coughing or sneezing), huddling, diarrhea, etc., should be recorded and veterinary advice obtained. In addition, the environmental conditions at the time of observing the symptoms should be recorded. This information helps alert you to potential problems in future flocks and is useful for the diagnosis and treatment of disease problems in the current flock. Veterinary information concerning poultry health can be obtained from your local veterinarian, the Cooperative Extension Service Division of Agriculture specialists or your county agent.

Document the use of water soluble vitamins and/or other medications. This record helps you keep track of the treatments applied to your birds.

Conclusion

Raising broilers and turkeys for show can be a rewarding and learning experience. By planning and preparing a proper environment, selecting a good diet and then following through with consistent care and documentation, the contestant will be on the right track for producing a grand champion bird.

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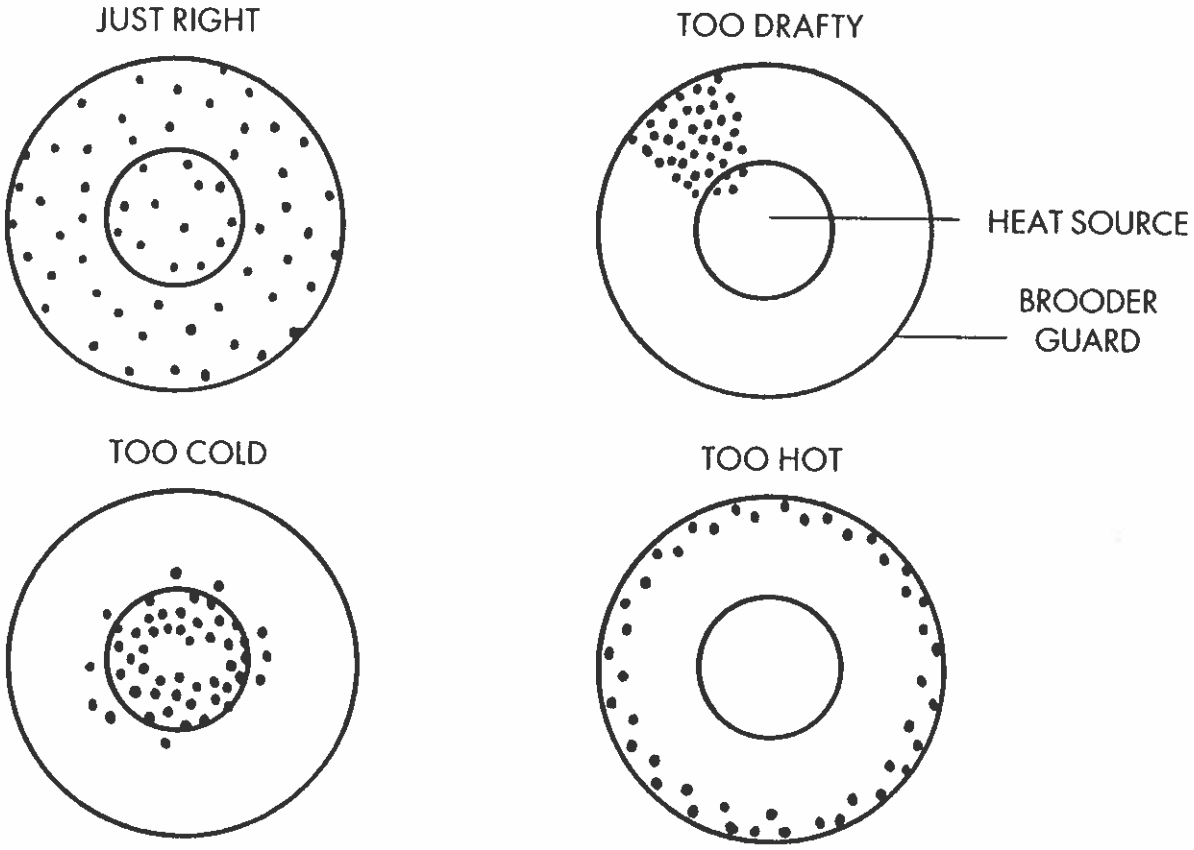
Body Language and Brooder Heat



Health

Chapter 3

Wayne County Poultry Resource Book

Version 1. Published April 2020

ASC-206

University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Common External Parasites of Poultry

Jacquie Jacob and Tony Pescatore, Animal and Food Sciences

A number of parasites attack poultry by either sucking blood or feeding on the skin, feathers, or scales on the skin. Continuous external parasites are those that spend all of their adult life on their host. Temporary parasites feed on but do not live on their host.

Continuous Parasites

Northern fowl mite

The northern fowl mite (*Ornithonyssus sylviarum*) is the most common external parasite in poultry (chickens, turkeys, game birds, pigeons, etc.), especially in cool weather climates. They are commonly spread through bird-to-bird contact. Northern fowl mites are blood feeders. Clinical signs of an infestation will vary depending on the severity of the infestation. Heavy mite infestations can cause anemia due to blood loss. Chickens will have weight loss and decreased egg production, carcass quality, and feed intake. The flock will also be more susceptible to disease.

Check for northern fowl mites around the vent area (Figure 1). Mites can often be seen as tiny white or dark specks moving quickly on the skin. Sometimes, however, the most obvious indication of an infestation is the presence of mite eggs and fecal material.

Northern fowl mites are usually found in poultry flocks during the winter and cooler months of fall and spring. This parasite has been seen on many species of wild birds but is believed to be carried mainly by the English sparrow.

"No mite strips" are an effective way to apply an insecticide to your flock. The strip contains permithrin and as the bird touches the strip the insecticide transfers directly from the surface of the strip to the birds. They are said to provide two years of protection against northern fowl mites. Examples of powdered insecticides include Prozap Insectrin Dust® and PoultryGuard®. Check the label for directions on the use and restrictions. Typical control measures include dusting the birds with a powdered insecticide or adding the powdered insecticide to the litter (10%) or dust bath (20% DE).

For organic producers who are not able to use the products listed above, diatomaceous earth can be used as a preventive measure. Diatomaceous earth (DE) is believed to be a natural insect control powder. DE is obtained from deposits of diatomite, which are the fossilized sedimentary layers of tiny phytoplankton called diatoms. DE is a form of amorphous silica that can kill insects by desiccation, by absorbing the oily or waxy cuticle layer by direct contact. When the thin, waterproof layer is lost, the insect loses water and dies. In addition to its desiccant action, DE works abrasively to rupture insect cuticles.

In addition to DE, a few products are available for use with organic poultry production, such as PyTGanic Pro® which is a pyrethrum-based product. Pyrethrum is a botanical insecticide derived from chrysanthemums. The life cycle of northern fowl mites is five to seven days, so repeated treat-

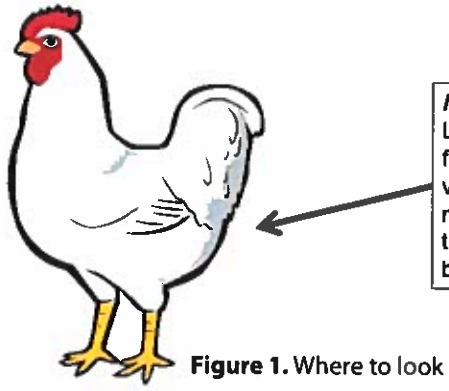


Figure 1. Where to look for northern fowl mites on a chicken

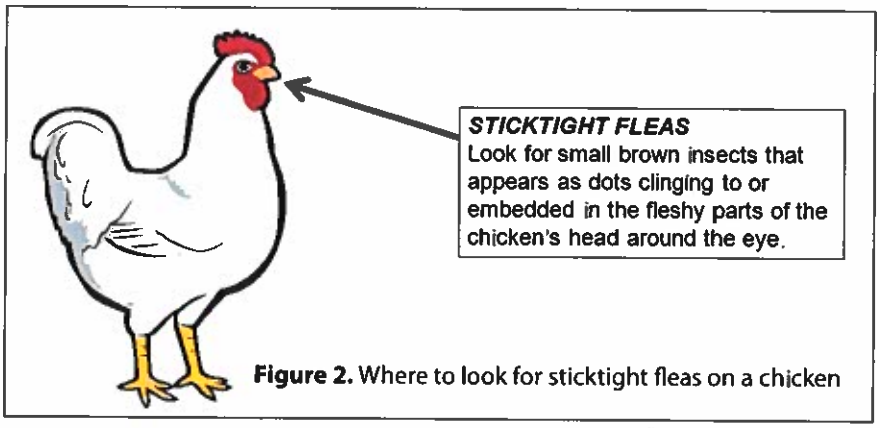


Figure 2. Where to look for sticktight fleas on a chicken

ments may be necessary to eliminate a large infestation. Follow label directions.

Sticktight fleas

Sticktight fleas (*Echidnophaga gallinacea*) are another common external parasite of poultry. Although they are called a "flea" they are stationary compared to most other fleas. They are a burrowing flea; female fleas attach to the skin around the face and wattles to lay eggs (Figures 2 and 3). Ulceration and aggravation of the skin can occur. When the area around the eyes is affected, blindness can result. In severe cases, stick-tight flea infestations can kill young birds.

Sticktight fleas can be transferred to other animals, including dogs, cats, horses and humans.

Sticktight flea larvae develop in the soil around chicken cages and pupate in about two weeks. Two weeks later, adult fleas emerge from the pupae and are free-living until breeding time. Female fleas attach to the skin around the face and wattles of chickens and lay their eggs to continue the life cycle.

Chickens raised in wire cages three or more feet above the ground do not usually become infested with sticktight fleas. One method for treating an infestation is to coat the adults with petroleum jelly. The attached fleas will die within a short period of time,

Figure 3. Chicken with sticktight fleas. *Jacquie Jacob*

but they remain attached to the chickens for an indefinite period (several days or weeks).

Scaly leg mites

Scaly leg mites (*Knemidokoptes mutans*) burrow into and live in the skin under the scales of the feet, causing lifting of the scales and deformity of the feet (Figures 4 and 5).

Chickens raised in wire cages three feet or more above the ground do not usually become infested with scaly leg mites. Prevention is easier than treatment, so inspect new birds before adding them to a flock. Transmission is bird to bird. Scaly leg mites are frequently picked up at poultry shows so treat all chickens return from poultry shows.

Chickens with scaly leg mites can be treated by dipping the legs in linseed oil or petroleum jelly (Vaseline) at seven-day intervals for three weeks. Do not use fuel oil, kerosene, motor oil or other liquid petroleum products on the chickens at any time. The swollen and deformed look to the feet may remain even after the mites are dead. Since most poultry judges consider a scaly leg mite infestation to indicate a lack of proper management by the exhibitor, such chickens should not be shown in poultry exhibits.

Chicken lice

Figure 5. Chicken feet deformed by scaly leg mites. *Jacquie Jacob*

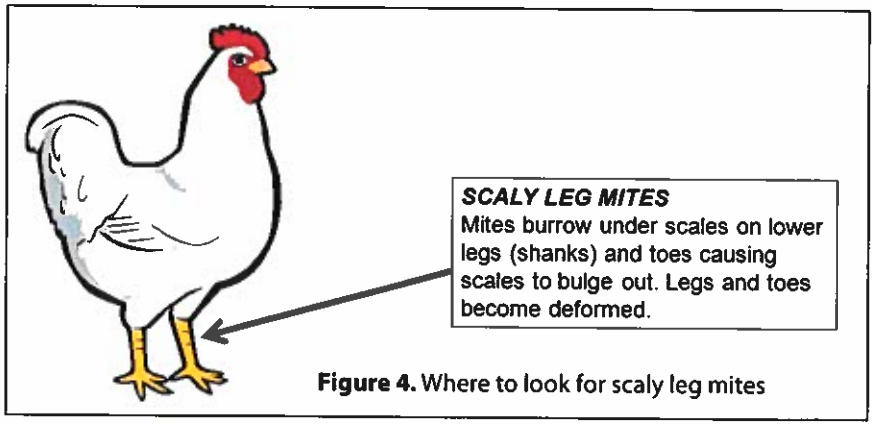


Figure 4. Where to look for scaly leg mites

Chicken body louse (*Menacanthus stramineus*) and the shaft louse (*Menopon gallinae*) are the two species of lice most commonly found on poultry. Lice feed on blood and other fluids of the host, causing birds to become restless and irritated. This adversely affects feed intake, digestion, growth and egg production. Young birds are more seriously affected.

Lice tend to be more abundant in unclean, overcrowded conditions. Pesticides used for northern fowl mites will usually also control lice.

CHICKEN BODY LICE
Look for small, yellow-brown, cigar-shaped, quick moving insects on skin and feathers on breast and under wings.

Figure 6. Where to look for chicken body lice on a chicken

Temporary Parasites

A number of blood-sucking external parasites feed on chickens but do not actually live on them. After feeding they leave the host and hide in the floor and walls of the housing near the host. The three most common are fowl ticks, chicken mites and bed bugs. All are considered rare and are nocturnal feeders. Because they feed only at night it may be hard to detect an infestation unless the birds are examined at this time. None of the parasites move quickly, so they are usually easy to observe on birds and, if necessary, to collect for identification.

Fowl ticks

Fowl ticks (*Argas persicus*) are also known as blue bugs. They are classified as soft ticks and are very different from the hard ticks normally found on cats and dogs. Fowl ticks are light reddish brown to dark brown, and the skin is wrinkled. The adults are usually 6 to 9 mm (0.24-0.35 inches) in length.

Female fowl ticks lay several batches of eggs. They typically lay 30 to 100 eggs per batch, though some batches may contain more than 100 eggs. A female lays several batches of eggs and produces an average of 700 to 800 eggs during her lifetime. A blood meal is needed to produce each batch of eggs. Under favorable conditions, time from egg to adult is approximately 30 days. Adult ticks completely engorge on hosts in 30 to 45 minutes. Adults are extremely resistant to starvation and can live more than a year without a blood meal.

Chicken mites

Chicken mites (*Dermanyssus gallinae*) are also known as red mites or roost mites. They are often confused with the northern fowl mite (*Ornithonyssus sylviarum*). The main difference between the two mites is that the northern fowl mite spends its entire life on the host and the chicken mite does not.

Chicken mites are quite small, but they can be seen with the naked eye. They are typically found in large numbers. The life cycle is fairly complicated, with a series of feeding and non-feeding immature stages. Eggs hatch in about three days, and under favorable conditions the life cycle can be completed in seven to ten days. Adults are resistant to starvation and can live off the host for more than a month.

Bed bugs

Bed bugs (*Cimex lectularius*) are typically found in large numbers. Adults are reddish brown, and the immatures are off-white in color. Females lay eggs in batches of 15 to 60 in the cracks and crevices they occupy. Females lay between 150 to 600 eggs in their lifetime. Time from egg to adult typically ranges from 1 to 4 months although it is not unusual for the time to be much longer. Nymphal stages can withstand long periods of starvation (1 to 5 months) and still survive. Adults completely engorge on hosts in 5 to 10 minutes.

Prevention and Treatment

Damage caused by all three of these temporary external parasites is similar. Birds will have bloody lesions of various sizes depending upon the parasite that fed upon them.

The chicken mite hitches rides on wild birds, rodents and other animals, but it is not known how ticks and bed bugs are spread between flocks.

Changes in poultry housing have almost eliminated these three parasites from commercial flocks. However, they sometimes appear in small flocks of chickens, other poultry, or exotic birds such as parakeets and cockatiels.

Because these pests are rare, it can be difficult to find pesticides labeled specifically for their control. Pyrethroid pesticides can be

used to treat the poultry house. Cracks and crevices, where these pests shelter, should be eliminated, minimized, or sealed. Entry of wild birds and rodents should be prevented with screens and other barriers. Treatment for these parasites must include a thorough cleaning and sanitizing of the poultry house.

Summary

Continuous external parasites of poultry can be detected through a physical examination of the bird. Periodic examination of your flock is recommended so that infestations can be detected early and a larger flock outbreak contained. It is especially important to detect infestations early in food-producing poultry because there are restrictions on the treatments available for these flocks. It is also important to remember that many of the external parasites live part of their life cycle off the bird in the environment so these areas should be treated during an outbreak as well.

Revised 9-2017

Nutrition

Chapter 4

Wayne County Poultry Resource Book

Version 1. Published April 2020

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, LEXINGTON, KY, 40546
ASC-191

How Much Will My Chickens Eat?

Jacquie Jacob and Tony Pescatore, Animal and Food Sciences

Introduction

Before purchasing chicks (or chickens) it is important to consider the cost of keeping them. Much of this cost is in the feed they consume. So the key question is, "How much will my chickens eat?" Chickens need a complete feed that contains protein (with the right balance of amino acids), energy, vitamins, and minerals. Today we know more about the nutritional requirements of chickens than any other animal. The amount of feed they need will depend on several factors.

Breed of Chicken

All the different breeds of chickens are descended from the red jungle fowl of Southeast Asia. After generations of genetic selection, chickens now come in many different shapes and sizes. Wild jungle fowl have a mature body weight of 2 pounds and lay about 10-12 eggs per year during the breeding season. Today we have meat-type breeds (known as "broilers") that reach over 4 pounds in about six weeks and egg-type breeds that lay almost 300 eggs a year.

Typically the larger the chicken the more feed they eat. Part of the feed is used to maintain the health and condition of the chicken. Maintenance refers to the energy required for activities such as scratching and walking, digestion, respiration, circulation, maintaining body temperature etc. The remaining energy and nutrients in the feed are then available for growth and/or egg production.

The larger the chicken the more maintenance it requires. For example, standard-size chickens require more feed than their bantam versions. Similarly, brown-egg laying hens tend to be bigger than the commercial white-egg laying strains (leghorns) and thus eat more feed.

Age

As with children, the nutritional needs of growing chickens change with age. For example, the protein requirement of chicks is higher than that of adults. The amount of feed a chicken can actually eat also changes as they get older.

Sex

Because male chickens are typically larger than their female counterparts, they have higher nutrient needs. For example, male broiler chickens typically grow faster than female broilers. When feeding a straight-run flock (both male and female chickens), it is common to formulate feeds to meet the average nutritional requirement. This method often leads to supplying more nutrients than the female chickens require while not feeding enough for the male chickens to achieve their potential growth. Similarly, roosters are not producing eggs so their nutrient requirements are not as high as their female counterparts in a flock producing hatching eggs.

Production Level

Hens that are producing eggs have higher nutritional requirements than those that are not in production. The main nutrients of concern are calcium and phosphorus since they are major components of egg shells. Growing meat-type chickens require more protein than growing pullets of egg-laying breeds.

Type of Feed

When nutritionists formulate diets for laying hens they start by setting a dietary energy level. Animals typically eat to meet their energy needs—that is, they will eat more of a low-energy feed than they will of one high in energy. Modern broiler strains are not as good at regulating feed intake but are more able to select different feedstuffs to create their own balanced diet. This method is known as "cafeteria feeding."

Poultry feeds can be given as a mash, crumble, or pellet. Layers typically are fed a mash feed. Commercial-broiler feeds are pressed into pellets, which concentrate the nutrients into a single bite. Broiler chickens can eat more of a low-energy feed when it is pelleted. The heat involved in pelleting feed improves the digestibility of many ingredients, especially rye, wheat, and barley. Pelleting also helps destroy any salmonella that may be present in the feed. Pelleting also results in less feed spillage and, thus, less waste.

Water Consumption

Chickens typically require twice as much water as feed—so if they eat 1 pound of feed they will drink 2 pounds of water (1 quart). An exception is that in healthy adult chickens, feed consumption decreases as room temperature increases above 68°F while water intake remains the same up to 77°F then increases at higher temperatures. Water consumption also increases slightly when the feed is pelleted. Increasing the protein content of feed also increases water intake.

It is important the chickens have sufficient access to water and that all the chickens can drink without having to fight for space to do so. If water intake is restricted it will restrict feed intake as well. Often a sudden drop in feed consumption can be traced to a problem with the watering system.

Health Status

While feed and water intakes are reduced during an illness, the ratio between the two typically remains the same. Most chickens with a serious illness will stop eating but may continue to drink. So when giving a medication to sick chickens it is best to give it in the water.

Management

Several management factors will affect feed intake. Pasture-raised or free-range chickens are more active and will therefore have higher energy needs. As a result, they will typically eat more feed.

It is important that all the chickens can eat at one time. Therefore, there must be enough feeder space so all the chickens can reach the feed at the same time. If there is insufficient feeder space, the smaller and/or weaker chickens will not get enough to eat. In addition, lack of feeder space can lead to body scratching and cannibalism.

The number of hours of light available each day also will affect daily feed consumption, especially if feeder space is limiting.

Temperature

As previously mentioned, chickens typically eat less when it gets hotter, especially with temperatures higher than 86°F. It is for this reason that higher energy diets (referred to as being "more dense") are fed since it allows the chickens to meet their nutritional requirements with reduced feed intake.

Meat Chickens

Through conventional breeding programs today's commercial broiler chickens grow fast with high feed efficiency. Broilers are typically allowed to eat as much as they want to maximize their growth potential. However, because broilers do grow fast, it is possible to limit feed intake for the first two weeks (by limiting hours of light) so that their skeletal system can be more developed before muscle weight is added.

Many people incorrectly believe that commercial chickens are fed hormones. Hormones are illegal in the United States (and most of the world) and are not required. The fast growth rate of broiler chickens was achieved through improved breeding programs, nutrition and management. Anyone labeling their chicken as "no hormones added" is required by law to add the statement, "Federal regulations prohibit the use of hormones."

Table 1 indicates the typical body weights and feed consumption of broiler chickens when fed a commercial-type diet. Broiler chicks grow fast for the first four to five weeks. After that the amount of weight they add each week decreases. Feed consumption, however, typically continues to increase. As a result, feed efficiency declines as the chick ages. This information can be used to determine the most economical market weight. A body weight will be achieved where the income from the increased meat production is not sufficient to cover the cost of the additional feed consumed.

Expect to feed more to slower-growing strains of chickens that are used for meat production. With the commercial broilers it takes less than seven weeks to raise a 5-pound chicken. By comparison, it takes 11 weeks to raise the slower-growing strains to the same weight. Slower-growing chickens are considered better for range production, but the increased feed costs must be taken into account when determining production costs.

Pullets

Chicken breeds selected for egg production have a smaller body frame than those selected for meat. They also have a slower growth rate. As a result their feed consumption per week is less. In addition, breeds selected for white-shelled eggs are typically smaller than those breeds for brown-shelled eggs. Table 2 compares the typical growth rate and feed consumption of commercial leghorn pullets with pullets of a dual-purpose breed.

Throughout the growth of the replacement pullets the dual-purpose pullets have heavier weekly body weights and consume more feed than commercial-type pullets. It should be noted that the amount of feed consumed is influenced by the energy level of the diet fed. The data in Table 2 are based on diets with 1,270-1,315 kcal of metabolizable energy (ME) per pound feed. If a low energy diet is fed, feed consumption will be higher.

Egg Layers

A few poultry genetics companies have developed strains for alternative production systems. As an example, Centurion has two Bovans—one that lays white-shelled eggs and the other brown-shelled. Again the pullets that were bred for brown-shelled eggs are heavier and consume more feed than those bred for white-shelled eggs.

Regardless of the variety raised, when properly managed (housing, diet, light, nutrition, etc.) there is a rapid increase in egg production within the first few weeks of egg production until a peak is

Table 1. Typical Body Weight and Feed Requirements of Broiler Chickens.[1]

Age (weeks)	Body weight (lb)			Weekly feed (lb)			Cumulative feed (lb)		
	Male	Female	Average	Male	Female	Average	Male	Female	Average
1	0.34	0.32	0.33	0.30	0.29	0.29	0.30	0.29	0.29
2	0.83	0.76	0.79	0.64	0.60	0.62	0.94	0.89	0.91
3	1.51	1.36	1.44	1.07	0.98	1.03	2.01	1.87	1.94
4	2.39	2.13	2.26	1.55	1.42	1.48	3.56	3.28	3.42
5	3.47	2.96	3.22	2.12	1.63	1.87	5.68	4.91	5.30
6	4.60	3.84	4.22	2.52	2.21	2.36	8.19	7.12	7.66
7	5.71	4.70	5.21	2.82	2.38	2.60	11.02	9.50	10.26
8	6.78	5.52	6.15	3.16	2.57	2.86	14.18	12.07	13.12
9	7.83	6.27	7.05	3.48	2.75	3.11	17.65	14.82	16.23

[1] Broiler chickens: Fed well-balanced diets providing 3,200 kcal ME/kg (1,452 kcal ME/lb).

reached. Production slowly declines after that. Eventually the level of egg production is not sufficient to cover the cost of production.

Hens laying brown-shelled eggs typically lay a larger egg than those laying white-shelled eggs. Egg weight slowly increases over the production cycle. Egg weight is related to body weight so that heavier hens lay larger eggs. In summer, if the heat goes up, the hens eat less and lose weight. As a result, during the summer hens typically lay smaller eggs.

A good rule of thumb is that each laying hen will eat a quarter pound of feed daily.

Table 2. Typical Average Body Weight and Weekly Feed Consumption for Replacement Pullets.

Age (weeks)	Leghorn (white-egg layers)[1]			Dual-purpose (brown-egg layers)[2]		
	Body Weight (lb)	Feed (lb)	Cumulative Feed (lb)	Body Weight (lb)	Feed (lb)	Cumulative Feed (lb)
0	0.08	0.22	0.22	0.08	0.30	0.30
2	0.22	0.62	0.84	0.26	0.70	1.00
4	0.57	1.14	1.98	0.72	1.24	2.24
6	0.99	1.50	3.48	1.10	1.54	3.78
8	1.46	1.58	5.06	1.65	1.68	5.46
10	1.65	1.68	6.74	1.98	1.76	7.22
12	2.16	1.76	8.50	2.43	1.86	9.08
14	2.43	1.86	10.36	2.73	1.98	11.06
16	2.69	1.90	12.26	3.04	2.08	13.14
18	3.03	1.98	14.24	3.31	2.20	15.34
20	3.25	2.20	16.44	3.53	2.42	17.76

[1] Leghorns: Fed well-balanced diet with 2,850 kcal ME/kg (1,293 kcal/lb) 0-12 weeks of age and 2,900 kcal ME/kg (1,315 kcal ME/lb) 12-20 weeks of age.

[2] Dual-purpose/brown-egg laying strains: Fed well-balanced diet with 2,800 kcal ME/kg (1,270 kcal/lb) 0-12 weeks of age and 2,850 kcal ME/kg (1293 kcal ME/lb) 12-20 weeks of age.

Chicken Feed Cheat Sheet

Assuming a 50-pound bag of feed, the typical feed requirements are as shown below.

For chicken meat production:

(50 chickens)

Commercial-type broilers

To produce 3-pound chickens..... 5-6 bags
To produce 4-pound chickens..... 7-8 bags
To produce 5-pound chickens.... 10-11 bags
To produce 6-pound chickens.... 13-14 bags
To produce 7-pound chickens.... 16-17 bags

Slow-growing broilers

To produce 3-pound chickens..... 5-6 bags
To produce 4-pound chickens.....9-10 bags
To produce 5-pound chickens.... 12-13 bags

For raising replacement pullets for egg production:

(25 pullets)

Commercial white-shell egg layer
to 18 weeks of age ..... 7 bags

Dual purpose type breed
to 20 weeks of age ..... 9 bags

Commercial brown-shell egg layer
to 18 weeks of age ..... 7 bags

For egg production:

(25 hens)

Commercial white-shell egg layer
3-3½ bags each month

Dual purpose-type hens
4-4½ bags each month

Commercial brown-shell egg layer
3-4 bags each month

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University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Reading a Feed Tag

Jacquie Jacob and Tony Pescatore, Animal and Food Sciences

Feed stores carry a variety of feed types. How do you chose which to buy? You need to read the feed tag. A lot of information is on a feed tag that can help you make your selection.

Product Name

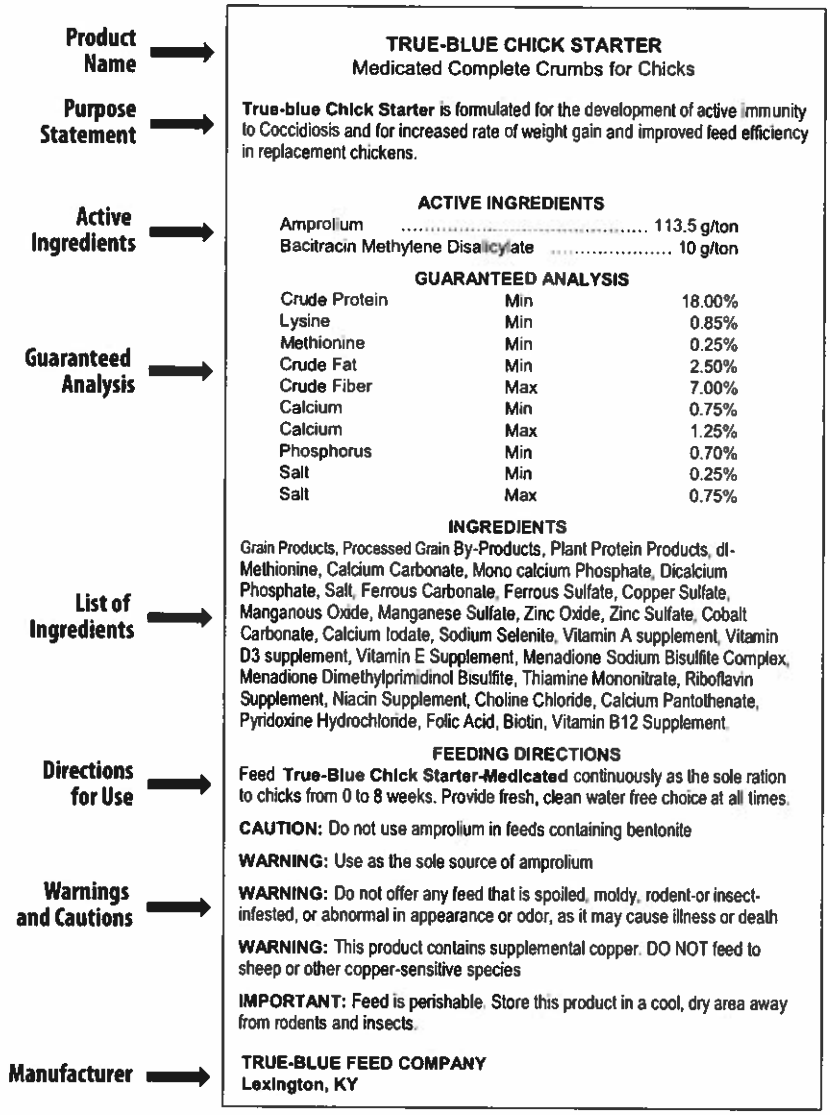
Each feed typically has a name, often specific for the company manufacturing it. Sometimes this name is a company specific trade name such as "Meat Maker." Typically the name gives an indication of which animals the feed was designed for, such as "Chick Starter" or "Layer Feed." If the feed is medicated, this should be indicated right under the product name. The product name should also include whether the feed is in a mash, pellet, or crumbled form.

In the feed tag example, the product name is "True-Blue Chick Starter." Note that it clearly states under the name that it is a medicated feed.

Feed can be in the form of a mash, pellets or crumbles. Pelleting helps to reduce feed wastage and has been shown to improve broiler growth performance. Most pellets are too big for young birds so they are broken down into crumbles. Most feed tags will indicate the form of the feed they contain, but not always. If the form is not indicated, assume it is in mash form. It costs money to pellet a feed, so if the manufacturer has done so they typically indicate it on the tag. In the feed tag example, the feed is crumbled.

Purpose Statement

Nutritional requirements of the different poultry species (chickens, turkeys, ducks, etc.) vary considerably. In addition, for specific species the nutrient requirements will vary depending on the age and production level of the individual birds. For example, feed for a broiler chicken is designed for rapid growth and is higher in protein than a feed designed for a laying hen. The calcium content of a layer diet would be higher than that of a broiler diet.



Medication Information

A variety of medications can be used in poultry feeds. The medication information will indicate the specific medication included in the feed, and at what level. It is important to pay attention to this part of the tag since some medications can be included in the feed for one species but should not be fed to others. For example, waterfowl should not be fed medicated chick feeds. Ducklings typically eat more feed than chicks. Some of the medications in chicken feed can be harmful if consumed in large amounts by waterfowl.

For those wishing to raise poultry without antibiotics or other medications it is important to know what to look for. The tag will not necessarily say it contains an antibiotic. Instead, it will list the name of the drug. In the feed tag example, Bacitracin has been added. Other examples of antibiotics include chlortetracycline, erythromycin, neomycin, oxytetracycline, streptomycin, tylosin, and virginiamycin. Similarly, some feeds contain a medication called a coccidiostat to control coccidiosis. Examples include amprolium and monensin. In the feed tag example, amprolium has been added for this purpose.

Guaranteed Analysis

The guaranteed analysis does not indicate specific levels of a nutrient in the diet. It simply indicates maximum and/or minimum levels. This allows the feed manufacturers to use the same feed tags regardless of the formulation used. Feeds are formulated on a least cost basis. As the prices of different ingredients increase or decrease, the levels of inclusion in the diet will change. For example, if the cost of corn increases dramatically, the feed manufacturer may include more barley or wheat as alternative energy sources. This may change the nutrient content slightly, but they will stay within the ranges indicated on the feed tag.

For example, the minimum level of **crude protein** is listed on poultry fed tags. Protein is added to poultry diets as a source of the amino acids needed for maintenance, growth and/or egg production. Animals synthesize a variety of different proteins from 22 amino acid building blocks. Animals are able to produce some of the amino acids in the levels required, but not all of the amino acids. Amino acids which cannot be synthesized by the bird are known as essential amino acids and they must be supplied in the diet. **Lysine** and **methionine** are two essential amino acids that should be listed. The example feed tag indicates the feed has a minimum of 18 percent crude protein, with minimum levels of 0.85 percent and 0.25 percent lysine and methionine, respectively.

Fat is an important source of energy in the diet, providing nearly 2.5 times as much energy per pound as carbohydrates (starch) and protein. Unfortunately, the level of energy in the diet is not indicated on a feed tag, but the higher the minimum level of **crude fat** in the diet typically the higher the energy level, although this is not always the case. The higher the dietary energy level the lower the amount of feed that needs to be eaten to meet the energy requirement of the birds being fed. The example feed tag indicates there is a minimum of 2.5 percent fat.

Crude fiber has been used as the industry standard for the level of fiber in poultry diets. Fiber is typically poorly digested by non-ruminants such as poultry and swine. The example feed tag indicates a maximum of 7 percent crude fiber.

Calcium and **phosphorus** are important minerals involved in a number of biological functions, including bone development and egg shell formation. The analysis usually indicates the minimum levels of these two macro-minerals. On the example feed tag, calcium content is guaranteed to be between 0.75 percent and 1.25 percent. The phosphorus content is guaranteed to be above 0.70 percent.

Salt is composed of sodium and chloride, both of which are essential minerals for poultry. Adding too much salt to the feed will result in increased water consumption, resulting in wet litter. Wet litter can lead to air quality problems in the poultry house, especially with regards to ammonia. Salt is one compound for which both maximum and minimum levels are given. On the example feed tag, there is betweeb 0.25 percent and 0.75 percent salt.

Ingredient List

The major ingredients in a feed may be listed individually or may be represented by a collective term such as animal protein products, plant protein products, grain products, etc. Collective terms make it easier for feed manufacturers to vary ingredients depending on the price of feed ingredients without having to create a new feed tag each time they mix feed.

Animal Protein Products

The harvesting of livestock and poultry for food production in North America results in the production of nearly 50 billion pounds of by-product material not used in human foods. These materials are used by the rendering industry to produce an important protein by-product for poultry. The rendering process breaks down tissues into protein-rich products that have no

resemblance to the original material. The cooking process controls bacteria while preserving the nutrients, resulting in a safe, nutritious animal feedstuff.

Meat meal is produced by rendering meat trimmings, inedible parts and organs, and fetuses. The materials are rendered (cooked) to produce a nutritional and economical feed ingredient which recycles these waste materials. Blood, hair, hoofs, horns, manure, stomach contents and hide trimmings are *not* included in meat meal. When bones are added to the meat it becomes **meat and bone meal**. Beef and pork by-products account for more than 80 percent of all products produced. If these by-products were not recycled into animal feeds they would have to be disposed of in landfills, causing environmental problems.

Fishmeal is another animal protein product included in poultry diets. Several species of fish can be processed into fishmeal, with Menhaden accounting for 90 percent of fishmeal production in the United States. Antioxidants must be added to fishmeal to stabilize the fat it contains and prevent it from spoiling during transportation and storage. Fishmeal is an excellent source of the essential amino acids lysine, methionine and tryptophan.

Poultry by-product meal is an animal by-product of poultry processing. It is made from grinding rendered parts of poultry carcasses and can contain bones, offal, and possibly undeveloped eggs. The only feathers that would be present would be those that are unavoidable in the processing of the birds. The feathers are used in a specific feedstuff, **feather meal**.

Plant Protein Products

Soybeans contain "anti-nutritional" factors that are destroyed by heat. As are result, if whole soybeans are used they must be roasted first. The main protein source used in American poultry diets is soybean meal. The oil extraction process is sufficient to destroy the anti-nutritional factors in the soybeans. Additional oilseeds that can be used whole or as an oilseed meal include canola, sunflower seeds, peanuts, cottonseed, flax, and sesame seed.

Additional ingredients that can be added to poultry diets as a source of protein include fava beans, field peas, lentils, and lupins. Buckwheat, though not a true cereal, can also be included as both a source of protein and energy.

Grain Products

Cereals are typically added to poultry diets as the main energy source. Possible grains include corn (most common), barley, wheat and sorghum. Less commonly used grains included rye, oats, and triticale.

Processed Grain By-products

Several by-products of grain milling can be used in poultry diets. Typically they are by-products of corn or wheat milling. Common by-products of corn milling include hominy, corn gluten feed, and corn gluten meal. Similarly, by-products from wheat milling include wheat bran, wheat germ meal, wheat red dog, wheat mill run, and wheat middlings. In addition, today corn is used as a source of carbohydrates for ethanol production. A by-product of ethanol production from corn is distillers dried grains with solubles (often referred to as DDGS). Similarly, a by-product from producing beer from barley is brewers dried grains, another possible ingredient for poultry diets.

Additional Ingredients

Feed tags often have several ingredients which provide specific vitamins or minerals. Examples include dicalcium phosphate, choline chloride, and riboflavin.

The list of ingredients typically includes ethoxyquin which is added to the feed as a preservative. Without ethoxyquin, or some other antioxidant, feeds will spoil quickly.

Directions for Use

Feed tags also include directions indicating which species of poultry the feed is intended for, such as chick starter. The example feed tag indicates that it should be fed to chicks for the first eight weeks of life. The tag also reminds producers that fresh, clean water must be available to the flock at all times.

Cautions and Warnings

If a feed is medicated the tag has warnings or cautions related to its use. It is important to note these warnings, especially if multiple species are kept in the same enclosure.

The example feed tag indicates that amprolium is included. Additional amprolium should not be given, typically in the water. This could exceed the safe intake of amprolium. The feed also contains copper so should not be fed to sheep or other species that are sensitive to copper. Some of the warnings are generic such as do not use spoiled feed.

Manufacturer

The last thing that is typically indicated on the tag is the manufacturer's name and location. In the example feed tag, the feed is manufactured by the True-Blue Feed Company in Lexington, KY.

Read the following feed tag and answer the following questions:

1. What is the name of the feed?
2. What form is the feed in?
3. What species and type of poultry should this feed by given to?
4. Is the feed medicated? If so, what is the medication and its purpose?
5. What precautions must you taken when using this feed?
6. What level of crude protein is guaranteed?
7. What two amino acids are listed in the guaranteed analysis?
8. Has fat been added to the diet? If so, what kind?
9. Is there an antioxidant added to the feed? If so, which one(s)?

DUCK, GOOSE AND CHICK STARTER/GROWER

For immature ducks, geese and chickens

GUARANTEED ANALYSIS

Crude Protein	Min	20.0%
Lysine	Min	1.10%
Methionine	Min	0.40%
Crude Fat	Min	4.0%
Crude Fiber	Max	5.0%
Calcium	Min	0.6%
Calcium	Max	1.1%
Phosphorus	Min	0.75%
Salt	Min	0.2%
Salt	Max	0.7%

INGREDIENTS

Grain Products, Processed Grain By-Products, Plant Protein Products, Animal Protein Products, Forage Products, Animal Fat (Preserved with BHA and Citric Acid), L-Lysine, Methionine supplement, Calcium Carbonate, Salt, Monocalcium/Dicalsium phosphate, Ferrous Suflate, Maganous Oxide, Zinc Oxide, Copper Sulfate, Iron Oxide, Ethylenediamine Dihydroioxdid, Sodium Selenite, Folic Acid, Vitamin D3 Supplement, Vitamin A Supplement, Choline Chloride, Niacin, Vitamin E Supplement, Menadione Dimethylpyrimidional bisulfite, Vitamin B12 Supplement, Calcium Pantothenate, Riboflavin, Biotin, Pyridoxine Hydrochloride, Thiamine, Propionic Acid, Natural Terpinenes, Acetic Acid, Sorbic Acid, Benzoic Acid, Mono- and Diesters of 1,2 Propanediol, Sodium Phosphate, Amorphous Silica, Propyl Benzoate, Propylparaben, Methylparaben, Propyl Acetate, Butylated Hydroxyanisole, Ethoxyquin (A preservative), Sodium Silco Aluminate

DIRECTIONS FOR USE

Feed **DUCK, GOOSE, AND CHICK STARTER/GROWER as the sole food to ducks and geese form 1 day of age until slaughter or supplemental food is no longer required. Beyond three weeks of age, supplemental grain and (or) forage may be used to meet a portion of their food needs.**

Producers desiring to raise chickens without use of medication may want to feed DUCK, GOOSE AND CHICK STARTER/GROWER from day 1 to slaughter or market.

TRUE-BLUE FEED COMPANY
Lexington, KY

Summary

- It is important to buy the right feed for your flock.
- The feed tag will tell you what type of feed it is and to which species it can be fed.
- The nutrient levels given in the feed tag can be used to compare one feed to another and help in selecting the best feed for your flock.
- Be careful with medicated feeds, noting any precautions or warnings on the feed tag.
- Feed is perishable, even with added ethoxyquin, so it is important to store the feed in a cool, dry area away from rodents and insects.

Answers:

1. Duck, goose and chicken starter/grower
2. Not indicated so probably mash
3. Immature ducks, geese and chicks
4. No
5. None indicated
6. 20 percent
7. Lysine and methionine
8. Yes, animal fat
9. Yes, ethoxyquin, BHA and citric acid

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Common Feed Ingredients in Poultry Diets

articles.extension.org/pages/68432/common-feed-ingredients-in-poultry-diets

***Written by**: Dr. Jacquie Jacob, University of Kentucky*

The major ingredients in poultry diets provide the protein and energy required for poultry to maintain health, grow, and produce eggs. (For more information about the nutritional requirements of poultry Refer to the article "Basic Poultry Nutrition.")

Energy Sources

Common energy sources in poultry feeds include cereals and fats and oils.

Cereals

Cereals are grasses that produce edible starchy grains, many of which can be used in poultry diets as an energy source. Although the starch in corn is highly digestible, most of the other grains contain **antinutritional factors** that interfere with digestion and/or the absorption of nutrients. These antinutritional factors include the **nonstarch polysaccharides**, often referred to as NSPs. NSPs cannot be broken down by the digestive enzymes poultry normally secrete in the small intestine (referred to as endogenous enzymes). As a result, the NSPs gel, increasing the viscosity of the intestinal contents. The increased intestinal viscosity reduces the availability of the nutrients in the feed. In addition, the presence of NSPs typically results in sticky droppings, which increase the moisture content of the litter. Litter that has a high moisture content can adversely affected air quality within the poultry house.

- **Barley** is commonly used in poultry diets in some regions of Canada and Europe. This cereal is grown on areas of both irrigated and dry land in the United States. It is an early-maturing crop that offers agronomic advantages when used in crop rotation. Barley is considered a medium-energy grain. It has a low starch content, a high fiber content, and some antinutritional factors.

- **Corn**, also called maize, is native to the Americas and was first cultivated by the American Indians. The corn plant is efficient at converting large amounts of sunlight into stable forms of chemical energy stored as starch, cellulose, and oil. Corn is the grain most routinely used in commercial poultry diets in the United States because it has a good energy content and is easy to digest. The amino acid profile of the protein in corn complements the amino acid profile of the other ingredients, such as soybean meal, typically used in feed. Alternative grains are typically evaluated in relation to corn.

- **Sorghum**, also called milo and guinea corn, is a highly drought-resistant crop that is grown in many areas of the world, including the United States. Sorghum is only 3% to 5% lower in feeding value than corn. It is often less expensive than yellow corn. The level of tannins in sorghum limit its use in poultry diets. However, tannin-free varieties are now available, and as a result, sorghum can be substituted for corn in poultry diets with only minor changes in the amounts of other ingredients.

- **Wheat** is often used in poultry diets in western Canada and parts of Europe. The husk of wheat detaches from the grain during threshing (unlike conventional barley and oats where the husk remains attached) reducing its fiber content.

Fats and Oils

Fats and oils provide a concentrated source of energy. Sources of fat include the following:

- **Tallow:** Derived primarily from the rendering of beef offal
- **Lard or choice white grease:** Derived primarily from the rendering of pork offal
- **Poultry fat:** Derived from poultry offal
- **Feed-grade animal fat:** Derived primarily from a mixture of rendered beef, pork, and/or poultry raw material
- **Yellow grease:** Derived primarily from reprocessed restaurant grease and cooking oil
- **Blended animal-vegetable fat:** Includes blends of different types and amounts of animal fats and vegetable oils from restaurant grease

In addition to providing concentrated energy, fats provide the following benefits:

- Improved physical characteristics of feed
- Decreased dustiness (feed loss is reduced by effective dust control)
- Improved palatability of feed
- Increased lubrication value of feed
- Reduced particle separation, which helps maintain a uniform mixture of each ration
- Possible contribution of linoleic acid, an essential fatty acid

Protein Sources

The many possible protein sources for poultry feeds include the following:

- Canola
- Fish meal
- Field peas
- Meat and bone meal
- Soybeans
- Cereal by-products

Canola

Canola is a variety of rapeseed that is low in glucosinolates in the oil and eruric acid in the meal. The name *canola* was coined to distinguish the plant from rapeseed, though in Europe canola is often referred to as double-zero rapeseed. Canola meal is a by-product of oil extraction from canola seeds.

Fish Meal

There are two basic types of **fish meal**. The first type is derived from fish, such as salmon and tuna, caught specifically for human consumption. The second type is derived from fish, such as herring, menhaden, and pollack, caught specifically for the production of fish meal. In the United States the fish most often used for fish meal is menhaden.

Field Peas

Peas are grown in temperate regions but are used as a food source worldwide. Traditionally peas rejected from the food industry were used in poultry diets. Now there are varieties of field peas grown specifically for animal feeds. Different varieties of field peas are available.

Meat and Bone Meal

Meat and bone meal are derived from slaughter by-products recycled for use in animal feeds. They are pressure cooked (rendered) to produce a nutritional and economical feed ingredient.

Soybeans

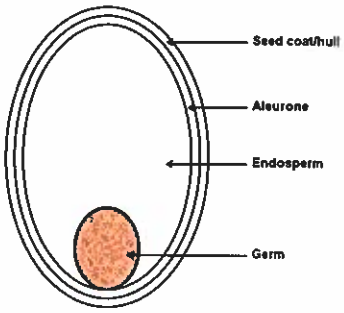
Soybean meal is the dominant protein supplement used in poultry diets and is considered the standard to which alternative sources of feed protein sources are compared. Soybean meal has a high protein content, especially compared to other plant protein sources.

Cereal By-Products

Many of the cereal grains used as animal feed are also used for human consumption or the development of industrial products. The grains are cleaned and then either dry or wet milled. Dry milling removes the outer fibrous coating of the seed and is used in the production of flour. Wet milling is used in the production of sugar, starch, syrup and/or oil. Many of the by-products of both dry and wet milling are suitable for inclusion in poultry feeds.

Understanding the by-products generated by dry and wet milling requires a basic understanding of the parts of the cereal grain. All grains have four basic parts: seed coat, aleurone, endosperm, and germ.

Diagram by Jacquie Jacob, University of Kentucky



The **seed coat** can exist in the form of a hull. For those cereals without a hull, the seed coat is in the form of the pericarp. The function of the seed coat is to protect the grain from moisture, insects, and fungal infection. The seed coat must be broken to allow for the digestion of the nutrients contained within the seed. The seed coat does not supply nutritional value, but depending on the particular type of cereal, the seed coat can dilute the amount of starch in the diet. In oat grains, for example, the hull represents 25% of the seed (on a dry matter basis). In sorghum, however, the seed coat represents only 3% to 6% of the grain weight and has little effect on the nutritional value of the grain.

The **aleurone** is a layer surrounding the endosperm. The **endosperm** is the location of most of the starch, which provides energy to the animals consuming it and is also the source of flour. The aleurone contains fiber and protein. The **germ** is the embryo of the seed and the location of protein and oil.

Common Cereal By-Products

- **Grain hulls** are the outer covering of the grain seed. The most common hulls are from oats and rice milling. Grain hulls are low in energy and crude protein but high in crude fiber. Hulls are typically classified as roughage and not widely used in feeds for poultry that require growth or high production.

- **Bran** is the coarse outer covering of a seed. It also contains a little of the flour. The most common brans are corn, rice, and wheat. Nutritionally, bran contains fiber and protein.
- The **germ** is the embryo of the seed. Germ meal is high in lipids and protein. The most common feed germ meals are derived from corn and wheat.
- **Gluten feed** and **gluten meal** are by-products of wet milling. Gluten is the substance remaining after removal of the germ and the starchy endosperm. Gluten feed and meal are considered protein sources. The most common cereals used in gluten feed and meal are corn and sorghum.
- **Middlings** (also referred to as midds) are by-products from the production of flour. They include the bran, shorts, germ, flour, and tailings. Rye and wheat are the most common middlings available. The maximum allowed levels of crude fiber in rye and wheat middlings are 8.5% and 9.5%, respectively.
- **Grain screenings** are a mixture of different materials that contain a minimum grain content of 70% and a maximum ash content of 6.5%. Grain screenings can include various combinations of dust, chaff, weed seeds, broken grains, unsound grains, and any other materials separated during the cleaning and processing of the grain. **Mixed screenings** must contain no more than 27% crude fiber and 15% ash.
- **Groats** are the grain seeds without the hull. The most common are oat and rice groats. Groats have a relatively low crude fiber content and contain a higher percentage of protein than the original grain.
- **Mill run** (also known as mill by-product) consists of bran, shorts, germ, flour, and tailings. It is a by-product of most of the cereal grains. There are specific minimum crude fat and maximum crude fiber limits that mill runs can contain, and these requirements vary depending on the cereal grain involved.
- **Corn hominy feed** includes corn bran, germ, and flour. It contains a higher percentage of both crude protein and fiber than the original corn grain. Compared to other by-products, however, corn hominy feed is lower in crude fiber content. Hominy feed must contain at least 4% crude fat.
- **Barley malt sprouts** are by-products from the malting industry. They are classified as a protein source and must contain a minimum of 24% crude protein. Malt sprouts consist of roots, sprouts, and malt hulls.
- **Rice polishings**, as the name suggests, are the residue created when polishing to produce white rice (versus brown rice). Rice polishings are low in crude fiber are high in crude fat and are a good source of the vitamin thiamin.
- **Wheat red dog** is a by-product of milling wheat and includes tailings with some bran, germ, and flour. The maximum allowed fiber content is 4%.
- **Wheat shorts** are also a by-product of wheat milling and consist of bran, germ, flour, and tailings. The maximum crude fiber content for shorts is 7%.

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, LEXINGTON, KY, 40546

ASC-203

Avian Digestive System

Jacquie Jacob and Tony Pescatore, Animal Sciences

An understanding of the avian digestive system is essential to developing an effective and economical feeding program for your poultry flock. Knowledge of avian anatomy, and what the parts normally look like, will also help you to recognize when something is wrong and take the necessary actions to correct the problem.

The digestive tract of any animal, including chickens, is important in converting the food the animal eats into the nutrients their body needs for maintenance, growth, and production (such as eggs or meat). Once food is eaten, it must be broken down into its basic components. This is done through both mechanical and chemical means.

- **Mechanical action** typically involves chewing, but since birds do not have teeth other mechanical methods are used.
- **Chemical action** includes the release of digestive enzymes and fluids from the stomach, pancreas and liver.

Once the nutrients have been released from food during digestion, they can be absorbed and distributed throughout the animal's body. The digestive tract is also referred to as the gastro-intestinal or GI tract. Whichever term is used, in birds it begins at the **mouth** and ends at the **cloaca** and has several important organs in between (see the Figure 2).

Beak / Mouth: Chickens, as with most birds, obtain feed with the use of their **beak**. Food picked up by the beak enters the mouth. As previously mentioned, chickens do not have teeth so they are not able to chew their food. The mouth does contain glands which secrete saliva which wets the feed to make it easier to swallow. The saliva also contains some enzymes which start the digestion of the food eaten. The chicken's **tongue** is then used to push the feed to the back of the mouth so that it can be swallowed.

Esophagus: The esophagus is a flexible tube that connects the mouth with the rest of the digestive tract. It carries food from the mouth to the crop and from the crop to the proventriculus.

Crop: The crop is an out-pocketing of the esophagus and is located just outside the body cavity in the neck region (see Figure 3). Any swallowed feed and water is stored in the crop until it is time to pass it on to the rest of the digestive tract. When the crop is empty, or nearly empty, it sends hunger signals to the brain so that the chicken will eat more.

Although salivary glands of the mouth secrete the **digestive enzyme** amylase very little digestion actually takes place in the crop – it is primarily a temporary storage pouch. The crop evolved for birds that need to move to the open to find feed but are typically hunted by other animals. These birds are able to consume relatively large

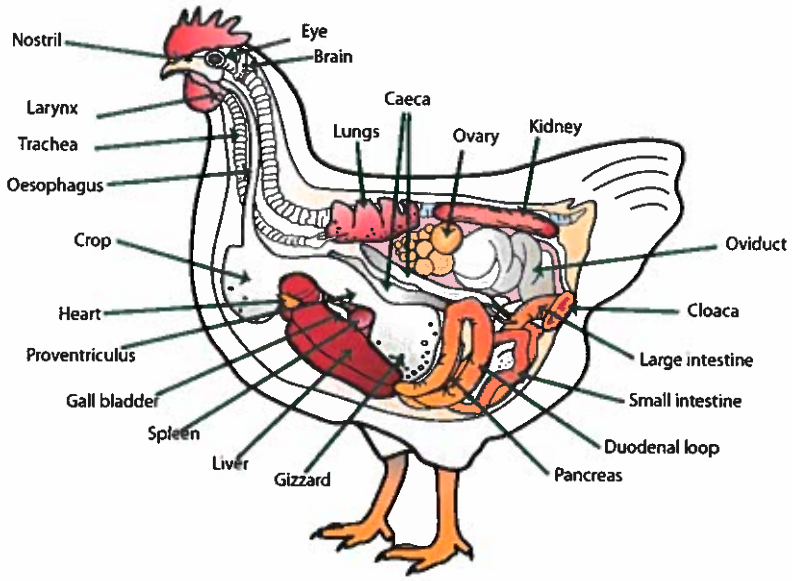


Figure 1. Model showing the internal organs of the female chicken
Source: PoultryHub

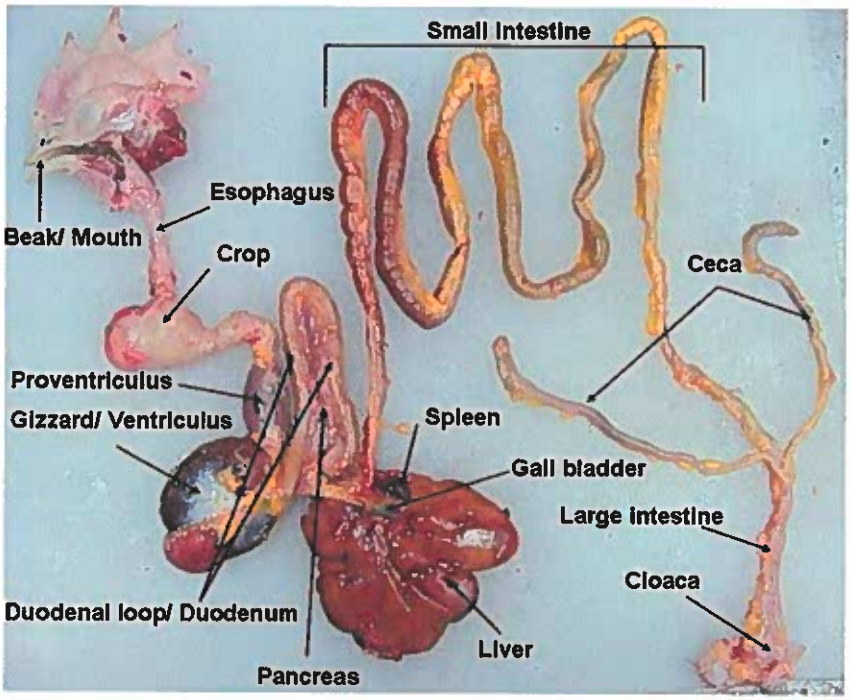


Figure 2. Parts of the digestive tract of a chicken

amounts of food quickly and then move to a more secure location to digest the food they consumed.

Occasionally the crop becomes impacted or 'backed up' (**crop impaction**, also referred to as **crop binding** or **pendulous crop**). This may occur when chickens go a long time without feed. This will cause the chickens to eat too much too fast when the feed becomes available again. A crop may also become impacted in a chicken that is free-ranged on a pasture of tough, fibrous vegetation. Crop impaction can also result when the chickens eat a long piece of string. With a crop impaction, even if a chicken continues to eat, the feed cannot get past the impacted crop. There is very little that can be done to treat a chicken with pendulous crop.

Proventriculus: The esophagus continues past the crop to connect the crop to the proventriculus. The proventriculus (also known as the '**true stomach**') is the **glandular stomach** where digestion begins. As with human stomachs, hydrochloric acid and digestive enzymes (e.g., pepsin) are added to the feed here and digestion begins. At this point, however, the food has not yet been ground up. The term 'proventriculus' is used since it comes before the 'ventriculus' or gizzard, with 'pro' being a Latin terming meaning before.

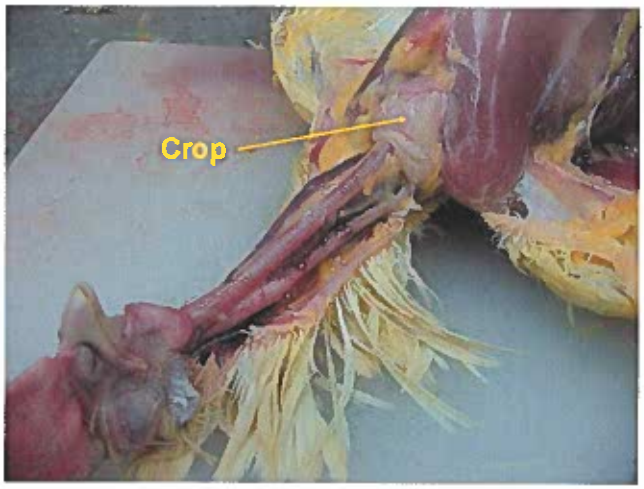


Figure 3. Location of the crop in a chicken. The crop is located just outside the body cavity in the neck region.

Gizzard / Ventriculus: The gizzard, or ventriculus, is a part of the digestive tract unique to birds. It is often referred to as the '**mechanical stomach**'. It is made up of two sets of strong muscles which act as the bird's teeth. Consumed feed and the digestive juices from the salivary glands and the proventriculus pass into the gizzard for grinding, mixing, and mashing. When allowed to free-range, chickens will typically eat small stones. These stones remain in the gizzard until they become ground into pieces small enough to pass through to the rest of the digestive tract. The stones/pebbles are weakened by the acidic environment created in the proventriculus and then are ground into tiny pieces by the strong muscles of the gizzard.

Chickens fed **whole grains** need to have access to small pebbles or given a product called **grit**. Grit is a commercial product made up of small stones. It should not be confused with limestone or oyster shell which is given to laying hens as a source of calcium for their egg shells. Chickens kept on pasture will also require supplementation with grit, though many of them may consume enough pebbles when they forage. Chickens fed only commercially prepared feed do not need grit.

Gizzards have a thick lining which protects the muscles from the acidic condition of the digesta coming from the proventriculus. When chickens are slaughtered, the gizzards are often saved, the lining removed, and the gizzard consumed by the family or sold as a food item.

When a chicken eats a small, sharp object such as a tack or staple, the object is likely to get stuck in the gizzard. Because of the strong grinding motion of the gizzard's muscles, these sharp objects may eventually put a hole in the gizzard wall. Chickens with damaged gizzards will grow thin and eventually die – a very good reason to keep your poultry houses free of nails, glass shards, bits of wire and the like.

Small intestine: The small intestine is made up of the duodenum (also referred to as the duodenal loop) and the lower small intestine. The **duodenum** receives digestive enzymes and bicarbonate (to counter the hydrochloric acid from the proventriculus) from the **pancreas** and bile from the **liver** via the **gall bladder**. The digestive enzymes produced by the pancreas are primarily involved in protein digestion. **Bile** is a detergent that is important in the digestion of lipids and absorption of fat-soluble vitamins (vitamins A, D, E and K). The remainder of the digestion occurs in the duodenum and the released nutrients are absorbed mainly in the **lower small intestine**. The lower small intestine is composed of two parts, the jejunum and ileum. The Meckel's Diverticulum marks the end of the jejunum and the start of the ileum.

In the developing embryo the yolk sac supplies the nutrients needed for it to develop and grow. Right before hatch, the yolk sac is taken into the navel cavity of the embryo. The residual tiny sac is the Merkel's Diverticulum (see Figure 4).

The material remaining in the yolk immediately after hatch is able to supply the feed and water needs of the newly hatched chicken. This is why it is possible to ship chicks long distances without adverse effects, as is done when chicks are purchased online and shipped via the postal service.

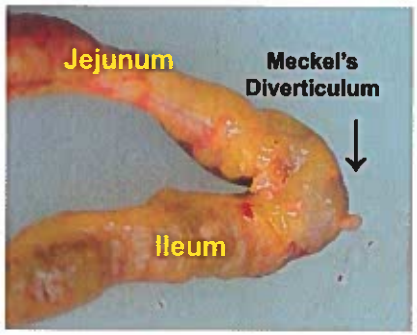


Figure 4. The position of the Meckel's diverticulum between the jejunum and ileum portions of the small intestine.

In recently hatched chicks, the yolk sac enters the body and the navel closes. Sometimes the navel may be inflamed and fail to close, producing a wet spot on the abdomen. A scab may be present. **Omphalitis** is a condition characterized by infected yolk sacs, often accompanied by unhealed navels in recently hatched chicks. It is infectious but not contagious. It is often associated with excessive humidity and contamination of the hatching eggs or incubator.

Ceca (plural form; singular = **cecum**): The ceca are two blind pouches located where the small and large intestines join. Some of the water remaining in the fecal material is reabsorbed here. Another important function of the ceca is the fermentation of any remaining coarse materials. In doing so they produce several fatty acids as well as the eight B vitamins (Thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folic acid and vitamin B_{12}). Because the ceca are located so close to the end of the digestive tract, however, very little of the produced nutrients are absorbed and available to the chicken.

The ceca empty their contents two or three times a day, producing pasty droppings that often smell worse than regular droppings. Cecal droppings typically have a mustard to dark brown in color. The number of times **cecal droppings** are released, as well as their color and texture, tell you that the chicken's digestive tract is functionally normally.

Large intestine (also known as the **colon**): Despite the name, the large intestine is actually shorter than the small intestine. The large intestine is where the last of the water re-absorption occurs.

Cloaca: In the cloaca there is a mixing of the digestive wastes together with wastes from the urinary system (urates). Fecal material is usually voided as digestive waste with white uric acid crystals on the outer surface. The reproductive tract also exits through this area but when a hen lays an egg the vagina folds over to allow the egg to leave through the vent without coming into contact with the feces or urine.

The color and texture of chicken fecal material can indicate the health status of the chicken's digestive tract. The white pasty material that commonly coats chicken fecal material is **uric acid**, the avian form of urine, and is normal (see Figure 5).

Some of the possible abnormal color and texture changes that can occur, together with possible causes, are shown on Page 4. These are just possible causes—any sick birds should be diagnosed by a veterinarian.

Intestinal Microflora

Both the small and large intestine are normally populated by beneficial bacteria, referred to as microflora ('micro' meaning small and 'flora' meaning plants). This population of microflora is important since they aid in digestion.

Figure 5. Normal chicken fecal material showing the dark fecal material with a coating of white uric acid crystals.

Appearance of Feces

Droppings with blood = coccidiosis

Greenish droppings = late stages of worms (or has eaten a lot of green vegetables if free-ranged)

White, milky runny droppings = worms, coccidiosis, Gumboro disease (Infectious Bursal Disease)

Brown runny droppings = E. coli infection

Clear or watery runny droppings = stress, Infectious Bronchitis

Yellow and foamy droppings = coccidiosis

Pasting of the vent (soiling around the vent) = consumption of large amounts of indigestible feedstuffs

Intestinal disease normally occurs when the balance of normal microflora is upset or the normal microflora is overrun by too many foreign organisms. The result is enteritis or inflammation of the intestines, producing symptoms that include diarrhea, increased thirst, dehydration, loss of appetite, weakness, and weight loss or slow growth.

When the damage to the intestinal tract is severe it is typically referred to as necrotic enteritis. 'Necrotic' means 'dead tissue' while 'enteritis' refers to an inflammation of the intestinal tract. Necrotic enteritis is a problem in many different types of production systems.

So where do these 'beneficial' bacteria come from? When chicks hatch their digestive tracts are virtually sterile. If raised by a mother hen, they would obtain the beneficial microflora by consuming some of their mother's fecal material. This is not possible in artificial incubation and brooding. Probiotics are a collection of the normal beneficial microflora that would inhabit a chicken's digestive tract. By spraying it in the shipping boxes or supplying it in the first feed the chicks receive the 'good' bacteria that they need to fight off infection by pathogenic bacteria, such as salmonella.

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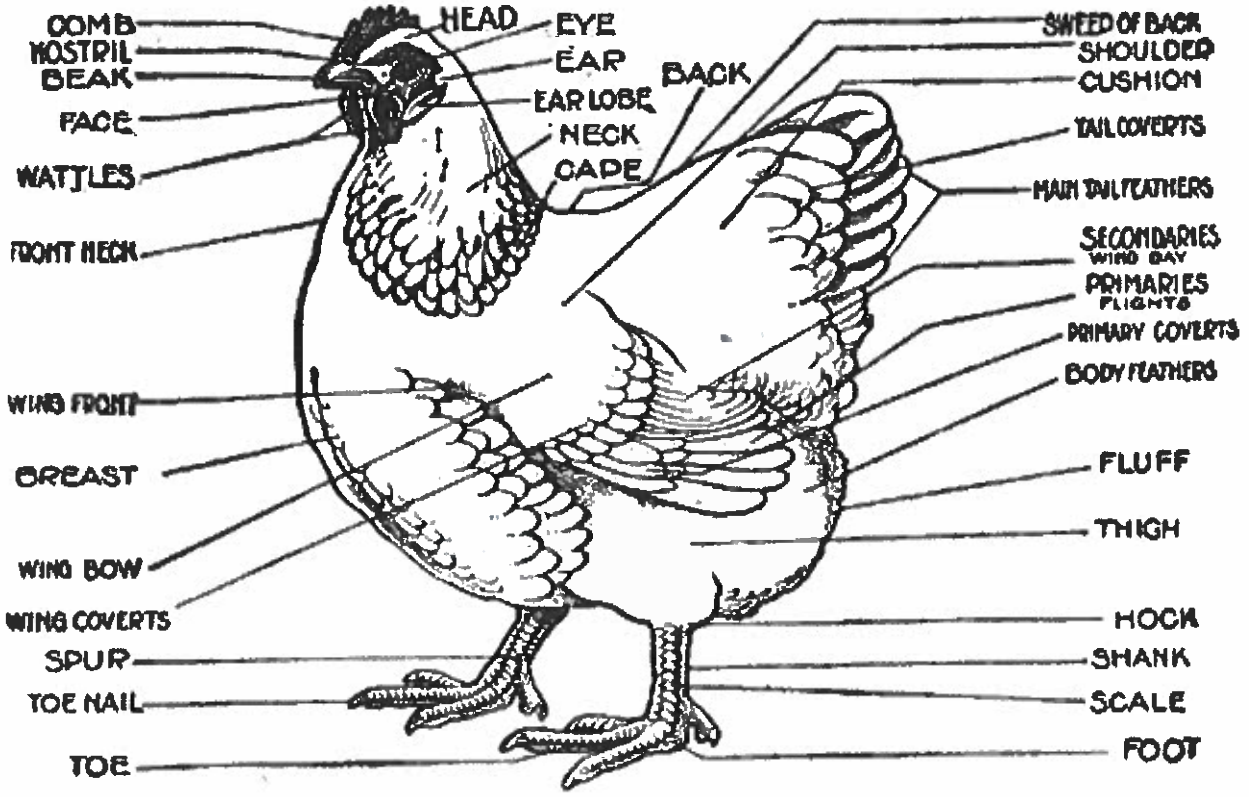
Anatomy

Chapter 5

Wayne County Poultry Resource Book

Version 1. Published April 2020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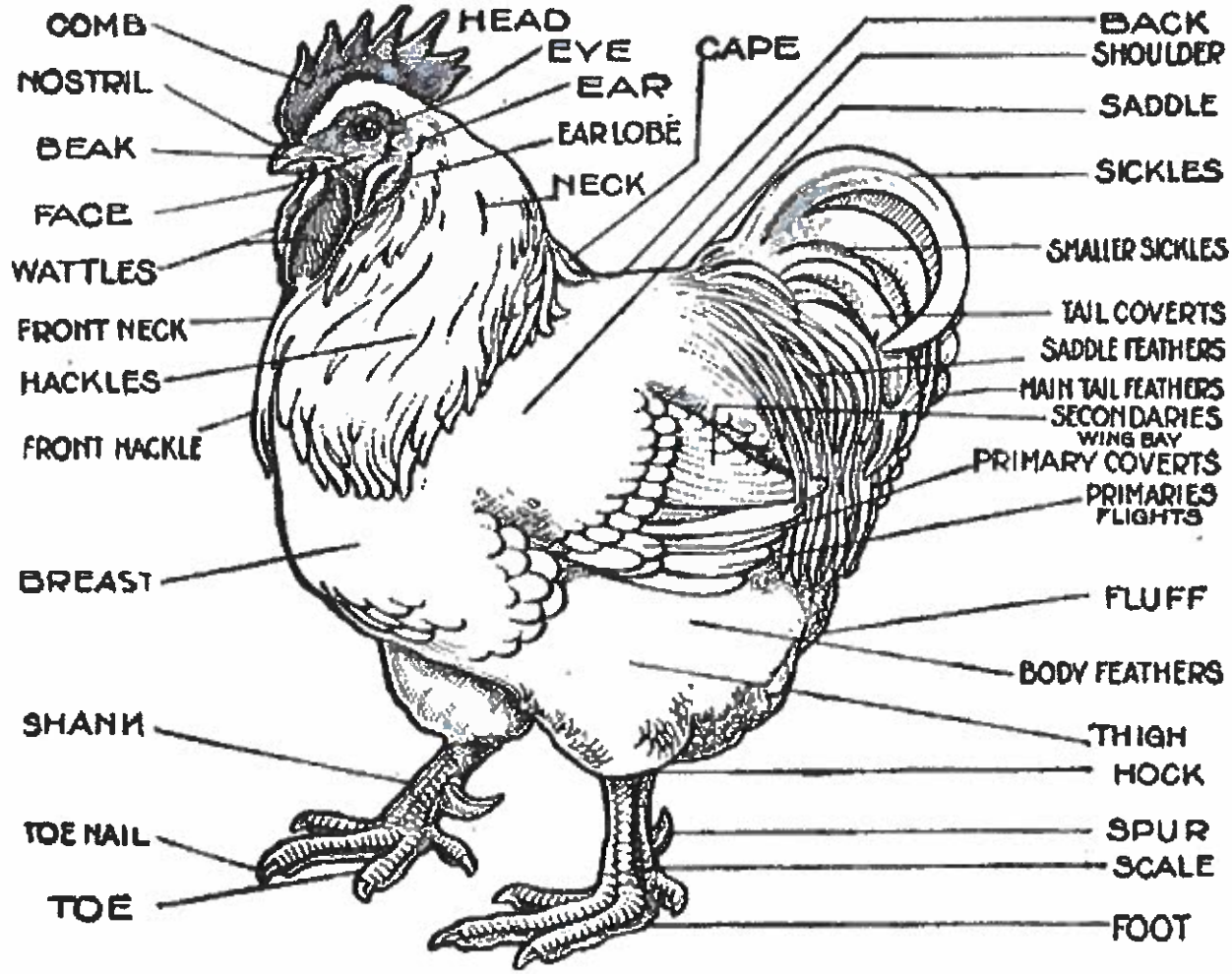
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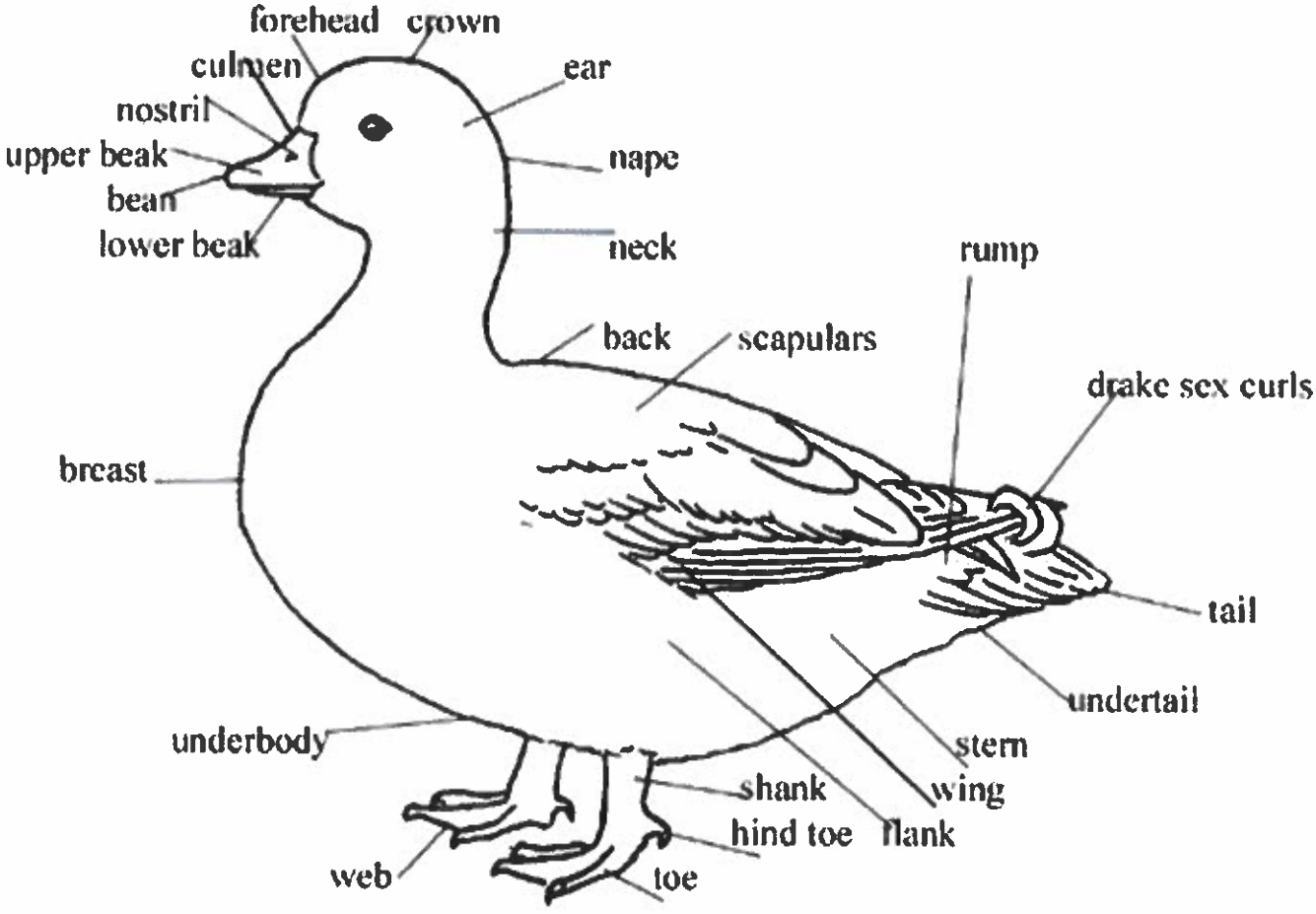
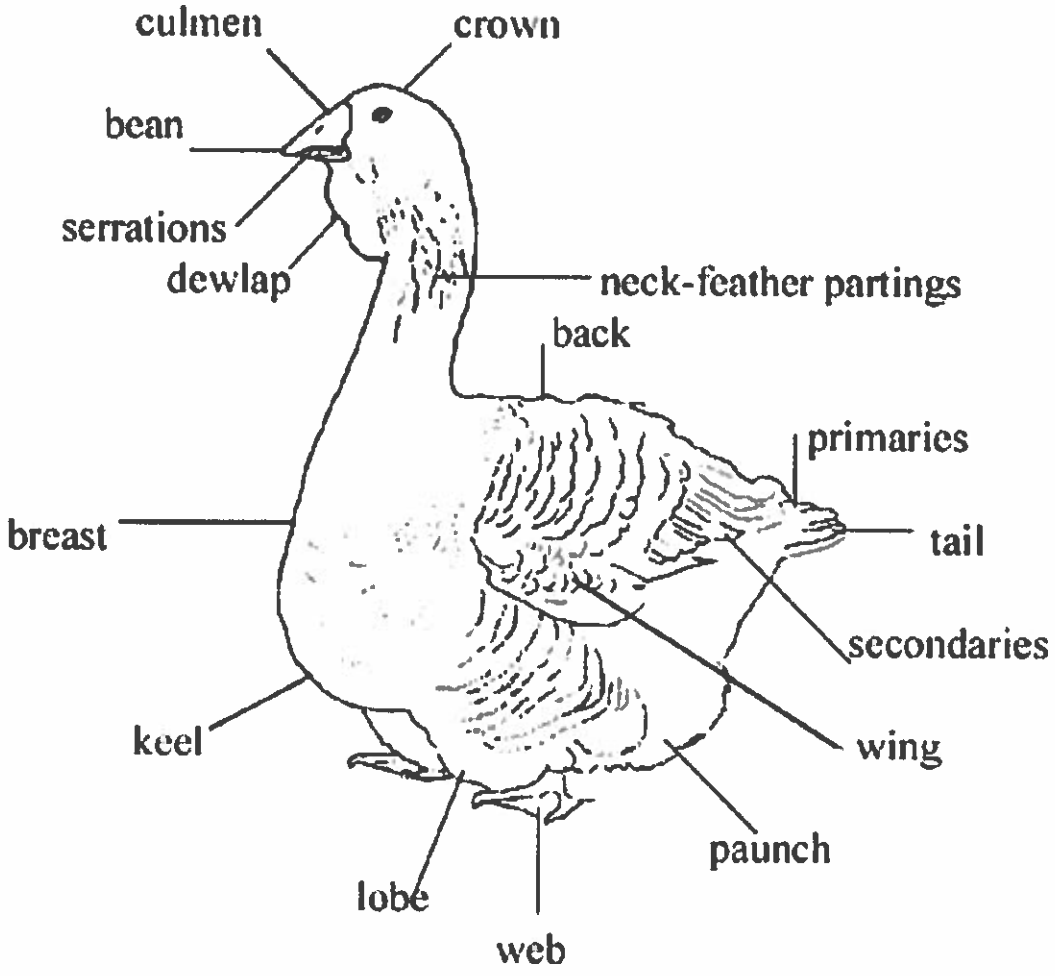
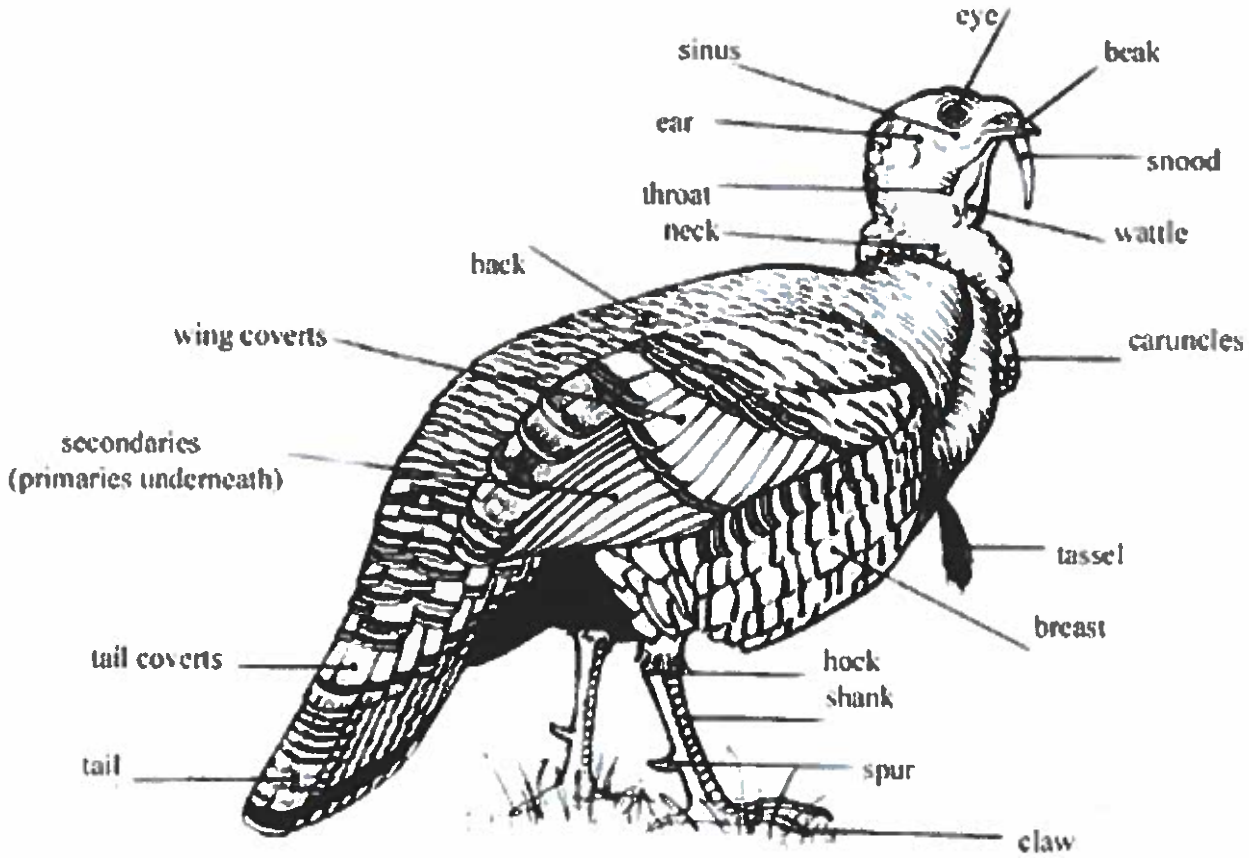
Duck



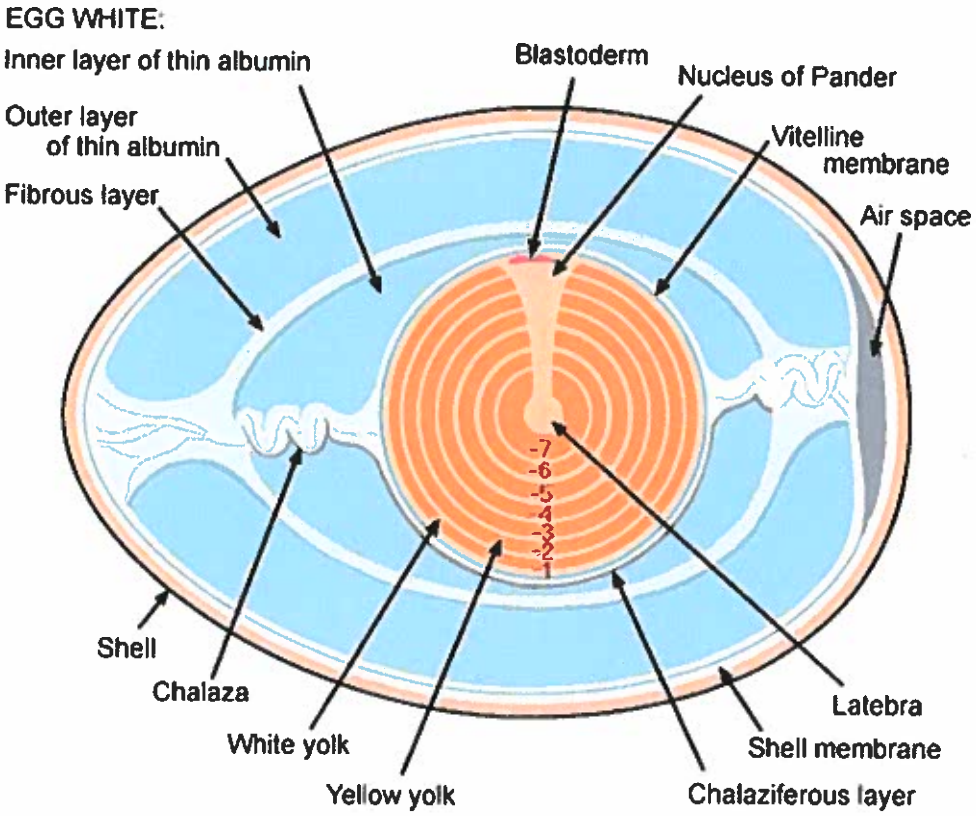
Goose



Turkey



Egg


EGG WHITE:
Inner layer of thin albumin
Outer layer of thin albumin
Fibrous layer
Blastoderm
Nucleus of Pander
Vitelline membrane
Air space
-7
-6
-5
-4
-3
-2
-1
Shell
Chalaza
White yolk
Yellow yolk
Latebra
Shell membrane
Chalaziferous layer

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ASC-204

Avian Muscular System

Jacquie Jacob and Tony Pescatore, Animal Sciences

If you raise poultry for meat, it is always a good idea to have an understanding of the muscular system of poultry so you can better understand any problems that may occur and how to correct them.

All animals have three types of muscles: smooth, cardiac, and skeletal. **Smooth muscle** is controlled by the **autonomic nervous system** (ANS) and is found in the blood vessels, gizzard, intestines and organs. **Cardiac muscle** is the specialized muscle of the heart. **Skeletal muscle** is the type of muscle responsible for the shape of birds and for voluntary movement. The poultry meat you eat is skeletal muscle.

The breast meat of chicken is frequently referred to as **white meat**. White meat is white because of the minimal activity of these muscles. Since chickens do not fly, breast muscles are not used as often as they would if chickens could fly. The thigh and leg meat are typically referred to as "**dark meat**." Dark meat is dark because the muscles are used for sustained activity—in the case of a chicken, chiefly walking. The higher activity of leg muscles increases their need for oxygen. The darker color of more active muscles comes from a chemical compound in the muscle called **myoglobin**, which is important for oxygen transport. Other species of poultry capable of flight (such as ducks, and geese) have dark meat throughout (i.e., the breast, thigh and drumstick).

American consumers, in general, have a preference for white chicken meat, and it is this part of the chicken typically used in value-added products such as chicken nuggets and chicken fingers. White meat is often considered the healthier of the two types of chicken meat. White chicken meat is leaner, has more protein and less fat than dark meat. The higher fat content of dark chicken meat is what gives it more flavor.

Green Muscle Disease, or Deep Pectoral Myopathy, was first identified in commercial turkey production and involves the death of the breast tenderloin but does not cause the death of the chicken. The dead tenderloins begin to decay resulting in the appearance of a yellowish-green color. The tenderloin (pectoralis minor) is deep in the breast and if the carcass is sold whole the problem typically goes unnoticed. It is only discovered when the roasted chicken is carved for dinner.

Green Muscle Disease is believed to result from vigorous activity of breast muscles (pectoralis major and minor). During vigorous activity, muscles normally swell with increased blood flow to supply the oxygen and nutrients needed by the muscles. Compared to other muscles, the tenderloins have a more rigid muscle cover and are confined to a tight space within the body such that they cannot expand to accommodate this increased blood flow. The net result of the muscle being confined and compressed is self-strangulation, suffocation, and eventually death of the muscle.

The incidence of Green Muscle Disease increases with increasing market weight in broilers, and more cases are reported in higher yielding crosses, especially the males. Increased broiler activity induced by such factors as feed or water outages, lighting programs, catching and live-haul, and even excessive noise, may result in an increased incidence of Green Muscle Disease. The increased activity associated with free-range broiler production, especially if there are predators in the area, has resulted in an increase incidence of Green Muscle Disease in this industry.

Converting Muscle to Meat

Once poultry are slaughtered, plucked, and gutted there are changes the muscles need to go through to become "meat." After slaughter, the heart is no longer pumping and supplying oxygen to the muscles. With the decline in blood supply, lactic acid starts to accumulate in the muscle and the pH declines (i.e., becomes more

A bit of trivia: *Does the wing have white or dark meat? Chicken wings, like the breast, are white meat.*

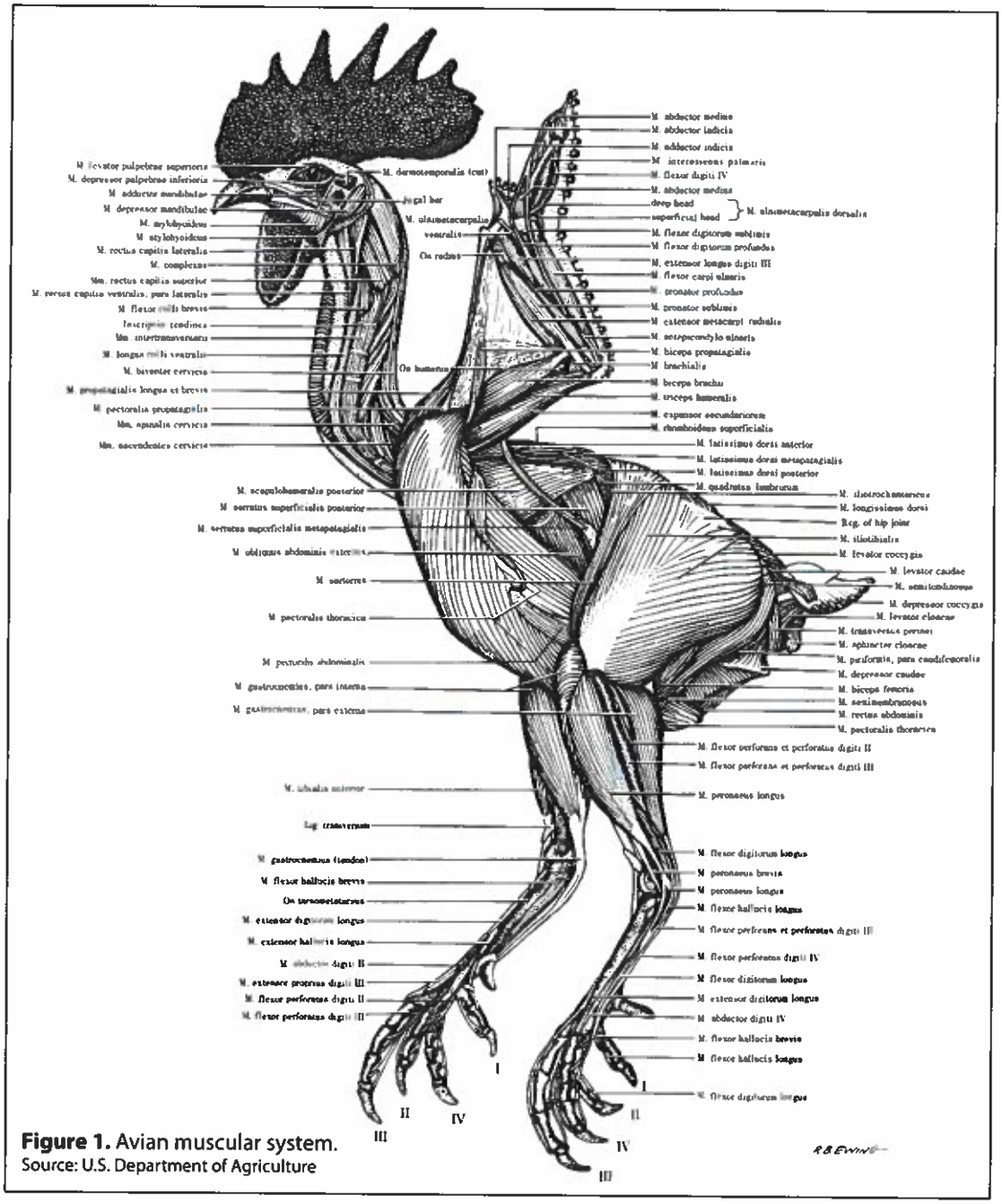

Figure 1. Avian muscular system.
Source: U.S. Department of Agriculture

acidic). The rate of the pH decline and the final point that it reaches are important factors affecting meat quality and color. The pH typically needs to decline from the normal of 7 to 5.8. If the pH does not drop low enough, primarily due to excess activity prior to slaughter, the meat will be dark, firm, and dry. On the other hand, if the pH drops too quickly immediately after slaughter, the condition of Pale Soft and Exudative (PSE) meat will result.

As is commonly observed after death, rigor mortis soon sets in resulting in a stiffness of the body. At this state the muscle is temporarily tough. After a period of time the muscle becomes more flexible again. It is for this reason that poultry are typically aged rather than eaten immediately after being processed.

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ASC-202

Avian Skeletal System

Jacquie Jacob and Tony Pescatore, Animal Sciences

All animals have a skeleton to allow them to stand up and to protect their internal organs and tissues. The avian **skeletal system** looks similar to those of their mammalian counterparts, but there are some important differences. Many of these differences relate to the bird's need to be light enough to fly while still maintaining the needed body support. Some important differences between the skeletons of birds and mammals are listed below.

- Some of vertebral sections are fused together to provide the rigidity required for flight.
- The **sternum** provides a large surface area for the strong attachment of the main flight muscles.
- The size of the head has been reduced significantly when compared to other species. A large head would make flying more difficult.
- The tail has been reduced to a very short section of fused bones called the **pygostyle** (sometimes referred to as the Parson's nose or the Pope's nose).
- The ribs have been modified by the inclusion of the **uncinate process** which refers to overlying flaps projecting off the ribs connecting ribs to the ones beside them. This gives strength to the rib cage so that it will not collapse during flight.
- The neck is quite long in most species to enable the bird to:
  - » Protect the delicate tissues of the brain from too much jarring when landing; the flexibility of the neck acts as a shock absorber
  - » Aid in the reaching of food located on the ground; the rigid body makes this simple activity more difficult without this modification
  - » Aid in the adjustment of the center of gravity needed when the bird changes from the upright position of walking or perching to the more horizontal position of flight
  - » Allow the bird to use its beak to obtain oil from the preen gland located on its tail; the bird uses the oil to preen its feathers

The bones of birds are also lighter in weight than those of their mammalian counterparts. Some of the bones are hollow and actually act as part of the **avian respiratory system**. They are called **pneumatic bones** (pronounced New-Matic) and include the skull, humerus, clavicle, keel (sternum), pelvic girdle, and the lumbar and sacral vertebrate.

Another important type of bone in the avian skeleton is **medullary** bones. These include the tibia, femur, pubic bone, ribs, ulna, toes and scapula. Medullary bones are an important **source of calcium** when hens are laying eggs. The hen mobilizes calcium from her bones to provide 47% of the calcium for the shell. The remainder of the required calcium is supplied by the feed. When in production, a commercial-type laying hen cannot obtain enough dietary calcium to allow for daily egg production. Without medullary bone to draw calcium from, the egg shells would be very thin and weak.

While there are some important differences between the skeletons of birds and other animals, there are also several similarities. Both have the same general skeletal structure.

Figure 1 shows the bones of a chicken wing. Like a human arm,

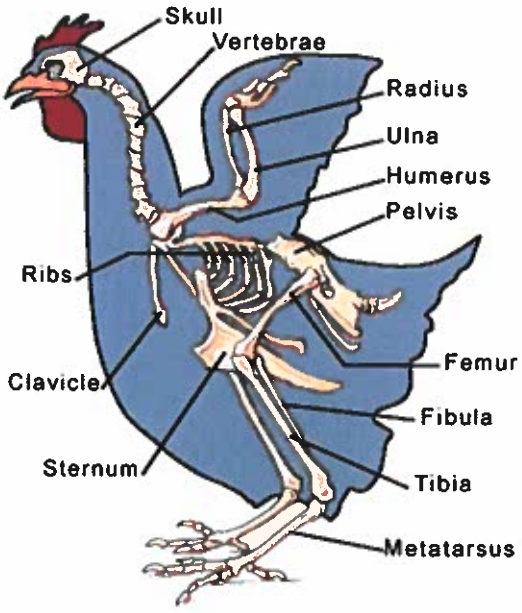

Figure 1. Chicken skeletal system.
Source: University of Illinois

it has a humerus, radius, and ulna. The main difference is that the phalanges that make up the fingers of people are fused in birds to allow for the attachment of feathers.

The common joints of the arm are easily identifiable in both the chicken and humans.

- Joint between humerus and scapula = shoulder
- Joint between humerus and radius/ulna = elbow
- Joint between radius/ulna and metacarpus = wrist.

Similarly, a chicken leg and human leg both have a femur, fibula, and tibia. The femur of a chicken holds the thigh meat while the fibula/tibia combination holds the meat of the drumstick. Comparing the leg joints is not quite as obvious as with the arm.

- Joint at the top of the femur = hip
- Joint between femur and the fibula/tibia = knee
- Joint between fibula/tibia and the metatarsus = ankle

The metatarsus of a bird is known as the **shank**. Birds walk up on their toes.

Summary

Aside from the obvious role of **structural support**, the avian skeletal system has two additional functions: **respiration** and **calcium transport**.

The avian skeletal system is compact and lightweight, yet strong. The tail and neck vertebrae are movable, but the body vertebrae are fused together to give the body sufficient strength to support the wings. There are two special types of bones which make up the avian skeletal system: the pneumatic and medullary bones.

The **pneumatic bones** are important to birds for respiration. They are hollow bones which are connected to the bird's respiratory system and are important for birds to be able to breath. Examples of pneumatic bones are the skull, humerus, clavicle, keel (sternum), pelvic girdle, and the lumbar and sacral vertebrae.

The **medullary bones** are an important source of calcium for the laying hen. Calcium is the primary component of egg shells and a hen mobilizes 47 percent of her body calcium to make an egg shell. Examples of medullary bones are the tibia, femur, pubic bones, ribs, ulna, toes, and scapula.

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ASC-200

Avian Respiratory System

Jacquie Jacob and Tony Pescatore, Animal Sciences

An understanding of the avian respiratory system is essential to develop a health monitoring plan for your poultry flock. Knowledge of avian anatomy and what the parts normally look like will help you to recognize when something is wrong and to take the necessary actions to correct the problem.

The respiratory system is involved in the absorption of **oxygen** (O_2), release of **carbon dioxide** (CO_2), release of heat (temperature regulation), detoxification of certain chemicals, rapid adjustments of acid-base balance, and vocalization. While the function of the avian respiratory system is comparable to that of mammals, they are quite different anatomically.

Birds don't breathe the same way mammals do. Like mammals, birds have two symmetrical lungs that are connected to a **trachea** (windpipe), but here the similarity ends. Mammalian lungs contain many **bronchi** (tubes), which lead to small sacs called alveoli. Because alveoli have only one opening, air can flow into and out of them, but it cannot flow through them to the outside of a lung. In comparison, the avian lung has **parabronchi**, which are continuous tubes allowing air to pass through the lung in one direction. They are laced with blood capillaries and it is here that gas exchange occurs. The avian respiratory system is described as non-tidal. The mammalian respiratory system, in contrast, is tidal in that air comes in and then goes out like the tide.

The avian respiratory tract (Figure 1) starts with the **glottis**. The glottis closes when feed is passing down the throat so that the feed does not enter the lungs.

The **trachea** is made up of cartilaginous rings that prevent its collapse from the negative pressure caused by inspiration of air.

The **syrinx** is the voice box. The bird's "voice" is produced by air pressure on a sound valve and modified by muscle tension. It is not possible to remove the syrinx to prevent roosters from crowing. They can be devoiced by changing the muscles by the syrinx but this is a complicated surgery.

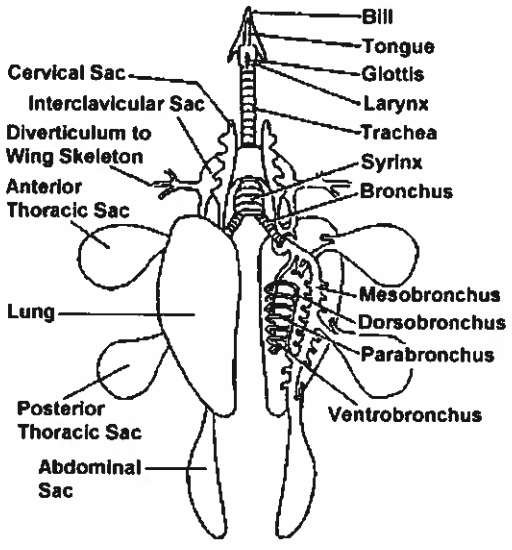

Figure 1. Avian respiratory system.
Source: Michigan State University.

Both male and female chickens are able to crow. The reason hens do not normally crow is because they do not feel like it due to the effects of the female hormone and the absence of sufficient levels of the male hormone. When the ovaries become diseased and the level of female hormones decrease, many hens will start to show male characteristics, including crowing.

The trachea divides into two smaller tubes called bronchi. There is a considerable narrowing in the diameter of the tube at this division. In some respiratory diseases **tracheal plugs** are often formed and they physically block the respiratory tract at the junction of the bronchi and thus suffocating the chicken. Excessive dust in the air is also believed to result in the formation of caseous tracheal plugs and adversely affects the health of the chickens.

Chicken **lungs** are relatively small and do not expand. Instead, they are firmly attached to the ribs. Birds have an **incomplete diaphragm** and the arrangements of the chest musculature and the sternum do not lend themselves to expansion in the same way that the chest of

mammals does. Consequently they can't inflate and deflate lungs in the same way as mammals do. Instead, birds pass air through the lungs by means of **air sacs**. The air sacs are balloon-like structures at the 'ends' of the airway system. In the chicken there are nine such sacs: an unpaired one in the cervical region; two interclavicular air sacs, two abdominal air sacs, two anterior thoracic air sacs and two posterior thoracic air sacs.

The key to the avian respiratory system is that distention and compression of the air sacs, not the lungs, moves air in and out. At any given moment air may be flowing into and out of the lung and being parked in the air sacs. The lungs are stiff and fixed, not at all like the distensible lungs of mammals. The air sacs act as bellows to suck air in and blow it out and also to hold part of the total volume. The air sacs fill a large proportion of the chest and abdominal cavity of birds, and also connect to the air spaces in the bones.

Since birds do not have a diaphragm, they depend on the movement of the sternum (keel) and rib cage in order to breathe. Holding a bird too tight will restrict movement of the rib cage and suffocate the bird. This often happens when young children hold baby chicks too tight.

Another important feature of the avian respiratory system is also part of the skeletal system. The bones of birds are lighter in weight than those of their mammalian counterparts. Some of the bones are hollow and actually act as part of the avian respiratory system. They are called **pneumatic bones** and include the skull, humerus, clavicle, keel (sternum), pelvic girdle, and the lumbar and sacral vertebrae. A broken pneumatic bone can make it difficult for birds to breathe.

With each breath, the bird's respiratory tract is exposed to the inside environment of a poultry house. Poor environments normally do not cause disease directly but they do reduce birds' defenses, making them more susceptible to infection from existing viruses and pathogens.

The air of poultry houses can contain **aerosol particles** or dust originating from the floor litter, feed, dried manure, and the skin and feathers of the birds. These aerosol particles can have a range of adverse effects on poultry. They act as an irritant to the respiratory system and coughing is a physiological response designed to remove them. Excessive coughing lowers the bird's resistance to disease. Aerosol particles can collect inside meat birds and can increase carcass condemnation at the processing plant.

Gases are generated from decomposing poultry waste; emissions from the birds; and from improperly maintained or installed equipment, such as gas burners. Harmful gases most often found in poultry housing are ammonia (NH_3) and carbon dioxide (CO_2). Research has shown that as little as 10 ppm ammonia will cause excessive mucus production and damage to the cilia. Research has also revealed that ammonia levels of 10-40 ppm reduce the clearance of *E. coli* from air sacs, lungs, and trachea in birds.

The avian respiratory tract is normally equipped with defense mechanisms to prevent or limit infection by airborne disease agents; to remove inhaled particles; and to keep the airways clean. Poultry health is affected by the function of three defensive elements: the cilia; the mucus secretions; and the presence of scavenging cells which consume bacteria.

Cilia are tiny hair-like structures in the trachea. Cilia are responsible for propelling the entrapped particles for disposal. **Mucus** is produced in the trachea. Mucus secretion and movement of cilia are well developed in chickens. The consistency of the mucus produced is important for the efficiency of the ciliary activity. Cilia cannot function when the mucus is too thick.

Scavenging cells in the lungs actively scavenge inhaled particles and bacteria that gain entrance to the lower respiratory tract. These cells consume bacteria and kill them, thus preventing their further spread.

It is the integrated function of cilia, mucus and scavenging cells that keeps chicken airways free of disease-producing organisms. The impairment of even one of these components permits an accumulation of disease agents in the respiratory tract and may result in disease.

The typical respiration rate of chickens is about 30 breaths per minute. The rate is higher in the light period (average of 35.6 breaths per minute) than in the dark period (average of 23.1 breaths per minute). The respiration rate increases dramatically during hot weather as panting (defined as greater than 150 breaths per minute) plays an important role in dissipating in the excess heat.

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Reproduction

Chapter 6

Wayne County Poultry Resource Book

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ASC-201

Avian Female Reproductive System

Jacquie Jacob and Tony Pescatore, Animal Sciences

Anyone raising poultry for eggs, whether for eating or for incubation, should have an understanding of the reproductive system. This will help them understand any problems that may occur and how to correct them. The avian reproductive system is different from that of mammals. Nature has designed it to better suit the risks associated with being a bird. Unless you are a bird of prey (a hawk, eagle or falcon), you are faced with the fact that everyone is trying to eat you. Being close to the bottom of the food chain requires the development of unique strategies for feeding and reproducing—all while retaining the ability to fly (Figure 1)

The reproductive strategy of most mammals, especially primates (such as chimpanzees, apes and gorillas), is to produce only a few offspring and devote a considerable amount of time to caring for them. Once they are full grown and ready to take care of themselves, the parent's job is complete.

Birds (with some exceptions, of course) have developed a strategy where they produce multiple offspring and tend to their needs for only a short period of time before tossing them into the wind, sometimes literally. The amount of time they devote to caring for their offspring depends on whether they are precocial (well developed at hatch) or altricial (under-developed when hatched), with the latter requiring more post-hatch parental care.

While mammals typically give birth to their offpsring, the offspring of birds develop outside the body of the parents—in eggs. When carried in the womb, mammalian embryos receive their daily requirement for nutrients directly from their mother via the placenta. For birds, however, all the nutrients that will be needed for the embryo to fully develop must be provided in the egg before it is laid.

The female reproductive system of the chicken is shown in Figure 2. It is divided into two separate parts: the **ovary** and the **oviduct**. In almost all species of birds, including chickens, only the left ovary and oviduct are functional. Although the embryo has two ovaries and oviducts, only the left pair (i.e., ovary and oviduct) develops. The right typically regresses during development and is non-functional in the adult bird. There have been cases, however, where the left ovary and oviduct have been damaged and the right one has developed to replace it.

The **ovary** is a cluster of developing yolks or **ova** and is located midway between the neck and the tail of the bird, attached to the back. The ovary is fully formed when pullet chicks hatch, but it is very small until the chicks reach sexual maturity. At hatch, pullet chicks have tens of thousands of potential eggs (i.e., ova) which theoretically could be laid. Most of these, however, never develop

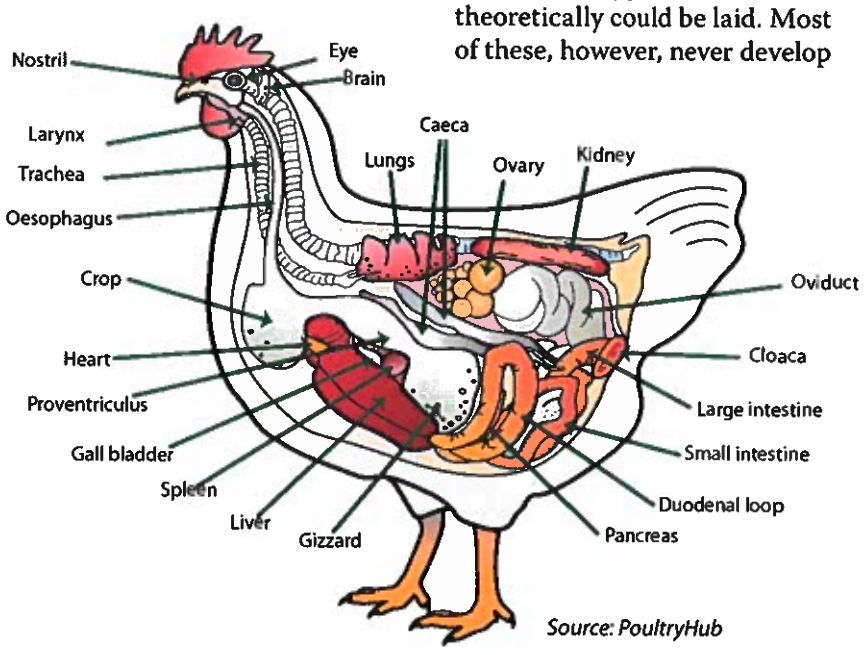

Figure 1. The internal organs of the female chicken.

to the point of ovulation. So the maximum number of eggs a hen can lay is determined when she hatches since no new ova are added once the chick has hatched.

Each ovum (singular form of ova) starts out as a single cell surrounded by a **vitelline membrane**. As the ovum develops, yolk is added. The color of the yolk comes from fat soluble pigments called **xanthophylls** contained in the hen's diet. Hens fed diets with yellow maize, or allowed to range on grass, typically have dark yellow yolks. Hens fed diets with white maize, sorghum, millet or wheat typically have pale yolks. The color of the yolks from these hens can be improved by the addition of marigold petals to provide the desired level of xanthophylls in the yolk.

Ovulation is the term used for the release of the mature ovum from the ovary into the second part of the female reproductive system, the oviduct. During ovulation the ovum, which is enclosed in a sack, ruptures along the suture line or **stigma** (see Figure 3). Occasionally the vitelline membrane is damaged and pale spots or blotches develop on the yolk. This is referred to as **mottling**. Although the appearance of the yolk is changed, there is no effect on the egg's nutritional value or flavor. A slight degree of yolk mottling is normal and is not typically noticed by consumers. A high incidence of yolk mottling, however, adversely affects consumer acceptance. The use of cottonseed meal (which contains gossypol) and sorghum (which contains tannin) in the diet can also increase the incidence of mottling. A calcium deficient diet will also have the same effect.

The female reproductive system is sensitive to light exposure, especially the number of hours of light in a day. The release of the next ova typically occurs 30-75 minutes after the previous egg has been laid. If the egg was laid too late in the day the next ovulation will wait till the next day and the hen will have a day when she does not lay an egg.

The second major part of the female chicken's reproductive system is the **oviduct**. The oviduct is a long convoluted tube (25-27 inches long when fully developed) which is divided into five major sections. They are the infundibulum or funnel, magnum, isthmus, shell gland, and vagina.

The first part of the oviduct, the **infundibulum** or funnel, is 3-4 inches long, and engulfs the ovum released from the ovary. "Funnel" is an inaccurate choice of name for this part since it gives the vision of the infundibulum waiting for the ovum to fall into it, which is not the case. Instead the released ovum stays in place and the muscular infundibulum moves to surround it. The ovum or yolk remains in the infundibulum for 15-18 minutes. **Fertilization**, if it is going to occur, takes place in the infundibulum.

The next section of the oviduct is the **magnum** which is 13 inches long and is the largest section of the oviduct as its name implies (from the Latin word for "large"). The ovum or yolk remains here 3 hours during which time the thick white or **albumen** is added and the **chalaza** is formed.

The third section of the oviduct is the **isthmus** which is 4 inches long. The developing egg remains here for 75 minutes. The isthmus, as its name implies, is slightly constricted (The term "isthmus" refers to a narrow band of tissue connecting two larger parts of an anatomical structure). The isthmus is where the inner and outer **shell membranes** are added.

The next section of the oviduct is the **shell gland** or uterus. The shell gland is 4-5 inches long, and the egg remains here for 20 plus hours. As its name implies, the **shell** is placed on the egg here. The

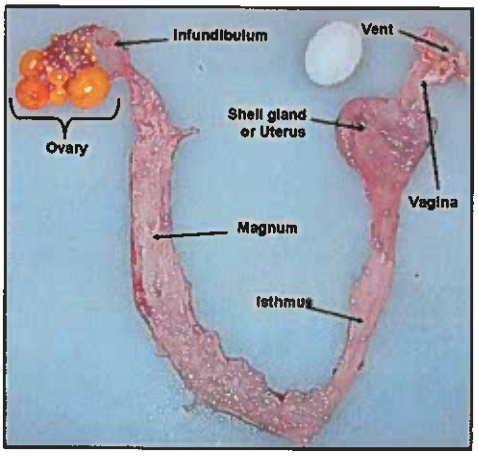

Figure 2. Parts of the reproductive tract of a female chicken. *Jacquie Jacob.*

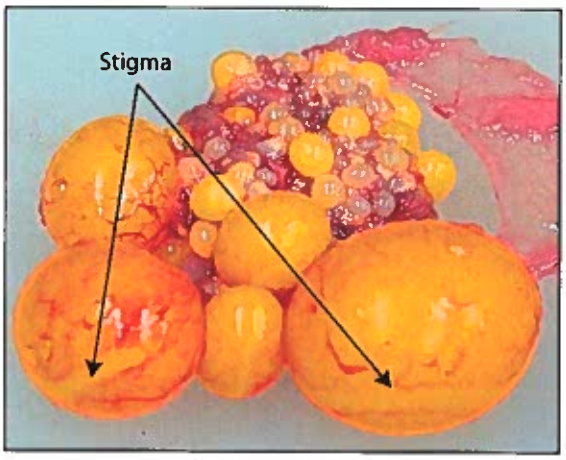

Figure 3. Ovary of a female chicken. *Jacquie Jacob.*

shell is largely made up of calcium carbonate. The hen mobilizes calcium from her bones to provide 47% of the calcium for the shell. The remainder of the required calcium is supplied by the feed. **Pigment** deposition, if there is any, is also done in the shell gland.

The last part of the oviduct is the **vagina** which is about 4-5 inches long and does not really play a part in egg formation. The vagina is made of muscle which helps push the egg out of the hen's body. The **bloom** or cuticle is also added to the egg in the vagina prior to **oviposition** (the laying of the fully formed egg).

Near the junction of the vagina and the shell gland, there are deep glands known as **sperm host glands**. They get their name from the fact that they can store sperm for long periods of time (10 days to 2 weeks). When an egg is laid, some of these sperm can be squeezed out of the glands into the oviduct so that they can migrate farther up the oviduct to fertilize an ovum. This is one of the really remarkable things about birds; the sperm remain viable at body temperature. This allows the hen to have fertile eggs for a period of time after a mating.

Birds lay eggs in clutches. A **clutch** consists of one or more eggs laid each day for several days, followed by a rest period of about a day or more. Then another egg or set of eggs is laid. Clutch size is species- and breed-specific. For commercial egg layers clutch size is typically quite large. Clutch size, as well as the numbers of clutches laid in a laying cycle, will vary with species, but the principle is the same.

In chicken hens, ovulation usually occurs in the morning and under normal daylight conditions, almost never after 3:00 PM. The total time to form a new egg is about 25-26 hours. This includes about 3½ hours to make the albumen, 1½ hours for the shell membranes, and about 20 hours for the shell itself.

Ovulation of a yolk for the next egg in a clutch occurs 30-75 minutes after the hen lays the previous egg, and so that each day the hen gets later and later in her timing. As an analogy, she runs behind, like a clock that is improperly adjusted. Eventually she gets so far behind schedule that she would have to lay eggs after dusk. Since hens do not typically ovulate late in the day, the next ovulation is delayed until at least the next day and egg laying is interrupted. This delay results in the break between clutches and the cycle repeats itself a day or so later.

Occasionally, a hen will produce **double-yolked eggs**. This phenomenon can be related to hen age but genetic factors are also involved. Young hens sometimes release two yolks from the ovary in quick succession. Double-yolked eggs are typically larger in size than single yolk eggs. Double-yolked eggs are not suitable for hatching. There is typically not enough nutrients and space available for two chicks to develop to hatch. It has happened, but it is rare.

Occasionally a young hen will produce an egg with no yolk at all. **Yolkless eggs** are usually formed when a bit of tissue is sloughed off the ovary or oviduct. This tissue stimulates the secreting glands of the different parts of the oviduct and a yolkless egg results.

Although it is rare, hens have laid an egg with a whole egg inside. This occurs when an egg that is nearly ready to be laid reverses direction and moves up the oviduct and encounters another egg in process of being put together. The results is that the first egg gets a new layer of albumen added and two eggs are encased together within a new shell. Such eggs are so rare that no one knows exactly why they happen.

Another egg problem that is commonly noted if you raise your own chickens is blood and meat spots. **Blood spots** are normally found on or around the yolk (Figure 4). The main cause is a small break in one of the tiny blood vessels around the yolk when it is ovulated. High levels of activity during the time of ovulation can increase the incidence of blood spots. **Meat spots** are usually brown in color and are more often associated with the egg white. They are formed when small pieces of the wall of the oviduct are sloughed off when the egg is passing through. In commercial operations, eggs with blood or meat spots are typically identified during candling and removed. It is rare, therefore, to see these eggs in stores. The incidence is higher in brown shelled eggs, and it is harder to identify them when candling the darker colored shells.

Occasionally an egg will be laid without a shell. It feels like a water balloon. The shell membranes were placed on the yolk and egg white, but it somehow slipped past the shell mechanism and the shell wasn't deposited. The occurrence

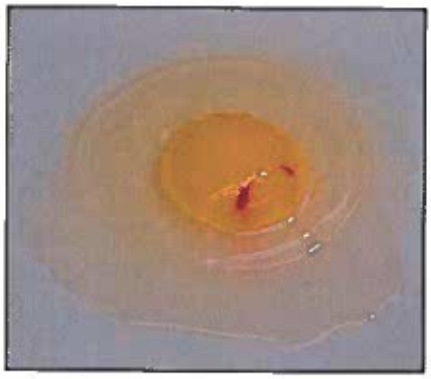

Figure 4. An egg with a blood spot on the yolk. *Steve Patton, UK.*

Precocial and Altricial Birds

Precocial birds are well developed when hatched and are able to get up and walk around on their own very quickly. This type includes most of the domestic poultry species–chickens, ducks, turkeys, etc.

Altricial birds are underdeveloped when they hatch and require a considerable amount of parental care before they are able to survive on their own. This type includes pigeons and passerine birds (i.e., perching/song birds) and hummingbirds. *Photos by Jacquie Jacob.*

of the occasional shell-less egg is not necessarily an indication of any health problem. If the incidence increases, however, there may be a deficiency of calcium, phosphorus and/or vitamin D. If the condition persists a veterinarian should be consulted. Infectious Bronchitis and Egg Drop Syndrome have been known to cause an increase in shell-less eggs.

Other things occasionally go wrong when an egg shell is being developed. The most obvious relates to shell texture. Occasionally the shell becomes damaged while still in the shell gland and is repaired prior to being laid. This results in what is known as a **body check**. Occasionally there will be **thin spots** in the shell or **ridges** will form. The shells of such eggs, though not cracked, are weaker than 'normal' eggs and should not be used as hatching eggs or sold as table eggs. Such hatching eggs will typically not produce a chick while table eggs are easily broken on the trip from the farm to the consumer.

A second category of problems is **abnormal shape**. Such eggs do not fit well into a typical egg carton or are more likely to break during transport, so they are removed during egg inspection and do not normally appear in eggs sold in the store.

To be considered a hatching egg, the egg should be a typical egg shape. Abnormally shaped eggs should not be used as hatching eggs. In many cases it is not clear which is the large end (and eggs should be incubated large end up) or they may not properly fit in the egg trays.

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UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, LEXINGTON, KY, 40546

ASC-199

Avian Male Reproductive System

Jacquie Jacob and Tony Pescatore, Animal Sciences

The avian male reproductive system is all inside the bird, unlike the males of mammalian species which have their reproductive systems outside of the body. This is one of the really remarkable things about birds; the sperm remain viable at body temperature. While female birds only have one mature gonad (i.e., ovary), both are developed in male birds. Similarly, while female birds are hatched with the total number of ova they will ever have with no new ova produced once hatched, male birds continue to produce sperm while sexually mature. While male birds continue to produce sperm for many years, the quality of the sperm decline with age, reducing fertility.

The male chicken possesses two testes, located along the chicken's back, near the top of the kidneys (Figure 1). The testes are elliptical shaped and light yellow in color.

Each vas deferens (ducts which transport sperm from the testes) opens into a small bump, or papilla, which is on the back wall of the cloaca. The papillae serve as the mating organ. The incorrectly named rudimentary copulatory organ is located on the middle and front portion of the cloaca and is used to classify the sex of baby chicks.

The vas deferens is also the main area for sperm storage in male birds. Applying external pressure in this area will result in ejaculation. This method is used for the collection of sperm when artificial insemination is being used.

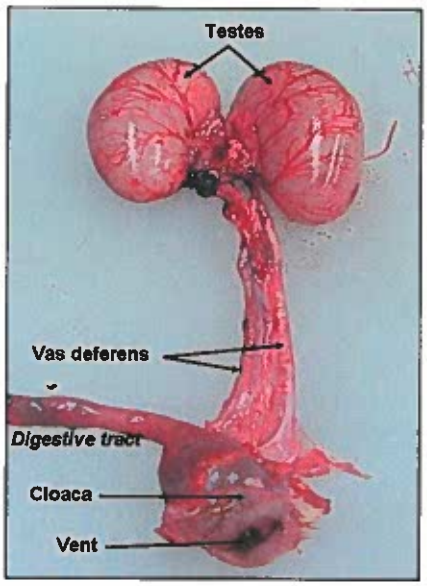

Figure 1. Reproductive tract of a male chicken. *Jacquie Jacobs.*

The main goal of a poultry breeder is to produce hatchable eggs. You must have a fertile egg to hatch a chick. Fertility, the percentage of eggs produced that are actually fertile, is a very important statistic in hatching egg production - the higher the percentage the better. If an egg is not fertile it will not, of course, contain an embryo and no chick will hatch. Simply put, hatchability can never be better than fertility.

Fertility is affected by both the male and the female, and the fertility of both tends to decrease as the birds get older. Flock fertility is dependent on the reproductive status of the birds (i.e., level of egg and semen production) combined with the birds' interest and capability of mating. From the female side, the decline in fertility is believed to be due to faster release of sperm from the sperm storage tubules. They are not able to store sperm as long, so more frequent mating is required. From the male side, it is presumed that there is a decrease in sperm quality as the rooster ages, as well as a decrease in mating activity. There is also typically an increase in early embryo death when the hatching eggs come from hens in the second half of their reproduction cycle. These early deaths often appear as clears and may be mistaken for infertile eggs when candling or breaking out unhatched eggs.

Capons

Capons are **castrated male poultry**, typically chickens, in a process referred to as **caponization**. As previously indicated, the testes of male birds are located inside the body so castration is a surgical procedure. When the testes are removed, the male bird fails to develop certain male characteristics or tends to lose them if they are already developed.

When chickens take longer to reach market weight the older meat tends to become rather coarse, stringy, and tough as the rooster ages. Caponized males grow more slowly than normal male chickens and accumulate more body fat. Deposits of fat in both the light and dark meat of capons is greater than that of intact males resulting in a meat that is more tender and juicier. The older the age at which capons are slaughtered the more flavorful the meat. With major improvements in the genetics of meat breeds, caponization is not necessary. The fact it is a surgical procedure makes it difficult and expensive and raises ethical concerns.

Figure 2. Smoked capons in the display case of a store. *Jacquie Jacobs.*

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University of Kentucky
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So You Want to Produce Your Own Eggs?

By Jacquie Jacob and Tony Pescatore, Animal and Food Sciences

Backyard chicken flocks are becoming popular throughout the country in urban, suburban and rural communities. Preparation is essential for a successful backyard flock.

Factors to Consider

Not everyone is suited for keeping a poultry flock. Ask yourself why you want to keep chickens and whether or not you have the time and money needed to do a good job as an owner of a small flock. If you live in an urban or suburban area, make sure that there are not any ordinances preventing you from raising chickens. Many cities have banned backyard flocks, or have some strict limitations on what you can and cannot do. In addition, some residential subdivisions have their own restrictions. Some ordinances set a minimum amount of land that you have to have available before you can keep a flock. Even if the rules do not specifically say as much, they may have set back restrictions, such as 50 feet from the neighbors, which make it difficult to have a flock without a minimum acreage.

Chickens need to be taken care of every day. They need to be fed, provided clean water, and have their eggs collected daily. It is a good opportunity to teach children responsibility, but make sure they can fit it into their daily routine. If the children make pets of the chickens, it is important to remember it is unlikely that they will live as long as a dog or cat. Chickens can get sick. Very few veterinarians will deal with chickens. For those that will, the costs can be high. You may have no recourse if your chickens get sick. It is also important to supervise any young children handling chickens. Chickens, as with many livestock species, have salmonella in their digestive tracts. Anyone handling chickens, or the equipment they have used, should take care to wash their hands and keep their hands away from their face until they do so. Chickens should not be brought into the house and equipment they have used should not be washed in a kitchen sink used for handling food.

Chickens make noise. While only roosters crow, hens are not quiet at all times. A hen can make quite a lot of noise letting everyone know when she has laid an egg. Luckily it does not typically happen all the time and can be controlled to some degree by regulating when the lights come on in the morning. In any case, the noise made by a few hens is significantly lower than that of a barking dog.

Chickens eat a lot. It is unlikely that you can produce eggs cheaper than you can purchase them in the grocery store, but you have the satisfaction of knowing where your eggs come from. Hens can make use of about 60 percent of the feed they eat. The rest is excreted as manure. Make sure you have a plan for what you are going to do with the manure your flock produces.

Chickens do not live forever, nor do they produce eggs forever. To complicate things, their life span is typically longer than their productive life. You have to have a plan for what to do with hens when they are no longer producing eggs. If you are going to keep them, because they are pets, you have to be willing to pay for their food while they are no longer earning their keep.

Chickens can be destructive to your garden. Chickens scratch when they forage. If you are letting your hens run free, you may have to fence of your garden to prevent them from damaging your plants.

Housing Required

There is no one ideal design for a chicken house (Figures 1 and 2). Any chicken house should provide shelter from the weather (hot and cold), have nest boxes for the hens to lay eggs in, provide perches for the hens at night, and be easy to clean out. Protection from predators is always a concern as well. Most also have a run for the hens to get out into the open air. Figures 1 and 2 both have well-built chicken houses with runs. The chicken houses do not have insulation, but the hens will be fine in the winter because there are no drafts. Chickens can tolerate quite low temperatures as long as they are dry and out of the wind and away from drafts.

It is important to keep your chicken house clean and dry. This

will prevent odors and flies, both of which can be annoying to you and your neighbors. It is important to manage your bedding well, to prevent rodents from making your chicken house their home. Manure can be composted to produce a valuable, odor-free fertilizer for your garden.

Equipment Needed

It is difficult to obtain ready-to-lay pullets so you should plan on raising your hens from chicks. Chicks can be purchased online and they are shipped through the mail. Most hatcheries, however, require that you purchase a minimum of 25 chicks to allow for safe shipping. Another source is the local feed or farm supply store. Kentucky state regulations, however, require that you purchase a minimum of six chicks. If you only want three you may need to purchase with a friend. The chicks are typically sold sexed, but sexing errors do occur so it is possible that you will get a cockerel instead of a pullet. You need to have a plan B if this occurs and you are not allowed to keep roosters in your area. You do not need roosters for hens to lay eggs. They are only needed if you want to produce hatching eggs.

If you are raising you hens from chicks, you will need to be able to provide them with heat for the first few weeks. Brooding chicks will require a heat source, typically a heat lamp. It is important to suspend the lamp properly so that it is not likely to fall and start a fire. A lot of houses have been lost because of fires started by heat lamps in a close-by chicken house.

You need to provide your flock with feed and water. This requires you to make or purchase a feeder and waterer. Both should be suited to the size of hens you have. For chicks, small feeders and waterers

Figure 1. This chicken house is ideal for a trio of hens. They have shelter from the weather and a run to go into for fresh air. The chicken house has wood shavings for bedding, a perch, and nest boxes which can be accessed from the outside for easy egg pickup. The window on the side can be opened for easy clean out of the house interior. The feed and water are provided outside, to encourage them to use the run. The run has a sand base which is cleaned out regularly, much like a litter box. The run is completely covered with wire to provide protection from predators. The run could have been a little taller to make cleanout of the run easier, but it is functional as is.

Figure 2. This larger, mixed flock of hens is provided with a larger chicken house and run. Again, wood shavings are used as the bedding. The nest boxes are accessible from the outside for easy egg pickup. While the feed is indoors, the water is outdoors. The perches extend over the nest boxes which can be a problem requiring the tops of the nest boxes to be cleaned on a regular basis to prevent build up and odor problems. Again the run is completely covered to protect the hens from ground and aerial predators.

are need. Chick feeders and waterers will be too small for hens so if you are raising your hens from day old you will need at least two sets of feeders and waterers to accommodate the different ages. You need to provide your hens somewhere to lay their eggs. It is important to have nest boxes with clean bedding so that you do not have to go hunting for the eggs and to keep your eggs as clean as possible. Nest boxes should be about 1 foot wide x 1 foot deep x 1 foot tall.

The hens should have perches to sleep on (Figure 3). Perches also provide the hens with a way to get away from one another in cases of feather pecking problems. The hens will sleep on the perches at night so much of their manure will be deposited in one location to make for easier cleanout.

It is important to provide your flock with bedding. This will absorb moisture from the manure and keep the chicken house clean. Wood shavings are the best bedding material. Straw and shredded paper make the worst.

Feeding Your Flock

A hen will eat about a quarter pound of feed every day. For a trio of hens, that is 5¼ pounds of feed a week. A flock of three hens

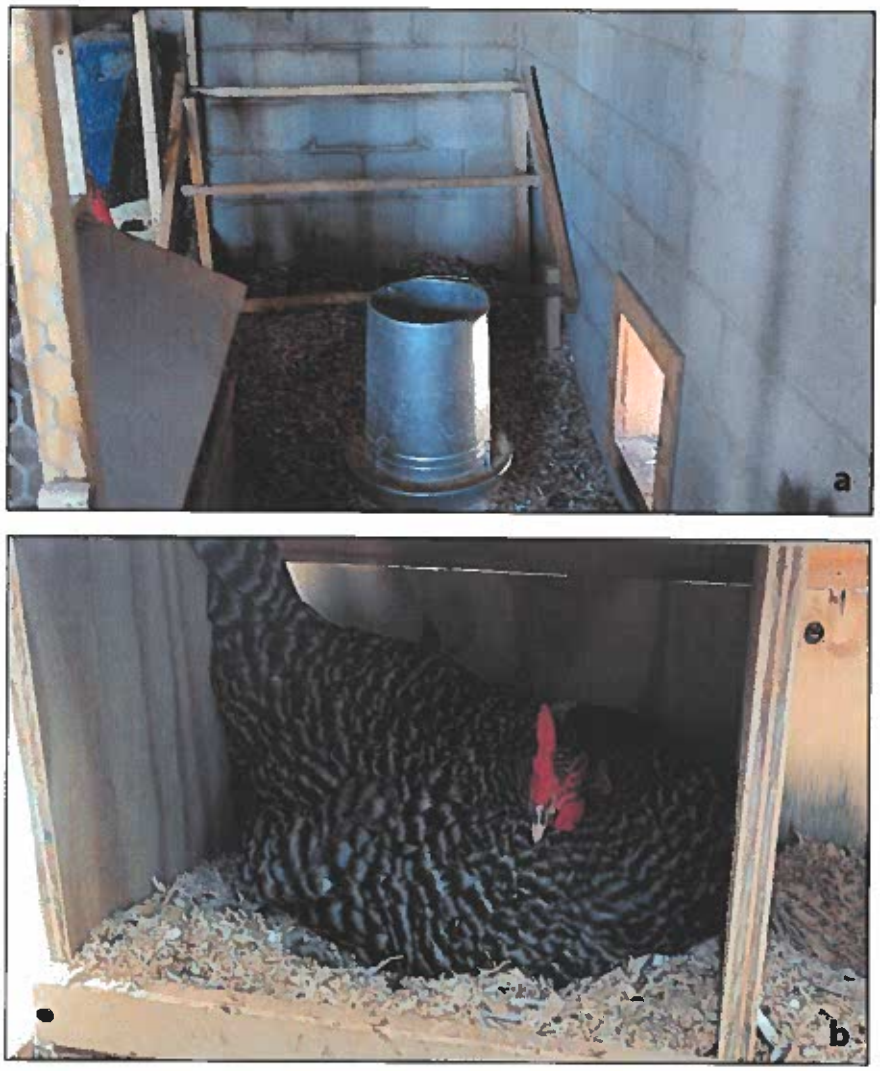

Figure 3. Examples of perches (a) for a small poultry flock and nest boxes (b) for a small laying flock.

Ranking of different litter types:

Best

Pine shaving

Good

Peanut hulls

Rice hulls

Chopped corn cobs

Kiln dried sawdust

Fair

Fresh sawdust

Dried leaves

Sawdust

Chopped straw

Poor

Long straw

Shredded paper
(especially computer paper)

would go through almost a whole 50-pound bag of feed every two months.

Chickens should be fed the right poultry diet—a chick grower diet for the pullets (young female chicken) and a layer diet for the hens. The diets are formulated to meet the specific needs of the age of the chicken. Feeding a chick grower diet to a layer will adversely affect egg production because it is too low in calcium. Similarly, feeding a layer diet to a pullet will result in health problems because it is too high in calcium. A chicken will eat about quarter pound of feed every day. The diets are formulated to meet all the nutrition needs of the chicken within that amount. Diluting the diets with scratch grains or cracked corn can lead to nutrient deficiency which can result in poor egg production, or even a decline in hen health.

Egg Production

It takes a hen about 26 hours to assemble an egg from the time it ovulates (releases the yolk from the ovary) until it lays an egg. The next yolk is ovulated 30 minutes after the previous egg is laid. The most a hen can lay, therefore, is one egg per day. They will lay for a few days and then take a break. Depending on the number of hours of light per day, hens typically come into production around 20 weeks of age. They come into production with increasing day lengths (i.e., the hours of sunshine per day are increasing) as is common in the spring and go out of production with decreasing day lengths (as is common in the fall). Once a flock starts laying, they typically increase in production quickly, maintain egg production for several weeks, and then slowly decrease in egg production (Figure 4).

To keep your hens producing throughout the winter supplemental light will be needed. The number of hours of light per day should be at least 14 hours per day but not more than 16. A timer can be used to help you regulate when the lights come on and go off. A light sensor can be used on the bulb socket so that the light only comes on when it is dark out, saving bulb life and electricity costs.

The color of the egg shell varies depending on the breed of the hen (Figure 5). The hens of some breeds lay white-shelled eggs, others brown. There are even breeds that lay light blue, green, or pink shades of egg shell. With a diverse flock of hens you can end up with your own Easter egg collection of eggs every day.

The color of the shell has no effect on the quality of the egg. The

Figure 4. Typical production curve for flocks of laying hens.

Figure 5. A dozen of eggs from a flock with a mixture of chicken breeds.

nutrient content is a reflection of what the hens eat, with dark egg yolks resulting from the consumption of grass or other pigmented materials.

It is important to pick up your eggs at least once a day. Store clean eggs in the refrigerator. Do not use any badly soiled eggs because they are a food-safety risk.

Terminology

Bedding: Material placed on the floor of the chicken house to absorb moisture, insulate the birds from the floor, and control odors

Chick: Baby chicken of either gender

Cock (or rooster): Adult male chicken

Cockerel: Young male chicken

Hen: Adult female chicken

Poultry: Domesticated birds raised for food, fiber, or entertainment

Pullet: Young female chicken

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Processing

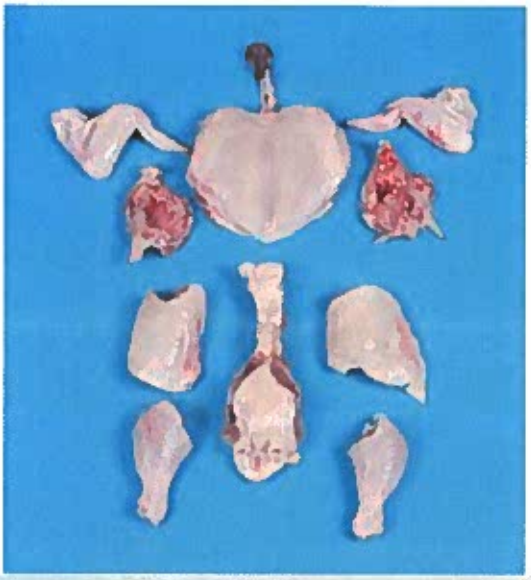
Chapter 7

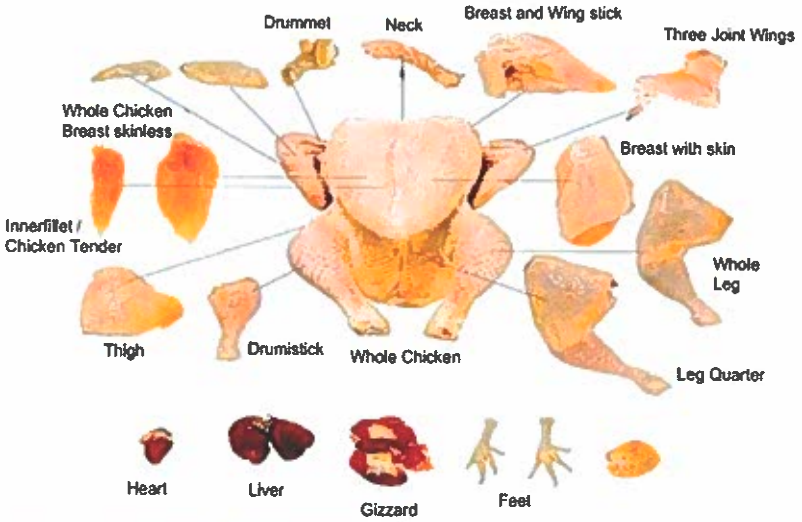
Wayne County Poultry Resource Book

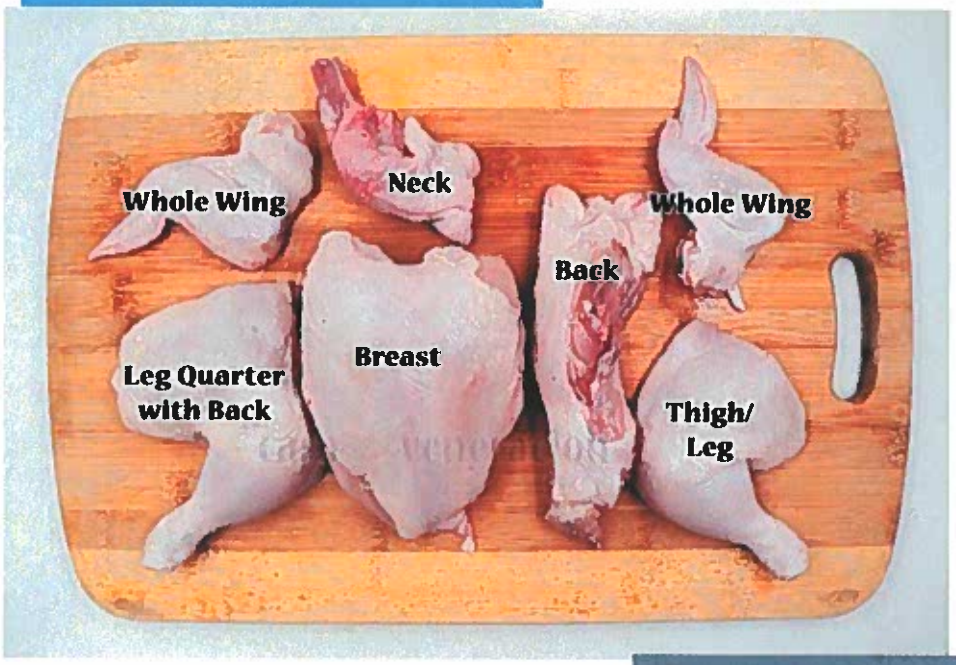
Version 1. Published April 2020

Cut	Retail Cuts	Restaurant Cuts
Chicken breast	Chicken breastbone in	Supreme (chicken breast with wing drumette attached)
Chicken breast boneless/skinless		
Chicken breast fillets (or tenders)		
Chicken leg	Chicken leg (back attached)	Chicken Ballotine (boneless leg)
Chicken drumstick		
Chicken thigh (bone in)		
Chicken thigh (boneless skinless)		
Chicken wing	Chicken wing (whole)	Chicken wings split, tips removed
Chicken winglette (or wingette)		
Chicken wing drumette		
Chicken wing tip		
Backs and Necks	Chicken backs and necks	Chicken ribs, backs and necks are used for stock

Poultry Meat Cuts

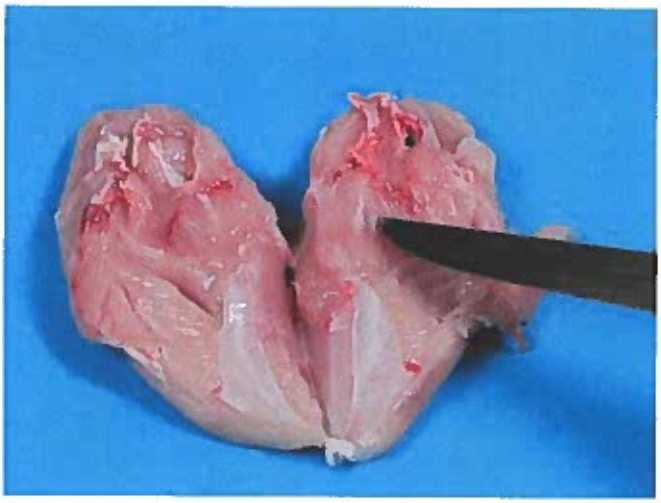




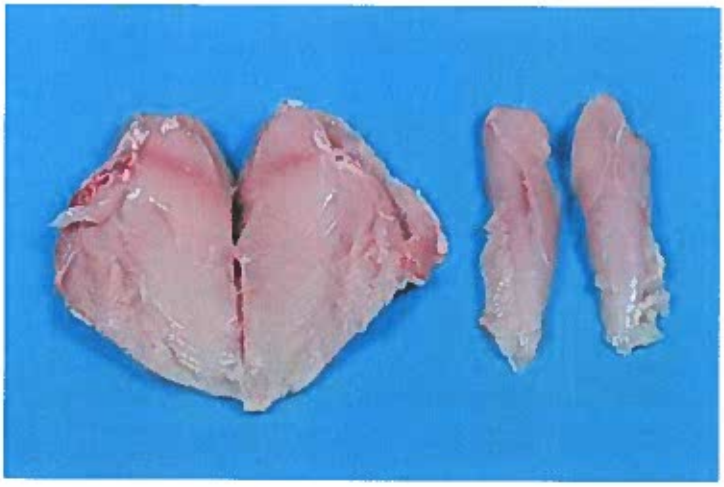


Segmented Chicken wing

Whole Boneless Skinless Chicken Brest



Whole Boneless Skinless Chicken breast with tenders removed



Whole Chicken Leg

Drumstick

Boneless Skinless Chicken Thigh

Chicken Half

Leg Quarter----- Breast Quarter

Bone -In Thigh

Whole Breast

Single Breast Boneless Skinless Fillet

Single Breast Boneless Fillet

Liver

Gizzard

Heart

Neck

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, LEXINGTON, KY, 40546

ASC-210

Processing Chickens

Tony Pescatore, Steve Skelton, and Jacquie Jacob, Animal and Food Sciences

When processing poultry, remember that you are producing a perishable food product that will eventually be consumed by people. The goal is to produce a safe, nutritious product.

Step 1. Feed withdrawal

Feed should be withheld from chickens prior to slaughter. Proper feed withdrawal will help reduce fecal contamination of the processed carcasses. Take care to match the time off feed with the time the chickens will be processed, factoring in the time between catching and processing the chickens.

Producers will benefit from using the proper feed withdrawal time. Changes in the gut occur when the chicken is off feed, so how long a chicken is without feed is an important issue. Too short a feed removal time will result in feed in the crop and digestive tract, which increases the chance for fecal contamination of the carcass. Too long a time off feed will result in watery digesta and fragile intestines, which can cause problems when processing the chickens.

The ideal time off feed before processing is between 8 and 12 hours. The minimum time off feed is 6 hours. It is worth the extra effort to remove feed at the proper time. The proper time will depend on the type of feed you are using.

Water removal is not as critical as feed removal. In hot weather chickens should be on water as long as possible. Your birds will die if deprived of water for long periods of time.

Step 2. Collection

It is best to catch chickens at night or in the early morning when they are the most calm. For small operations, it is best to catch each chicken individually. For larger operations, however, this method is too time-consuming. Typically the chickens are caught by both legs right above the feet. No more than three chickens should be carried in each hand. Don't let the wings flap too much or the wings may be bruised or broken.

Place chickens in transportation crates. Wooden crates are available, but plastic crates are easier to wash and disinfect. Crates should be cleaned after every use since disease can be transported on the surfaces and spread from one flock to another.

The holding capacity of a crate depends on the size of the birds and the crates as well as the weather conditions that day. A crate will typically hold eight chickens in the summer and ten in the winter.

Step 3. Holding

After the chickens are caught and crated, keep the crates off the ground to prevent contamination from fecal material or water from the slaughterhouse floor. Leave an empty crate on the bottom of a stack to keep chickens off the floor (Figure 1).

When removing the chickens from the crates (Figure 2), handle them with care so that they are not bruised and no bones are broken. The wings are most likely to be bruised or broken with improper handling.

Figure 1. Chickens being held in a crate prior to processing. Note that the bottom crate is empty to keep the chickens off the floor.

Figure 2. Removal from crates

Step 4. Killing

Bleeding cones are commonly used to aid in killing chickens. Most cones are stainless steel and come in a variety of sizes. It is also possible to make your own using plastic traffic cones.

Place the chicken in the cone headfirst with both wings folded together. The cones prevent the chickens from flapping their wings or backing out and escaping. It is important, therefore, that a cone of the correct size is used.

The most humane method of killing chickens is to stun them first so that they are unconscious when their jugular veins are cut. For kosher (Jewish) and halal (Muslim) slaughter, however, the chickens cannot be stunned prior to killing.

In smaller processing plants the chickens are typically stunned using an electrical knife. The knife is placed on the non-feathered part of the head to improve contact (Figure 3). It is important that the person using the stunning knife wear rubber gloves to prevent shocks.

When a chicken is first stunned it will tighten all its muscles. Once the muscles relax the chicken is unconscious. The chicken is not dead at this point, only unconscious, so it is important to kill the chicken as soon as possible after stunning so it does not regain consciousness.

Figure 3. Use of an electrical knife to stun a chicken prior to cutting the jugular veins

The stunning knife should operate at 110 volts. Higher voltages can result in hemorrhages and broken bones. Stunning at this voltage has the added benefit of relaxing the feather follicles, making feather removal easier.

The jugular veins are located on either side of the neck just below the junction of the head and neck (Figure 4). To properly bleed a chicken, one or both of the jugular veins are cut. It will take a few minutes for the chicken to completely bleed out. It is good to have a trap under the cones to collect the blood as it is drained from the chickens. This blood can then be composted along with the feathers and evisceration waste.

It is important that the spinal cord not be cut, as would occur if the head is completely cut off. Severing the spinal cord is said to "set" the feathers, making them harder to remove. The esophagus should also not be cut. If the esophagus is broken or cut, material from the digestive tract may leak out and contaminate the carcass.

Any chicken that dies before it reaches the bleeding cone should be discarded. Improper bleeding of the chicken can result in a cadaver such as the one shown in Figure 5. In such cases the bleeding time was too short, or the jugular veins were not properly cut.

Figure 4. Cutting the jugular vein of a stunned chicken during processing

Figure 5. Blood pooling under the breast skin of a chicken that was dead prior to bleeding

For kosher and halal slaughter, the chickens are not stunned and the jugular and carotid arteries are cut on one side of the head only. This method results in a slower bleed out.

Step 4. Feather removal

Once the chicken has fully bled out, it is removed from the cone and placed in a scald tank. The heat breaks down the proteins holding the feathers in place, making their removal easier. After the water in the tank is heated to the correct temperature, the chicken carcasses are placed on the blades in the tank and rotated through the hot water for a specific period of time (Figure 6).

Scalding is not permitted in kosher processing. As a result, feathers are more difficult to remove.

The scald temperature should be about 140°F. If the scald tank is at the correct temperature it is easy to pull out the wing feathers

Figure 6. Placement of the bled chickens on the blade of the scald tank

(Figure 7). If the temperature is too hot, the carcass becomes partially cooked (Figure 8). If the temperature is too low, the feathers will be difficult to remove when the carcasses are placed in the plucker. Figure 9 compares the result of a scald temperature that is at an adequate level to one where the scald temperature was too low.

Automatic feather pluckers use plastic "fingers" to pull the feathers off the carcass circulating in the equipment. The circulating carcasses will hit each other as well as the walls of the equipment. The pressure that the carcasses are exposed to may result in leakage of any fecal material remaining in the lower intestines, contaminating all the carcasses in the equipment at the time. This is one step, therefore, where the efficiency of the feed withdrawal program can be evaluated. A poor feed withdrawal program will result in increased feather contamination.

Figure 7. Testing the ease of feather removal post-scald

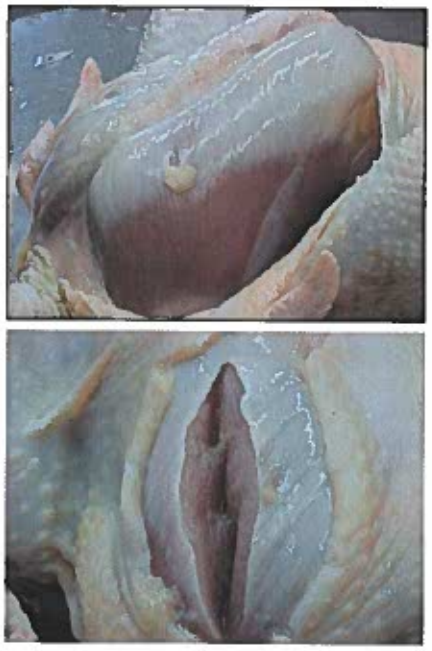


Figure 8. Partially cooked breast meat from a chicken that was scalded at too high a temperature

Figure 9. Comparing the effectiveness of feather removal post-plucker of a chicken that has been scalded at the correct temperature (left) with one that was scalded at too low a temperature

Step 5. Removal of preen gland

When the carcass is ready for evisceration, hang it from a shackle by its feet, with the head hanging down. The preen gland is removed as shown in Figure 10. The preen gland is the only oil gland that the chicken has. There are two sacs that, when squeezed by the chicken's beak, release oil for use when preening feathers. The removal of the preen gland is not required for food safety reasons. Instead it is removed to prevent oil on the carcass, which can result in reduced carcass quality. Figure 11 compares the accuracy of oil gland removal for two carcasses. The difference in the appearance between the two carcasses can be easily seen.

Figure 10. Removal of the preen gland

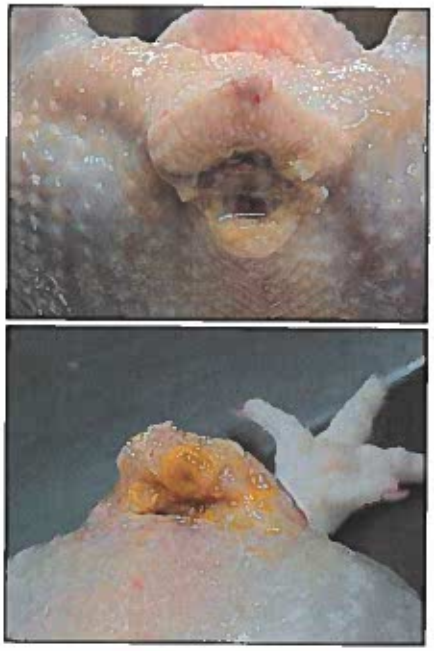


Figure 11. Comparing a carcass with a clean removal of the oil gland (left) and a carcass in which the oil gland has been cut and the contents allowed to contaminate the carcass

Step 6. Removal of the crop

To remove the crop, which should be empty, place the chicken's neck in the palm of your hand. Pull the skin tight and cut through the skin along the back of the neck (Figure 12). Pull the skin of the neck away from the neck itself and isolate the trachea and esophagus (Figure 13). The trachea, which is part of the respiratory system, has rings of cartilage. The esophagus is part of the digestive system and does not have these rings. Follow the esophagus back toward the base of the neck and find the crop (Figure 14). Loosen the crop from the skin. Pull the trachea and crop from the body cavity. Figure 15 shows an example of why the chickens must be off feed for a sufficient amount of time before processing. The carcass in the photo has a full crop. The crop has broken, and the contents are contaminating the carcass.

Figure 12. Cutting along the back of the neck

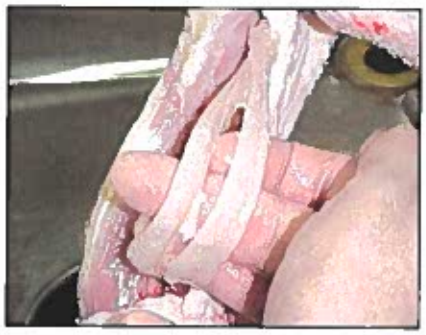


Figure 13. Locating the trachea and esophagus

Figure 14. Locating the crop just outside the body cavity of the chicken

Figure 15. A processed chicken carcass with a full crop

Step 7. Removal of the internal organs

To open the body cavity, cut a hole at the base of the tail above the vent (Figure 16). Reach into the body cavity and hold the large intestines while you continue cutting around the vent (Figure 17). Do not nick the intestines or the carcass could become contaminated as the internal organs are removed. Pull the cloaca and large intestines loose from the body cavity (Figure 18). Enlarge the opening by cutting the skin from the current opening to the keel (Figure 19). It is important that the intestines are not nicked or broken during this step. Figure 20 shows a carcass that had its intestines broken. The result was contamination of the chicken carcass by the fecal material, which is a food safety concern.

Place the chicken's head and neck into the shackles to allow easy removal of the internal organs (Figure 21). Reach into the body cavity and pull out the internal organs (Figure 22).

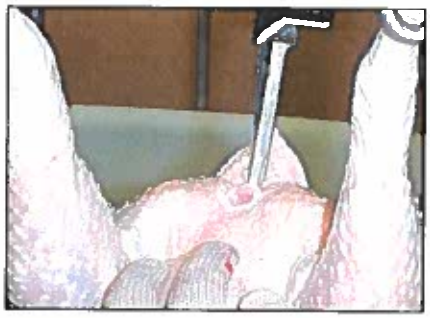


Figure 16. Cut a hole at the base of the tail above the vent.

Figure 17. Hold the large intestines while continuing to cut around the vent.

Figure 18. Pull the cloaca and large intestines loose from the body cavity.

Figure 19. Enlarge the abdominal opening by cutting the skin from the opening to the tip of the keel.

Figure 20. Carcass with fecal contamination from broken intestine

Figure 21. Place the chicken's head and neck into the shackle.

Figure 22. Reach in the body cavity and remove the internal organs.

Step 8. Inspection of the internal organs

Inspect the internal organs for any sign of disease or abnormality (Figure 23). Similarly, once the entire intestinal tract has been removed it should be evaluated for disease or abnormality. In order to be able to identify disease or abnormality in the internal organs it is important to be familiar with the normal appearance of these organs in a healthy chicken. Figures 24, 25 and 26 show organs and intestines from a healthy broiler chicken. The liver is mahogany to light tan in color. The membranes are clear, and there are no hemorrhages. The gall bladder is intact. It is enlarged because the chicken was not eating prior to slaughter and thus did not have a need for bile, which is stored in the gall bladder. The color of the spleen is similar to that of the liver. The membrane around it is clear, and there are no hemorrhages. The intestines are intact. The connective membranes are clear, and there are no hemorrhages.

After inspection, completely remove the organs. The heart, gizzard and liver can be saved for consumption. The gizzard should be cut open and the inner membrane peeled off and discarded. The spleen and gall bladder are separated from the liver and discarded. Handle carefully so that the bile is not released from the gall bladder since it will stain the liver.

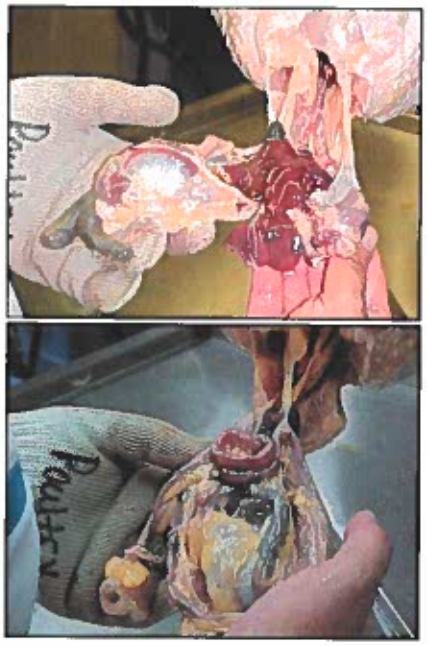


Figure 23. Inspect the intestines and organs for any sign of disease or abnormality.

Figure 24. Normal heart (top) and gizzard from a healthy chicken

Figure 25. Normal liver, gall bladder and spleen of a healthy chicken

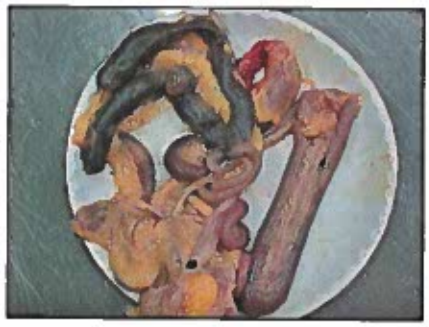


Figure 26. Normal intestines of a healthy chicken

Using a lung remover, remove the lungs from the inside of the carcass (Figure 27). The lungs should be bright pink in color and have no lumps (Figure 28). The lungs are discarded.

Figure 27. Removing the lungs from the body cavity

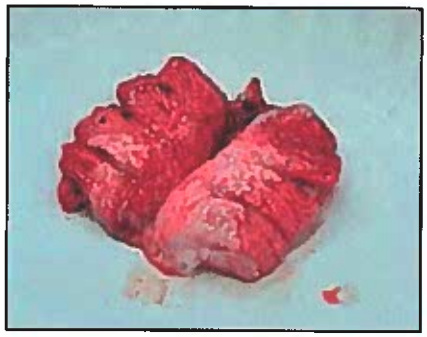


Figure 28. Lung from a healthy chicken

Step 10. Removal of the neck and legs

The next step is to remove the neck (Figure 29) and feet (Figure 30). The neck is typically cut off while the carcass is still in the shackles. Remove the carcass from the shackle and cut off the feet at the hock joint. The neck can be kept as an edible part. When a commercially produced whole chicken is sold with giblets, it has the neck, heart, gizzard and liver in the body cavity. Some people also consume chicken feet. They are cleaned and the outer skin removed. They are often used to make chicken soup.

Figure 29. Removing the neck

Figure 30. Removing the feet

Step 11. Finish

Do a final rinse and inspection of the carcass. Remove any bruises, such as the bruised wing shown in Figure 31 and the bruised muscle meat shown in Figure 32.

Figure 31. Bruised wing

Figure 32. Bruised breast muscle

Step 12. Reduction of the temperature of the carcass

After the carcass has been rinsed, inspected and any bruises removed, place it in a chill tank containing water and ice (Figure 33). The purpose of the chill tank is to get the temperature of the product to 40°F or lower. When the correct temperature is reached (in less than 4 hours) the product is removed, drained and packaged.

Figure 33. Processed chicken carcass in chill tank

Trouble-shooting

Occasionally things go wrong. It is important to identify the source of the problem and adjust the processing method accordingly.

- The carcass shown in Figure 5 is an example of an incomplete bleed. The chicken was not properly bled (too short a bleed time) or the jugular veins were not properly cut. An adjustment in the slaughter technique is required.
- The bruised wing shown in Figure 31 is due to rough handling of the chicken while it was being caught, placed in the crate or removed from the crate. Careful handling of live birds will help prevent this problem.

- Similarly, deep muscle bruising as shown in Figure 32 is the result of rough handling of the live chickens. Careful handling of the chickens at the farm and at the time of load out will prevent this type of damage.
- A very torn carcass such as the one shown in Figure 34 may be the result of a broken picker finger in the plucker. In addition, excessively fat carcasses tear easily. The intestines of the carcass shown have ruptured, contaminating the carcass. As a result, the carcass is not salvageable. In contrast, the carcass in Figure 35 has torn skin, but there is no damage to the intestines. While the appearance of the carcass is negatively affected, there is no food safety reason to discard the carcass. It can be salvaged with corrective action.

Figure 34. Carcass contaminated by torn intestines

Figure 35. Torn carcass with no damage to the intestines

- A tearing of the intestines can result in leakage onto the carcass, as shown in Figure 20. Causes include improper cutting of the opening around the vent or a feed withdrawal time greater than 14 hours, which can result in fragile, easily torn intestines. Such carcasses need to be washed and chilled separately from other carcasses.
- The carcass shown in Figure 36A has a small body scratch, indicated at the point of the knife. The scratch was most likely made by the toenail of another chicken. A possible cause for scratches is overcrowding or inadequate feeder space. As shown in Figure 36B, the flesh under the skin is necrotic, making it unfit to eat. The carcass can be salvaged, however, if this tissue is removed. As shown in Figure 36C, the amount of flesh that needs to be removed is far greater than the original scratch would indicate.

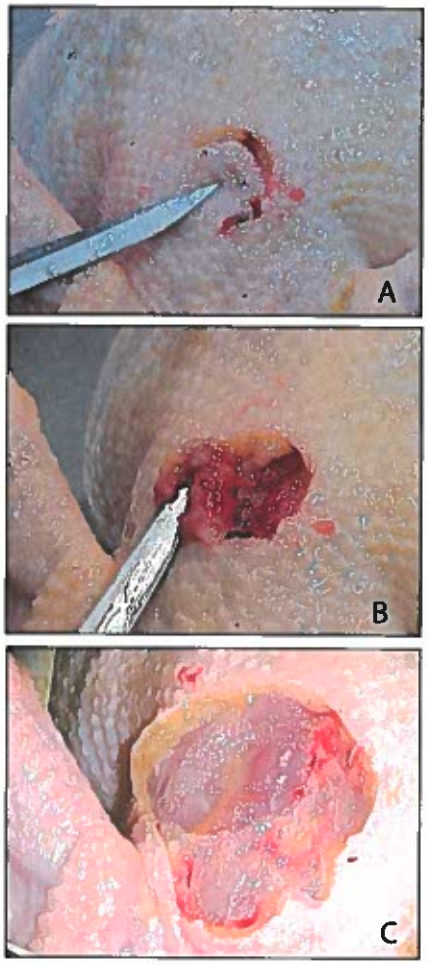


Figure 36. Impact of a small scratch on the quality of the underlying meat

Issued 10-2013

1, 2, 3 of Marketing Your 4-H Project

Preparing to sell your animal(s) or dairy products at the auction is an important part of your 4-H project. It helps you learn sales, marketing and community relations skills. Have fun with it! Be a great representative of yourself, your family, your club and Wayne County 4-H.

1 Before the Fair

Create a list of businesses and/or individuals to invite

- ✓ 4-H project related: where do you buy feed and supplies, equipment, veterinarian.
- ✓ Invite your dentist, doctor, banker, where you purchase your vehicles, insurance rep. – local businesses that you and your family spend money with.
- ✓ Identify leading businesses in our community to visit and personally invite – construction companies, auto dealers, corporations and more!

Write a personal letter inviting the business to the 4-H auction

- ✓ Your letter should be 2-3 paragraphs.
- ✓ Hand written letters are best!
- ✓ Explain your 4-H project – how you cared for, fed and prepared your animal(s) for fair.
- ✓ Share what you like about 4-H and the fair.
- ✓ Thank businesses for being a part of our community and mention specifics if your family works with them (i.e. we buy our feed from your store, we shop at your location).
- ✓ Include a picture of you and your animal (can be taken in your yard, put on clean, nice jeans, present yourself and your animal at their best).
- ✓ Include the day and time your animal sells.

Hand deliver letters to potential buyers (Approximately 3 weeks before fair)

- ✓ Plan ahead what you will say when inviting buyers. Practice with your parents.
- ✓ Ask for the business owner. Introduce yourself with a firm handshake.
- ✓ Make eye contact, be confident and smile!
- ✓ Share your name, 4-H Club, and invite them to the Wayne County Jr. Fair livestock auction. Talk about the animal(s) you are exhibiting and selling.
- ✓ Ask if they have any questions about the auction (if a new buyer – share the information brochure)
- ✓ Thank them for supporting Wayne County 4-H!

2 At the Auction

Present yourself and your animal (if applicable) with pride.

Personally thank your buyer for supporting you and 4-H.

- ✓ Have family member listen closely for the buyer's name and watch where they are seated so you can personally thank them at the sale.
- ✓ A sincere thank you and handshake is GREAT!
- ✓ Buyers prefer you do not give them baked goods or other gifts at the fair as many are attending the auction all day or other activities at the fair.

3 After the Auction

- ✓ Write a personal thank you note to the buyer! Include details about your 4-H experiences.
- ✓ Thank you letters must be addressed, stamped and submitted to the Extension office starting the Monday following the Fa
- ✓ Market livestock checks are mailed to youth approx. 4-6 weeks after the fair. You MUST turn in your thank you notes to the Extension Office in order to receive your market livestock check.

How to Write a Thank-You Letter

It's very important to send donors and sponsors and auction buyers a personalized, handwritten thank you. Here are some tips for successful thank-you letters.

- Use your best handwriting.
- Show gratitude.
- Include your name, your age or grade in school, where you're from or your club name.
- Reference the gift you are thanking them for. If the gift was money, it's not in good taste to reference dollar amounts. Examples would include "thank you for sponsoring the market swine trucking" or "thank you for your successful bid at the premium auction".
- If you are not personally familiar with this person, limit the amount of personal information you include about yourself to your name and county. If you are familiar with this person, make reference to how you know them.
    - An example would include "You are a fantastic Grandpa, thank you for your support", or "Thank you for being a supportive neighbor".
- Include the project area(s) that you are participating in.
- You may include a reference to how you will use your award.
    - Examples include, "this will help me continue to work in my project area" or "next year I plan to show (#) (livestock) at the Clay County Fair"
- You could include something about the 4-H program, such as "thank you for your support of the Clay County 4-H program", or "Thank you for encouraging 4-Hers to make the best better", or "thank you for making the 4-H/FFA Premium Auction possible", or "thank you for contributing to this important youth education program"
- At the bottom of your letter, write "sincerely" and then sign your first and last name.

Showing

Chapter 8

Wayne County Poultry Resource Book

Version 1. Published April 2020

Caring for Your Bird

Once you decide which bird to enter in the contest, you must give special attention to that bird in the areas of care and feeding. The first thing you may want to do is to separate the bird from any other birds. Go to a place where you can give it extra attention and where it receives more exposure to people. (You may even want to play loud music around the bird to get it used to noise.) By handling your bird often and providing exposure to other people, you may ensure a better performance during the actual contest.

As with any birds you own, be sure to provide the bird with a balanced diet so it is in good overall condition (body weight). If you need information on the proper diet for the types of birds you own, refer to your 4-H leader or to your local MSU Extension office staff.

Next to training (which is described on page 8 in "Training Your Bird"), the grooming of your bird is most important. Before the show, be sure to do the following grooming tasks:

8 to 12 weeks before the show:

If your bird has any broken or damaged feathers, pull them out carefully so new feathers will grow into their place by the date of the show. Keep in mind that sometimes it may take longer than 12 weeks for replacement feathers to grow back. Frequently check your bird for lice and mites so you can treat it ahead of time. Check around the head, vent area, on the legs and back, and under the wings. If you find lice or mites, treat the bird with a recommended lice and mite treatment (check with your local feed store, farm supply store or veterinarian for the type of treatment). *Be sure to follow directions on the label.*

3 to 5 weeks before the show:

Check again for external parasites and treat the bird if necessary.

3 to 5 days before the show:

Clean and groom your bird. You will need the following materials:

- Laundry tub with running water or two buckets
- Mild soap or whitening shampoo (for use with white birds only)
- Warm water
- Towels and soft cloths
- Old toothbrush
- Blow-dryer (optional)
- Nail clippers

Depending on how dirty your bird is, use these materials to either give it a bath or do some spot cleaning. Giving your bird a bath is probably a better idea. Remember that ducks and geese that are allowed to swim in a pond will stay fairly clean, but those kept in cages will probably need to be cleaned. Keep the following points in mind as you clean and groom your bird:

- To give your bird a bath, place it in a laundry tub or use two buckets (one filled with lukewarm soapy water and the other filled with lukewarm rinse water). Make sure the water level is below the bird's ears so the water doesn't get into its ears. Use a soft cloth to wash the feathers and an old toothbrush to scrub the bird's shanks,

toes and feet. Be sure to rinse the bird thoroughly. Remember that by giving your bird a bath ahead of time, the bird has time to recondition its feathers by preening. During the winter, keep the bird in a warm area to dry. You may want to use a blow-dryer to dry the bird. *Caution: Keep the blow-dryer away from any contact with water.*

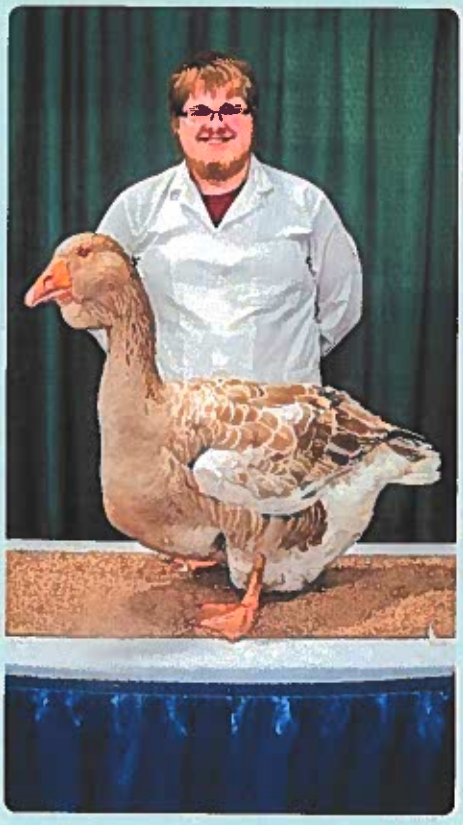
- If the bird is not dirty and doesn't require a bath, you may just need to clean some of its feathers. Wash in the natural direction of the feathers lie. *Do not wash against the feathers.* Be sure to rinse the bird thoroughly.
- Dry the bird's feathers with a soft cloth or towels and a blow-dryer. Use the cloth or towels to remove most of the water before you begin blow-drying. After you finish drying the bird, keep it in a warm place until it is completely dry.
  - **Chickens:** If a chicken has tight feathers (for example, Leghorns), blow-dry in the direction of the feathers. If a chicken has fluffy feathers (for example, Cochins), blow-dry against the feathers.
- Use the toothbrush and warm soapy water to scrub the bird's feet, toes and shanks. Rinse and dry all parts thoroughly.
  - **Chickens:** Wash the comb, wattles and beak with a soft cloth.
- Using nail clippers, clip the bird's toenails if they are too long, but be careful not to cut them too short. Trim only the transparent part of the nails, a little at a time; otherwise, the nails might bleed.
- Trim the beak as needed by using nail clippers to align the top and bottom of the beak.

On the day before the show:

- Take time to apply a few final touches to make your bird look even better. Place a little mineral oil or petroleum jelly on a soft cloth and apply it to the bird's beak or bill, shanks and toes. Be careful not to apply too much oil or jelly. Do not apply it on the feathers.
  - **Chickens:** Also lightly apply the oil or jelly to the bird's comb and wattles.
  - **Pigeons:** For pigeons with "clean" legs (that is, with no feathers on the shanks or on the toes), apply the oil and jelly on the shanks and toes. For pigeons with "booted" legs (that is, with feathers covering the shank area only but not the toes), apply the oil or jelly on the toes and a little on the beak. Be careful not to get the oil or jelly on the feathers.
- After you are finished with cleaning, make sure the bird returns to a clean pen. Continue to keep the pen clean so the bird doesn't get dirty again.

SHOWMANSHIP

The showmanship part of the contest focuses on your ability to demonstrate your knowledge and skill of handling, posing and examining your bird. Throughout the contest, the judge will evaluate your skills, attitude and appearance. A quiz may also be part of the contest.



The steps for showing chickens, turkeys, ducks, geese and pigeons are included on pages 10 to 38. Photos of the steps are included in these sections.

At the end of each species section is the Michigan 4-H Poultry Showmanship scorecard that should be used during showmanship contests. Check with your 4-H leader or MSU Extension staff member ahead of time to learn about the point system your county uses.

Your Attitude and Behavior

During the contest, every eye will be on the participants, so act properly. Be alert and smile as you complete the various steps of showmanship. Look at the judge from time to time to make sure you have his or her attention. Be courteous to everyone during the contest. If the judge asks you questions, answer them politely. Use the word "sir" or "ma'am" when asking or answering questions. Be sure to be a good sport and congratulate your peers after the contest – no matter who wins.

If all the contestants perform the various steps of showmanship equally well, the judge must then consider attitude and behavior when scoring the contestants.

The Poultry Quiz

A quiz may be a part of the fitting and showmanship contest, usually given to each participant at the end of the contest. It tests participants' knowledge about the particular species of poultry being shown and their general knowledge of poultry. The number and type of questions will depend on such things as contestants' age division and the amount of time available. The quiz may be written or verbal. Contestants should be prepared for both.

To prepare for the poultry quiz, spend some time learning about the species of your bird and the breed of your bird as well as general poultry science and management principles. Check with your 4-H leader or county MSU Extension staff member for information resources that would be helpful.

Showing Chickens

In the showing part of the competition, you will be asked to remove your chicken from the carrier and take it to the assigned judging area. Judging may begin as soon as you are placed in the judging line.

Chickens: Figure 1

Chickens: Figure 2

Chickens: Figure 3

Handling and Posing the Chicken

Step 1: Entering the bird in the cage

Hold the chicken in front of you so the bird's head is facing you. Your palm should be under the breast area of the bird so that one thigh rests between your thumb and index finger and your remaining fingers wrap around the other leg and extend up the side of the body. Place your free hand on the bird's back to provide additional support.

When you reach the cage, release your hand from the top of the chicken to the open cage.

Turn the bird 180 degrees so that the bird faces the doorway of the cage (**Chickens: Figure 1**).

Slowly place the bird in the cage headfirst. Then turn the bird in a profile position for posing.

Step 2: Posing the chicken in the cage

Make sure the bird is in the profile before you begin posing the bird (**Chickens: Figure 2**). You may use a training stick for posing the bird. Touch the stick under the head area touching the wattles. The bird's head should be up and its neck should be fully stretched. The feathers should be tight and smooth. If you are using a stick, pose the bird with the stick to maintain the position. After your bird is posed, take a step back from the cage so the judge can evaluate your bird.

Step 3: Removing the chicken from the cage

When removing the chicken from the cage, always remove it headfirst (**Chickens: Figure 3**). Your hand should be over the bird's back and your other hand should be under the breast, with your fingers grasping the thighs.

Chickens: Figure 4

Step 4: Final pose

When you have removed the chicken from the cage, close the door, turn toward the judge and stand at attention. Stand steady with your free hand straight down at your side. The bird should face you while sitting in the palm of your hand (**Chickens: Figure 4**). The judge will release you from this pose after a proper examination.

Examining the Chicken

The examination section follows posing the bird. When the judge gives the command to examine your bird, perform the following steps to determine defects, disqualifications and the condition of your bird.

If your bird is a hen, be sure to examine it to determine its past egg production (pigment loss, handling quality, abdominal capacity and molt). If you would like more information on how to evaluate past egg production characteristics, check with your 4-H leader or county MSU Extension staff member.

Step 1:

Examine the head area. Let the bird rest in your hand while you use your free hand to examine the bird.

- Look at both eyes to make sure they are not blind. Point your index finger at the eyes. (The bird should blink or move when pointed at.) Notice the pigment around the eye-ring (**Chickens: Figure 5**).
- Look for defects on the comb. Point your index finger at the comb. Also, feel the condition (texture) of the comb by holding the comb between your thumb and index finger (**Chickens: Figure 6**).
- Feel the texture of the wattles and look for any apparent abnormalities (**Chickens: Figure 7**).
- Examine the condition of the feathers on the head area for any sign of molting (**Chickens: Figure 8**).

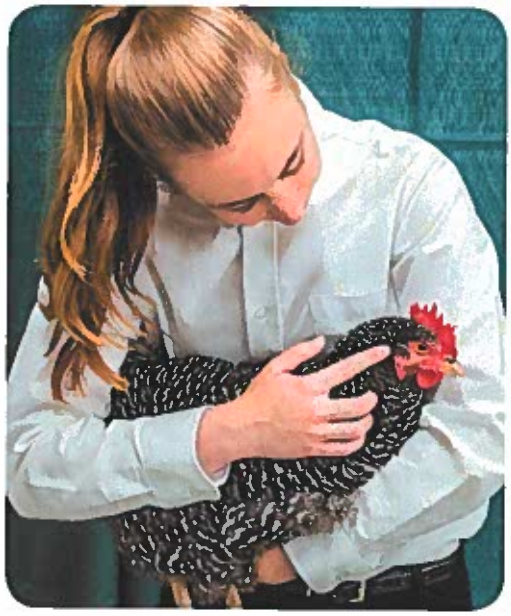
Chickens: Figure 5

Chickens: Figure 6

Chickens: Figure 7

Chickens: Figure 8

Chickens: Figure 9



Chickens: Figure 10

- Look at the beak for any defects such as crookedness. Point your index finger at the beak. Also, examine the pigmentation of the beak (**Chickens: Figure 9**).
- Examine the color of the earlobes to see if they are true to the breed. (Refer to the American Poultry Association's *American Standard of Perfection* for guidelines.) Point your index finger at the earlobes. Then locate the ear and point your index finger at it (**Chickens: Figure 10**).

Step 2:

Run your fingers over the neck area to feel for smoothness. Also, notice the condition for any sign of molting (**Chickens: Figure 11**).

Step 3:

Examine the back area. Run your hand over the back area to feel for any abnormalities. Use your hand to measure the length and breadth of the back area to check the conformation of the bird. Look at the under-color of the feathers on the back and check for any sign of molting (**Chickens: Figure 12**).

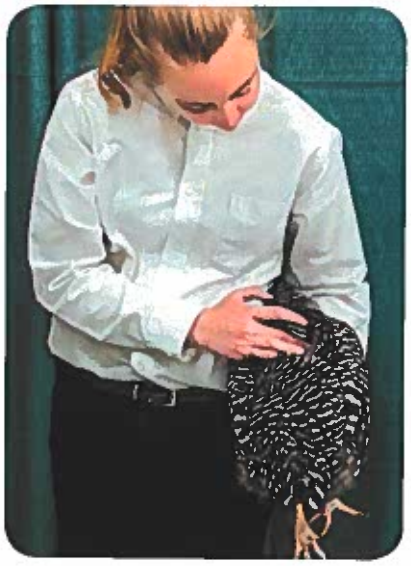
Step 4:

Run your hand down the bird's tail. Press the tail feathers toward you and examine the condition of the feathers. You may want to count the tail feathers to determine any sign of molting (**Chickens: Figure 13**).

Step 5:

Examine the vent area. As the bird rests on your hand, tilt the bird downward so that the bird's head is facing the ground and the vent area is toward you (**Chickens: Figure 14**). Look for lice and mites. If your bird is a hen, examine the condition of the vent to see if the hen is in laying condition. Also, look for pigmentation loss. With the bird in the same position, check the "handling quality" of the bird. This is one way used to determine past egg production. Determine by feeling the skin of the abdominal area for thickness or thinness. Pinch the skin below the vent

Chickens: Figure 11



Chickens: Figure 12

Chickens: Figure 13

Chickens: Figure 14

Chickens: Figure 15

area and roll it between your fingers to examine this. Also, at this time, feel the tip of the pubic bones for thickness and flexibility.

Step 6:

If your bird is a hen, measure the abdominal capacity. (Abdominal capacity is another way to determine the hens past egg production.) Use your fingers to estimate the distance between the two pubic bones (**Chickens: Figure 15**) and the distance between the end of the keel bone and the top of the pubic bones. These measurements will indicate the past egg production. In a standard large fowl hen, if the distance is approximately 1.5 inches or less, the bird is not laying at present and has probably not laid many eggs in the past. A distance over 1.5 inches indicates that the bird has laid eggs in the past and may be laying now. A distance of 2 inches or more indicates that the chicken has laid many eggs in the past.

Step 7:

Check the abdomen. If your bird is a hen, use your fingers to grasp the abdomen to determine its hardness or softness (**Chickens: Figure 16**). This will further indicate the bird's condition of egg production. A soft, pliable abdomen indicates the bird is currently producing eggs. A hard abdomen indicates that the bird is not producing at present or that the bird is a poor producer. Also, check the abdomen for any sign of molting and the condition of the feathers in this area.

Step 8:

Examine the thighs to determine the amount of meat present (**Chickens: Figure 17**). The thigh area is especially important in meat-type chickens.

Step 9:

Examine the shanks to see if they are clean and whether there are mites present (**Figure 18**). A crusty condition or upturned scales indicate that mites are present. Look at the pigment condition of the front and back of the shanks.

Chickens: Figure 16

Chickens: Figure 17

Chickens: Figure 18

Chickens: Figure 19

Chickens: Figure 20

Step 10:

Examine the toes (**Chickens: Figure 19**). Check the number of toes present. Remember that certain breeds have five toes. Look for defects on the toes and examine the pigmentation and the condition of the toenails.

Step 11:

Examine the feet. Look at the feet of a hen for pigment loss and correct color. Also, examine the feet for any defects (**Chickens: Figure 20**).

Step 12:

Examine the breast. In meat-type chickens, the breast is the most important meat area. Use your palm to feel the length of the keel bone and the meat on it (**Chickens: Figure 21**). Check the straightness of the keel bone and look for any abnormalities such as indentations. Feel and look at the breast area to determine if there are any breast blisters or other defects on it.

Step 13:

Examine the wings. Open and stretch the left wing of the bird with your free hand (**Chickens: Figure 22**). Tilt the bird slightly away from you. Check the primary and secondary feathers for signs of molting. Take a closer look at the skin on the inside of the wing for lice and mites. Transfer the bird to your other hand. Follow the above directions using your free hand to examine the right wing.

Chickens: Figure 21

Step 14:

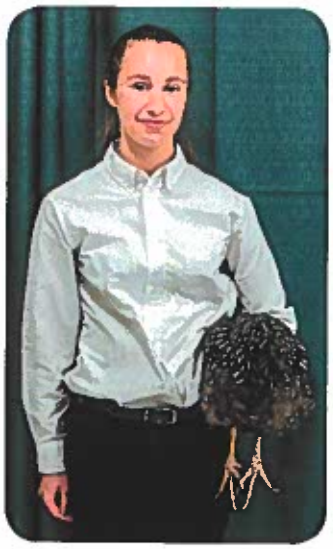
Examine the crop area. Feel it with your hands for any abnormalities (**Chickens: Figure 23**). It is better *not* to feed your bird on the morning of the showmanship contest so you avoid feed in the crop. If there is a great deal of feed in the crop, the bird will throw up when handled.

Step 15:

Return the bird to the upright position resting on your hand (**Chickens: Figure 24**). Give support on top with your other hand if necessary.

Chickens: Figure 22

Chickens: Figure 23



Chickens: Figure 24

Showing Turkeys

In the showing part of the competition, you will be asked to remove your turkey from the carrier and take it to the assigned judging area.

Turkeys: Figure 1

Turkeys: Figure 2

Handling the Turkey

Since handling a turkey is not an easy task, working with your bird on a regular basis can help make it easier. The size of your bird in relation to your size is important because larger birds can be difficult to handle. You can handle a turkey in several ways when moving it from one place to another, but the following method is recommended:

Step 1:

Open the door of the cage.

Step 2:

Slowing walk the turkey to and from the show area. It is not recommended for youth to carry turkeys to and from the showing area (**Turkeys: Figure 1**).

Posing the Turkey

You will be given instructions by the judge to pose your turkey. Posing the turkey is done on an individual basis or as a group. You should begin by standing behind with your turkey already placed in a sideways profile (**Turkeys: Figure 2**).

Step 1:

Turn the turkey to the right so its head is facing the judge and pointing away from you.

Step 2:

Set the legs of the turkey about 6 to 9 inches apart (depending upon the size and age of the bird) on a straight line, when looking from the side.

Step 3:

Use a training stick, if you wish, or your index finger to touch the area beneath the lower beak to obtain proper carriage. At this time, the turkey should stretch out its neck as high as possible.

Step 4:

Set the wings properly over the body and tail.

Step 5:

Use the stick to set up the tail. Simply touch the stick under the tail feathers so the turkey will hold the tail tight and display a proper tail carriage as denoted by the American Poultry Association's *American Standard of Perfection*

Step 6:

Lightly run the show stick, or your hand, over the back of the bird's neck and continue to stroke downward. Continue to stroke over the tail area. Use one gentle stroke from the neck to the tail area.

Step 7:

Use your pointing finger or show stick under the beak and the palm of your free hand under the tail carriage to set the bird's position.

Step 8:

Stand behind the turkey slightly turned to the right and pose along with the turkey while watching the judge, keeping the judge in view at all times.

Step 9:

When the judge gives the command, stand in attention posture and look confident. The bird should remain in the "pose" position. If your bird moves a leg, immediately pick up the leg and set it back without disturbing the other birds in pose. If your turkey moves both of its legs, then you should reset the turkey, step back and wait for further instructions. You should *not* try to pose the bird again.

Examining the Turkey

The examination takes place after you have posed the turkey. When the judge gives the command to examine your bird, perform the following steps to determine conformation, fleshing, defects, disqualifications and overall condition of your bird. The examination steps begin with the turkey standing posed.

Step 1:

Stand back 2 to 3 feet away from the turkey and look the bird over for its balance and carriage (**Turkeys: Figure 3**).

Turkeys: Figure 3

Step 2:

Examine the head area. Hold the bird in the standing position with one hand over its back. Use your other hand to examine the bird's head area (**Turkeys: Figure 4**).

- Examine the eyes. Check both eyes to make sure they are not blind. Point your index finger at the eyes. (The bird should blink or move when pointed at.) Notice the color and check for any signs of discharge.
- If the bird has a snood, examine it by feeling it. Check the texture. Determine if the snood is long or short. (Young birds may have a small snood.)
- Use your index finger to point at the beak. Check the top and lower beak for any defects such as crookedness.

Turkeys: Figure 4

Turkeys: Figure 5

Turkeys: Figure 6

Turkeys: Figure 7

- Examine the bird's crown (the area between each eye and ear). Also, point to each ear. Check for the development of caruncles (**Turkeys: Figure 5**).

Step 3:

Examine the bird's throat area to see if the throat wattles are developed. Feel the texture with your fingers. Also, check the development and color of the caruncles.

Step 4:

Examine the neck area for length, erectness and signs of molting (**Turkeys: Figure 6**).

Step 5:

Run your palm along the bird's back to feel the feathers and to check for any abnormalities. Check for roached back, the under-color of the feathers and signs of molting. Use your hand to measure the length and width of the back (**Turkeys: Figure 7**).

Step 6:

Examine the left wing and then the right wing. Open and spread the wings one at a time. Examine the primary and secondary feathers for signs of molting or for any damage. Check the condition of the covert feathers. Look under the wings for signs of lice (**Turkeys: Figure 8**).

Turkeys: Figure 8

Turkeys: Figure 9

Turkeys: Figure 10

Turkeys: Figure 11

Step 7:

Examine the tail to see if all tail feathers are present, to check the condition of the feathers and to look for signs of molting. Examine the tail carriage (**Turkeys: Figure 9**).

Step 8:

Examine the abdomen area. Check to see if the vent is visible and if there are signs of lice or mites. Also, check the condition of the fluff feathers. Use your finger to feel whether the abdominal area is soft or hard (**Turkeys: Figure 10**).

Step 9:

Examine the thigh area to determine its size and the amount of meat on the thighs and drumsticks. Keep in mind that the turkey is a meat bird (**Turkeys: Figure 11**).

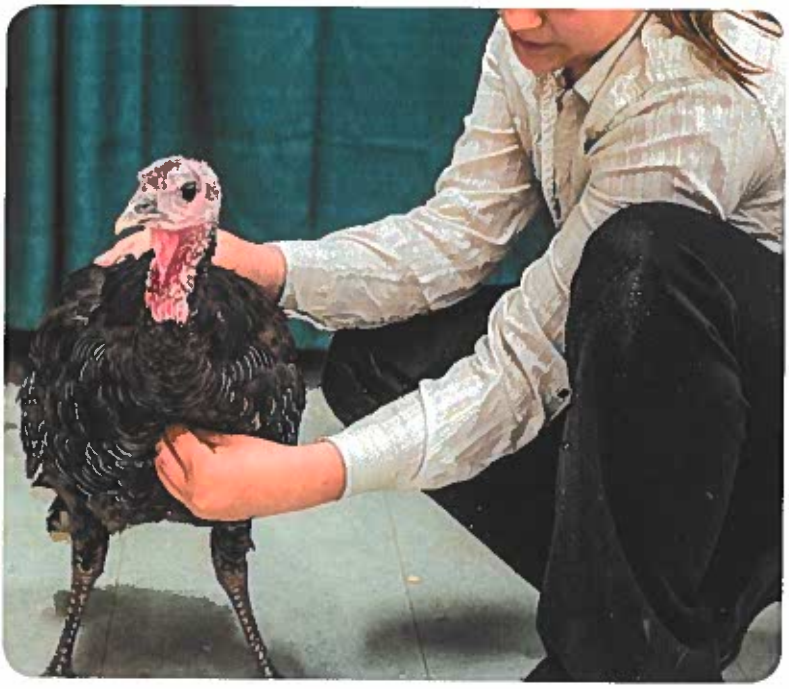
Step 10:

Examine both legs for defects such as bowed legs or crooked toes. Examine the shank area for cleanliness, mites and spurs. Count the number of toes, and examine the nails and the feet for defects (**Turkeys: Figure 12**).

Step 11:

Examine the breast for size. Determine if it is entirely covered with meat and well-rounded or if the breastbone sticks out. Check to see if the keel (breast) bone is straight and long or short, dented or curved. Check the condition of the plumage on the breast. Determine if the breast plumage is molting. Check the length, width and depth of the breast.

Turkeys: Figure 12



Turkeys: Figure 13

Step 12:

Check the size of the turkey's rib cage. Count the number of ribs and check to see if they are placed well apart. Check the overall balance of the turkey (**Turkeys: Figure 13**).

Step 13:

Feel the crop to see if it is full or empty. Check for signs of a pendulous crop and crop infections.

Step 14:

Check to see if the turkey has a beard on the breast area. Check the beard's color and length.

Step 15:

Step back so the judge can examine your bird for its condition.

Walking the Turkey

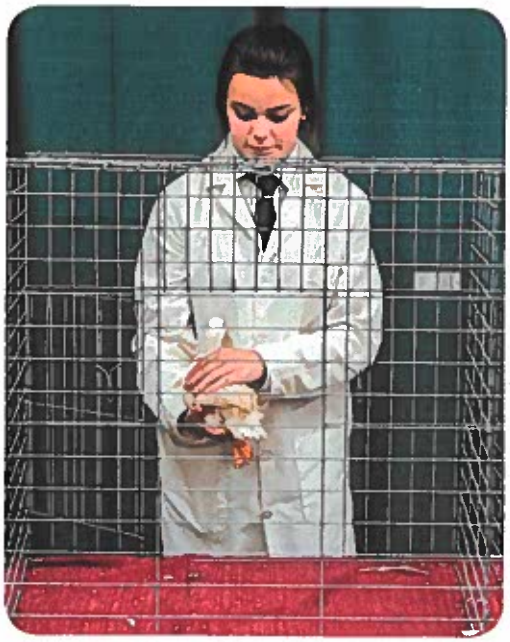
If the county or competition includes walking the bird in the showmanship contest, the judge will ask contestants to walk their birds one at a time. The others in the group will wait their turn.

General Appearance of the Turkey

The judge will also consider your bird's general appearance, which refers to its production characteristics (fleshing and conformation), feather condition, freedom from defects, general health and fitting. The judge will examine each bird in a general way. This may not be a detailed examination due to a lack of time. However, the judge will thoroughly examine the fitting of the bird to determine how well you have cared for it.

Showing Ducks

In the showing part of the competition, you will be asked to get your duck from the carrier and take it to the assigned area. Remember that you and the bird will be judged from this point on. All the directions for showing are from right-handed contestants. Left-handed contestants should use the opposite hand from that noted in the steps.



Ducks: Figure 1

Handling the Duck

Step 1:

Handle the legs of waterfowl with extreme care. Hold the duck with one hand under the breast giving support to its weight and at the same time grasping the legs together. Your thumb should be outside one leg and your index finger should be between the duck's legs. Use your remaining fingers to grasp the other leg of the duck at the thigh area.

Step 2:

Hold your other hand over the back of the duck to prevent it from trying to escape. (**Ducks: Figure 1**)

Step 3:

Hold the duck right in front of you. The head of the duck should be close to your body, with its tail away from your body. (**Ducks: Figure 2**)

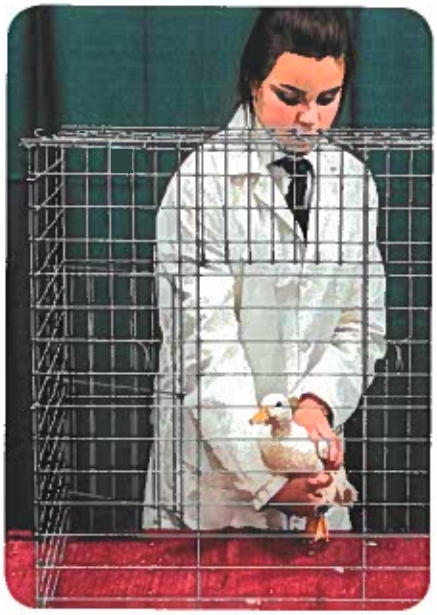
Ducks: Figure 2

Posing the Duck in the Cage

When it is your turn to pose the duck in the cage, do the following:

Step 1:

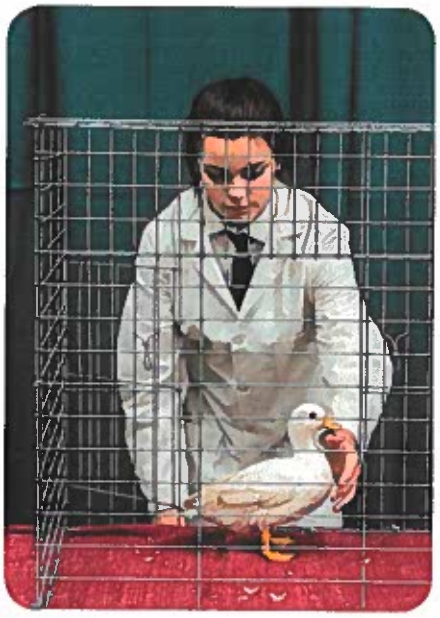
Release your hand over the duck to open the cage.



Ducks: Figure 3

Step 2:

Turn the duck around to place the head of the duck in the cage first (**Ducks: Figure 3**).



Ducks: Figure 3

Ducks: Figure 5

Ducks: Figure 6

Step 3:

Turn the duck back toward you and pose the bird in the profile position (**Ducks: Figure 4**). Use a training stick if you wish under the duck's lower bill so the duck will stretch out its neck. Make sure the legs are spread apart on a straight line and that the bird stands erect in this pose.

Step 4:

Stand with your duck in the posed position. Take a step back and stand at attention with your arms at your sides.

Removing the Duck and the Final Stand

When the judge gives the command to "remove your duck," reach into the cage and remove the duck properly.

Step 1:

Place one hand under the duck's breast so your fingers can grasp the legs together. Place the other hand on the duck's back.

Step 2:

Remove the bird, head first, close the cage door and take a step backward.

Step 3:

Stand at attention with the bird in your hand. When the judge gives you the command move from this area to the area where the duck will be judged.

Examining the Duck

The examination section follows posing the bird. When the judge gives the command to examine your duck, perform the following steps to determine defects, disqualifications and the condition of your duck.

Step 1:

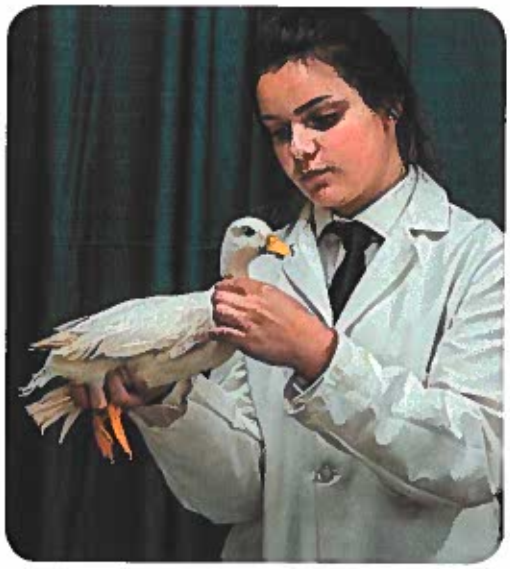
Examine the duck's head area. Let the bird rest in your hand while you use your free hand to examine the bird (**Ducks: Figure 5**).

Step 2:

Look at the duck's eyes to check their size and color and to observe for blindness. Point your index finger at both eyes (**Ducks: Figure 6**). (The bird should blink or move when pointed at.)

Ducks: Figure 7

Ducks: Figure 8



Ducks: Figure 9

Step 3:

Examine the bill to determine its color and shape. Look to see if the color of the bill is true to the breed or sex (**Ducks: Figure 7**).

Step 4:

Examine the bird's head to see if it follows its breed standard. Also, check to see the prominence of the bird's cheeks and the condition of the head plumage. If the duck has a crest, point your finger at it (**Ducks: Figure 8**).

Step 5:

Examine the bird's neck area for length and strength (ducks generally have long necks). Check the arch of the neck. Examine the feather condition of the neck for abnormal coloring (**Ducks: Figure 9**).

Step 6:

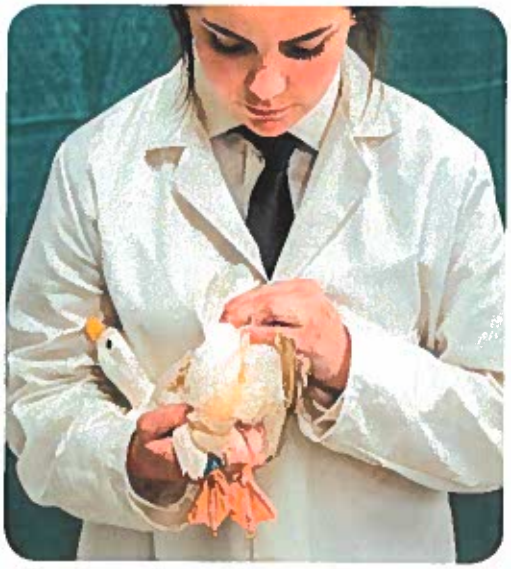
Use the palm of your hand to run over the duck's back to determine its length and width. Meat variety ducks will have a long and wide back. Check the back feathers for the under-color and for signs of molting or missing feathers (**Ducks: Figure 10**).

Step 7:

Slowly tilt the duck downward so you can examine the tail area. Check to make sure all tail feathers are present. Also, look for curled feathers (**Ducks: Figure 11**). (An adult drake will have curled sex feathers in the middle of the tail feathers.)

Ducks: Figure 10

Ducks: Figure 11



Ducks: Figure 12

Ducks: Figure 13

Ducks: Figure 14

Step 8:

Check the abdominal area and look for the vent opening. Note: Steps 9-11 are important for determining a female duck's past egg production qualities (**Ducks: Figure 12**).

Step 9:

Use your fingers to examine the spread of the pubic bones (**Ducks: Figure 13**).

Step 10:

Use your fingers to examine the space between the rear of the keel bone and the pubic bone (**Ducks: Figure 14**).

Step 11:

Examine the abdomen area for the duck's trimness (leanness) or hardness. Also, examine the feather condition in this area (**Ducks: Figure 15**).

Step 12:

While the duck is still in the tilt position, pull each leg gently to check for straightness (**Ducks: Figure 16**).

Step 13:

Examine the shanks of the legs for cleanliness, color and abnormality.

Ducks: Figure 15

Ducks: Figure 16

Ducks: Figure 17

Step 14:

Examine the toes. Check the toenails for color and length. Look to see if any are missing (**Ducks: Figure 17**).

Step 15:

Examine the webs of both feet for damage, abnormalities and parasites.

Step 16:

Examine the foot for abnormalities and abscesses.

Step 17:

Examine the breast area. Check the length of the keel (breast) bone (**Ducks: Figure 18**). Examine this area for any defects such as a dented keel bone. Also, check the feather condition and the amount of meat on the breast area. (Keep in mind that this is important for meat birds.)

Step 18:

Examine the wings by spreading each one open. Look at the condition of the primary and secondary feathers and coverts (the feathers covering the bases of the primary wing feathers). Also, check for signs of molting (**Ducks: Figure 19**).

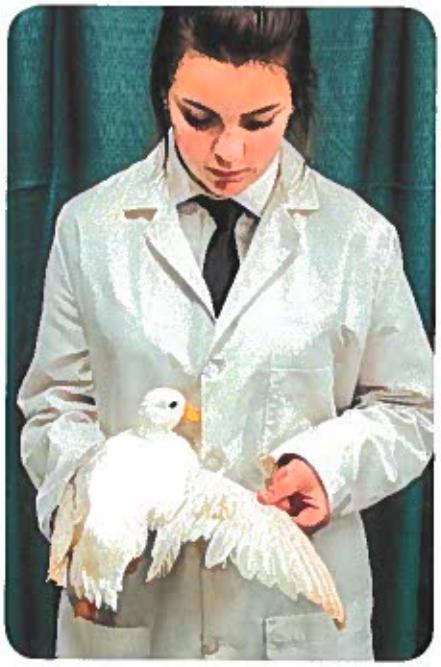
Step 19:

Examine the crop for fullness and abnormalities (**Ducks: Figure 20**).

Step 20:

Step back so the judge can examine your bird for its condition.

Ducks: Figure 18



Ducks: Figure 19

Ducks: Figure 20

Showing Geese

In the showing part of the competition, you will be asked to remove your goose from the carrier and take it to the assigned judging area.

Geese: Figure 1

Geese: Figure 2

Handling the Goose

Since handling a goose is not an easy task, working with your bird on a regular basis can help make it easier. The size of your bird in relation to your size is important because larger birds can be difficult to handle. You can handle a goose in several ways when moving it from one place to another, but the following method is recommended:

Step 1:

Open the door of the cage.

Step 2:

Slowing walk the goose to and from the show area. It is not recommended for youth to carry geese to and from the showing area.

Examining the Goose

The examination section follows posing the goose. The goose should be standing. When the judge gives the command to examine your goose, perform the following steps to determine defects, disqualifications and the condition of your goose.

Step 1:

Examine the goose's head area (**Geese: Figure 1**).

Step 2:

Point your index finger at the eyes to check them for size, color and blindness. (The bird should blink or move when pointed at.)

Step 3:

Examine the bill for length, width, shape, color and knob (if present). Determine if the color of the bill is true to the breed or sex.

Step 4:

Examine the head for size and shape. Check the head plumage. Check the size of the dewlap (if present) under the goose's beak.

Step 5:

Examine the neck area for length and strength. Geese generally have strong necks, especially the African and the Chinese breeds. Check to see if the neck is arched, and examine the neck feathers for condition of molting and other abnormalities (**Geese: Figure 2**).

Geese: Figure 3

Geese: Figure 4

Geese: Figure 5

Step 6:

Use the palm of your hand to run over the goose's back area. Check the back's length and width. Heavy breeds will have long and wide backs. Check the back feathers for the under-color and for signs of molting or missing feathers. Make sure the color of the plumage is true to its breed.

Step 7:

Examine the goose's tail feathers to see if they are all present (**Geese: Figure 3**).

Step 8:

Use your fingers to push the tail feathers aside to look for the vent.

Note: Steps 9 and 10 are important in a female goose to determine the past egg production qualities.

Step 9:

Use your fingers to measure the spread of the pubic bones.

Step 10:

Use your fingers to measure the space between the rear of the keel bone and the pubic bone. Check to see if the abdominal area is hard or soft and pliable.

Step 11:

Examine the feather condition of the abdominal area (**Geese: Figure 4**).

Step 12:

Examine the amount of flesh on the thigh area (**Geese: Figure 5**).

Step 13:

Examine the shank of the legs. Check for cleanliness, color and abnormalities (**Geese: Figure 6**).

Geese: Figure 6

Geese: Figure 7

Geese: Figure 8

Geese: Figure 9

Step 14:

Examine the toes, and check the color and length of the toenails. Also, check to see if any toenails are missing.

Step 15:

Examine the webs on both feet for tears, abnormalities and parasites (**Geese: Figure 7**).

Step 16:

Examine the goose's feet for abnormalities and abscesses (**Geese: Figure 8**).

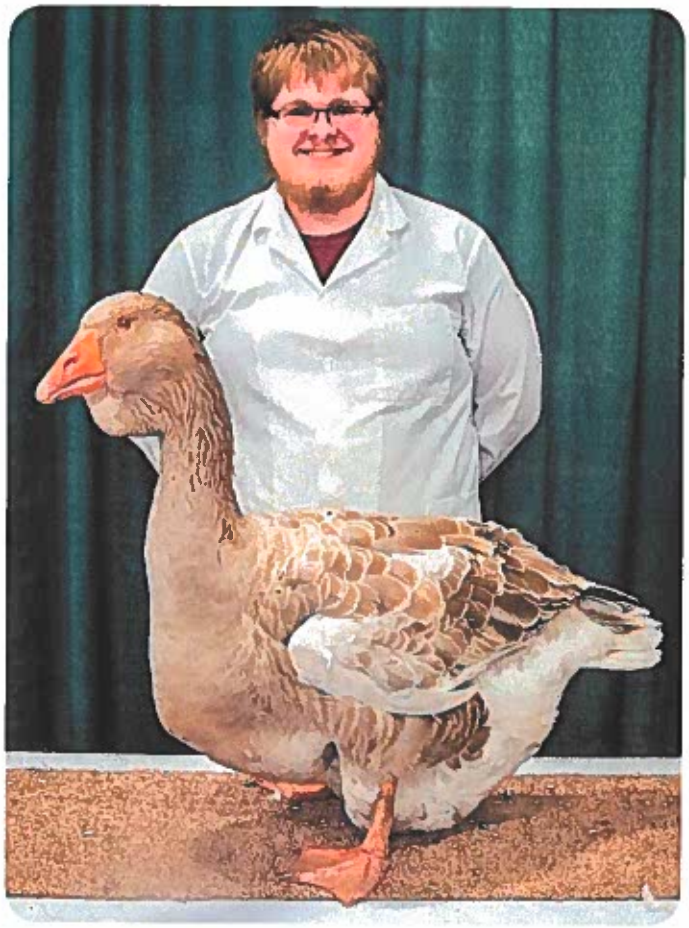
Step 17:

Examine the breast area. Check the shape and length of the keel bone. Also, check the feather condition and the amount of meat on the breast area. Keep in mind that this is important for meat breeds (**Geese: Figure 9**).

Step 18:

Spread each wing open and look at the condition of the primary and secondary feathers and coverts (the feathers covering the bases of the primary wing feathers) for signs of molting. Look for any external parasites on the skin area of the wings (**Geese: Figure 10**).

Geese: Figure 10



Geese: Figure 11

Step 19:

Examine the crop for size, fullness and abnormalities.

Step 20:

Step back so the judge can examine your bird for its condition (**Geese: Figure 11**).

General Appearance of the Goose

The judge will also consider your bird's general appearance, which refers to its production characteristics (egg or meat), feather condition, freedom from defects and general health. The judge will examine each bird in a general way. This may not be a detailed examination due to a lack of time. However, the judge will thoroughly examine the fitting of the bird to determine how well you have cared for it.

Goose Fitting and Showmanship Scorecard

	Points Allowed
Handling the bird	25
Posing the bird	10
Examination of the bird	25
Condition of the bird	20
Poultry quiz	10
Appearance, attitude and behavior of participant	10
Appearance (5)	
Attitude (2)	
Behavior (3)	
Total points	100

Breeds

Chapter 9

Wayne County Poultry Resource Book

Version 1. Published April 2020

Breeds of Chickens

Ameraucana: the most well known for their blue tinted eggs and earmuffs. *Origin: United States Comb: Pea APA class: other standard Misc.*

Black Australorp: Are very reliable and prolific layers with large brown eggs. *Origin: England Comb: single APA class: English*

Buckeye: Developed in the state of Ohio! They are dark mahogany red and thrive in winter climates. *Origin: United States Comb: pea APA class: American*

Brahma: Large birds with excessive plumage on their whole body. A hardy dual-purpose breed. *Origin: China /Indian/ USA Comb: pea APA class: Asiatic*

Cochin: Large birds with excessive plumage on their legs and feet. *Origin: China Comb: single APA class: Asiatic*

Cornish: Large birds with excessive muscling great for meat production and the foundation of the broiler industry. *Origin: England Comb: single APA class: English*

Breeds of Chickens

Hamburg: Small birds that are hardy and active. Capable of flight these birds are flighty *Origin: Germany Holland Comb: pea APA class: Continental*

Jersey Giant: Are a heavier breed, slow to mature and produce large brown eggs. *Origin: United States Comb: single APA class: American*

Japanese Bantam: Friendly birds that are good foragers. *Origin: Japan Comb: single APA class: Asiatic*

Breeds of Chickens

Leghorn Top egg production - over 300 eggs a year and they mature quickly. They are noisy, flighty and easily excited. *Origin: Italy Comb: single APA class: Mediterranean*

Modern Game Birds are neither good for eggs nor meat. They are commonly used for fighting. *Origin: England Comb: single APA class: English*

New Hampshire: A dual purpose chicken, selected for more meat production than egg production. Medium/heavy in weight, it dresses a nice plump carcass as either broiler or roaster. *Origin: United States Comb: Single APA class: American*

Breeds of Chickens

Orpington: A large, bold bird with wide chest broad back and small head and tail. *Origin: England Comb: single APA class: English*

Old English Game: One of the oldest strains of poultry. These birds are commonly used for fighting because of their large leg structure. *Origin: England Comb: single APA class: English*

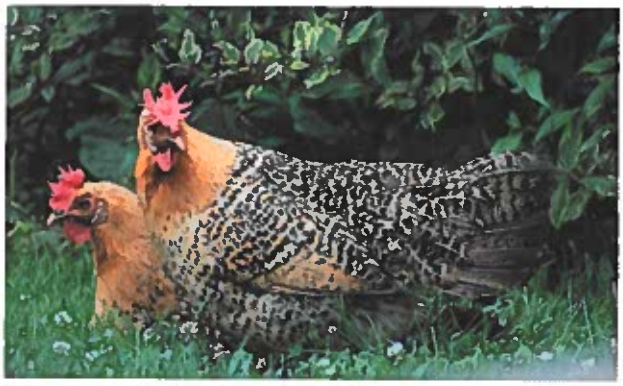
Plymouth Rock are a favorite dual-purpose breed with a docile personality. *Origin: United States Comb: Single APA class: American*

Breeds of Chickens

Rhode Island Red: These birds are utility birds, raised for meat and eggs, also commonly showed. They are tough birds, resistant to illness and excellent foragers. *Origin: United States Comb: Single APA class: American*

Silkie: Bantam birds with soft-as-silk feathers. Known for their black bones *Origin: China Comb: walnut APA class: feathered legged*

Sebright: are not big egg or meat producers, they are friendly but active birds *Origin: England Comb: rose APA class: English*

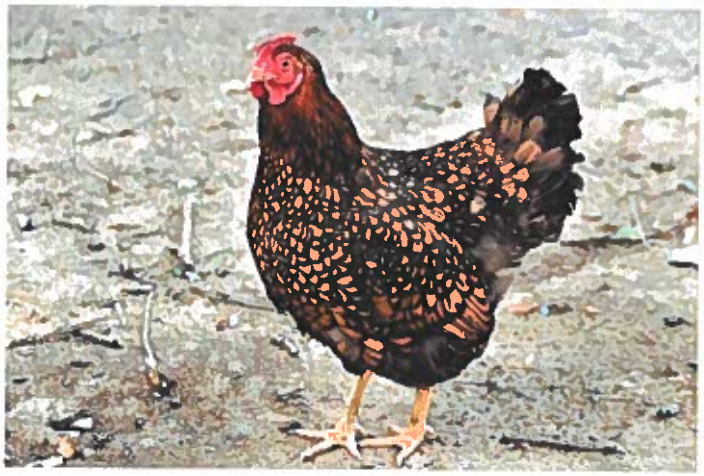


Sicilian Buttercup: beautiful very flighty birds with bright coloring. *Origin: Sicily Comb: buttercup APA class: Mediterranean*

Sussex: A large sized dual-purpose breed laying light brown eggs, they come in 8 different colors. *Origin: United States Comb: single APA class: American*

Polish: popular pets have a large crest of feather on their head. *Origin: Holland Comb: V-Comb APA class: Continental*

Breeds of Chickens



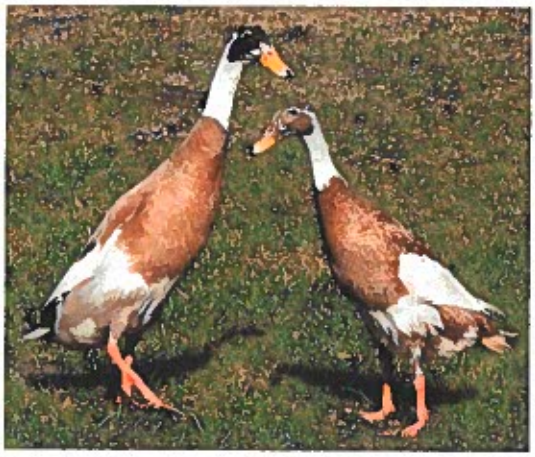
Wyandotte: A medium sized breast with a rose comb and clean yellow legs. Their feathers are large and lose fitting. *Origin: United States Comb: pea APA class: American*

Breeds of Ducks

White Pekin: mature in 20-24 weeks, a very calm, talkative breed with no flying ability. *APA Class: Heavy*

Crested: mature in 20-24 weeks, a nervous breed, talkative breed with no flying ability. *APA Class: Medium*

Breeds of Ducks

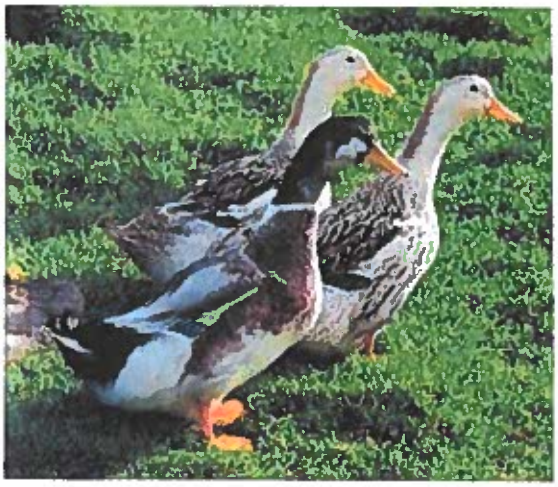


Runner: mature in 20-24 weeks, good foragers, a nervous breed, with no flying ability. *APA Class: Light*

Swedish: mature in 20-24 weeks, a calm breed, talkative breed with no flying ability. *APA Class: Medium*

Cayuga: mature in 20-24 weeks, good foragers, calm, with no flying ability. *APA Class: Medium*

Rouen: mature in 20-24 weeks, good foragers, calm, with no flying ability. *APA Class: Heavy*



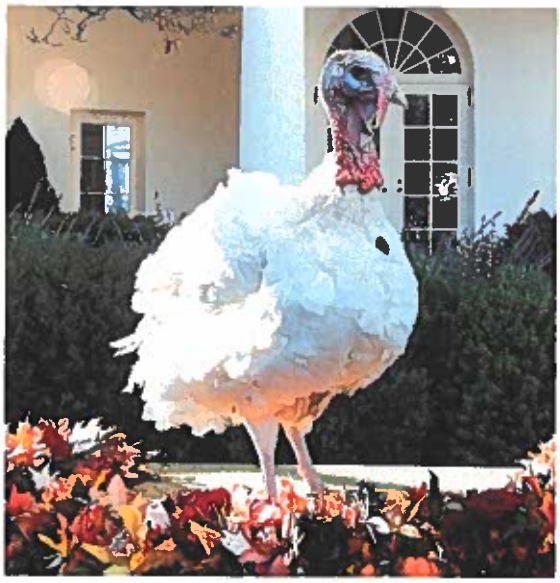
Silver Appleyard: good foragers, calm, with no flying ability. *APA Class: Heavy*

Khaki Campbell: mature in 20-24 weeks, good foragers, a nervous breed, with no flying ability. *APA Class: Light*

Breeds of Ducks

Flying Mallards: wild breed, will migrate in the winter, self-reliant, great foragers and great mothers

Breeds of Turkeys



Broad Breasted White: known for their fast growth, good livability, and great feed conversion. *Type: Domestic-Meat*

Breeds of Turkeys

Broad Breasted Bronze: known for their fast growth, good livability, and great feed conversion and bronze in color. *Type: Domestic-Meat*

Royal Palm: known for being active foragers and good flyers. *Type: Heritage-Meat/Exhibition*

Bourbon Red Heritage: Great foragers and do well on pasture heavy breast and exceptional flavor. *Type: Heritage-Meat*

Black Spanish Heritage: Known for their meat production rapid growth rates and early maturity.
Type: Heritage-Meat

provided by Mike Walters

Blue Slate Heritage: a rare heritage breed that is an excellent forager and backyard/farm turkey
Type*: Heritage-Meat/Eggs*

Chocolate Heritage: Rare turkeys with a unique colored plumage
Type*: Heritage-Meat/Exhibition*

Breeds of Geese

Chinese: raised knob and orange feet, talkative, great layers and excellent weeders

Toulouse: Great mothers, excellent weeders with low flying ability

African: large breed, excellent meat birds, males can be aggressive, excellent mothers

Glossary:

ABA - American Bantam Association
Abdomen - area between the keel and the pubic (hip) bones
Abdominal capacity - the distance between the two public bones (width) and between the pubic bones and the tip of the keel (depth)
Air cell - the air space between the two shell membranes, usually at the large end of the egg
Albumen - the white of the egg
Alektorophobia - the fear of chickens
Allantois - a sac connected to the embryo's abdomen and involved in embryo respiration
Amnion - a sac surrounding the embry filled with amniotic fluid which protects the developing embryo from shock and provides a medium for the develop embryo to exercise their muscles
Anatomy - the structure systems of an animal (skeletal, muscular, digestive, etc.)
Anthelmintic - medication given to treat a bird with internal paraistes
Antibiotic - a chemical produced by a microorganism or fungi and used to destroy or inhibit the growth of bacteria and other microorganisms
Antibody - a natural substance in the blood that recognizes and destroys foreign invaders and that causes an immune response to vaccination or infection
Antigen - a foreign protein in the blood that differs from nautral body proteins and, as a result, stimulates the natural production of antibodies
AOSB - any other standard breed
APA - American Poultry Association
Ascites - accumulation of fluid in the abdominal cavity
As hatched - description of a group of chicks that have not been sorted
Aves - a class of animals composed of birds
Avian - pertaining to birds
Aviary - a large enclosure for holding birds in confinement;
Aviculture - the science of birds
Axial feather - the short wing feather located between the primary and secondary flight feathers
Banding - putting a tag or band with identification on it to the wing or leg of a bird
Bantam - a chicken breed that is one third to one half the size of a standard breed.
Banti - a non-technical term sometimes used to mean 'bantam'
Barbicels - tiny hooks that hold a feather's web together
Barring - alternate markings of two distinct colors on a feather
Bay - light golden brown in color
Beak - the hard protruding mouth part of a bird consisting of an uper and a lower part
Beard - the feathers bunched together under the beak of some breeds of chickens; coarse hairs protruding from the breast of turkeys
Bedding - material scattered on the floor of a poultry house to absorb moisture and manure (also called litter)
Biddy - a non-technical term for a laying hen that is over one year of age
Bill - the 'beak' of waterfowl
Billing out - the act of chickens using their beaks to scoop feed out of a feeder and onto the floor
Biosecurity - disease prevention program
Blade - the lower, smooth part of a single comb
Bleaching - the disappearance of the color from the vent, face and shanks of yellow-skinned chickens
Blood spot - blood in an egg
Bloom - the moist protective coating on a freshly laid eggs that partially seals the pores of the egg shell to prevent penetration by bacteria (also called the cuticle)
Blowout - when there is vent damage, typically caused by laying a very large egg (also referred to as a prolapse)
Blue - slate gray feather color

Booted - having feathers on the shanks (legs) and toes
Breast blister - enlarged, discolored area on the breast or keel bone often seen in heavy birds
Breed - a group of chickens having a distinctive body shape and the same general features; aslo a term used when group male and female birds for mating
Broiler - a meat-type chicken
Brood - to care for a batch of chicks
Brooder - a devise used to provide warmth to young chicks
Broody - a hen that is sitting on eggs with the intent of hatching them
Buff - orange-yellow color in feathers that is not shiny or brassy
Candle - to examine the contents of an intact egg with the use of a light
Candler - light used to examine the contents of an egg without breaking it open
Candling - using a candler to check the contents of an egg
Cannibalism - when poultry eat the flesh of fellow flock mates
Cape - narrow feathers between a chicken's neck and back
Capon - a castrated male chicken (requires surgery since the reproductive organs are internal
Carrier - an apparently healthy bird that can transmit a disease to others; also refers to a container to transport birds
Caruncle - brightly colored growths on the throat region of turkeys and the face of muscovy ducks
Cecum - a blind pouch at the junction of the small and large intestines that hosts a community of microorganisms that can ferment (digest) fiber (plural = ceca)
Chalza - two white cords of tightly spun albumen (egg white) found on either side of the yolk and important in keeping the yolk properly positioned within the egg (plural = chalazae)
Chick - young (baby) chicken
Chicken tractor - a portable pen for chickens on pasture
Chick tooth - a tiny, hard projection on the beak of a newly hatched chick that was used by the chick to break the shell to hatch (also called an egg tooth)
Chook - an Australian term for chicken that has been used in the US for chickens in a small flock
Chorion - a membrane the surrounds the yolk sac and amnion
Class - a group of chicken breeds that were originally developed in a particular region of the world (e.g. American, Asiatic, Mediterranean)
Clean legged - having no feathers on the shanks or toes
Cloaca - the portion of the avian anatomy where the intestinal, reproductive and urinary tracts end
Clubbed down - a condition where the down feathers do not erupt from their feather sheath resulting in a coil-like appearance
Cluck - sound a hen makes after laying an egg
Clutch - a group of eggs or chicks
Cock - adult male chicken (also referred to as a rooster) or an adult male pigeon
Cockerel - immature male chicken
Coccidia - protozoan intestinal parasite
Coccidiosis - a parasitic infection (coccidia) in the intestinal tract of poultry
Coccidiostat - a drug used to keep poultry from getting coccidiosis
Coliform - any bacteria resembling Escherichia coli
Comb - the fleshy red outgrowth on the top of a chicken's head
Condition - typically refers to a chicken's state of health and cleanliness
Conformation - refers to the body structure of poultry
Conjunctiva - mucus membrane covering the eyeball
Conjunctivitis - infection of the conjunctiva
Contagious - disease that is easily passed from one bird to another
Contract grower - a farmer that grows chickens, under contract, for a broiler company
Coop - the house or cage in which poultry are housed
Coverts - feathers that cover the primary and secondary wing feathers
Crest - ball of feathers on the heads of some breeds of chickens and geese

Crop - enlarged part of the digestive tract of birds that serves as a temporary storage space of food
Crossbred - the offspring of parents from different varieties or breeds
Crumbles - a poultry feed that has been pelleted and then the pellets broken up
Cuckoo - a course and irregular barring pattern in feathers
Cull - to remove a bird from the flock because of productivity, age, health or personality issues
Cuticle - the moist protective coating on a freshly laid eggs that partially seals the pores of the egg shell to prevent penetration by bacteria (also called the bloom)
Culture - incubating a sample from a diseased bird to look for the presence of bacteria
Cushion - mass of feathers that gives a round effect seen in female cochins
Cygnet - young (baby) swan
Defect - any characteristic that makes a chicken less than perfect
Depopulate - to destroy an entire flock
Dewlap - the flap of skin below the beak of turkeys and some geese
Disinfect - kill bacteria through chemical means
Disqualification - a defect or deformity serious enough to bar a bird from a poultry show
Down - a layer of feathers found under the tough exterior feathers
Drake - an adult male duck
Dressed - cleaned in preparation for eating (feathers and guts removed)
Droppings - another term for chicken manure
Dub - to surgically remove a bird's comb and wattles close to the head
Duck foot - a disqualification of chickens where the hind toe is carried too far forward and touches the third toe or is carried too far back and touches the ground
Duckling - a young (baby) duck
Duodenal loop - the upper part of the small intestine (also referred to as the duodenum)
Dry-bulb thermometer - used to determine the temperature in a room or incubator
Dust bath - the habit of chickens to splash around in soft soil to clean their feathers and discourage external parasites
Ear lobes - the flesh patch of bare skin located below the ears of birds
Ectoparasite - an external parasite
Egg tooth - a tiny, hard projection on the beak of a newly hatched chick that was used by the chick to break the shell to hatch (also called a chick tooth)
Electrolytes - a mineral solution used to treat dehydration
Embryo - the developing cihick in an egg
Embryology - the study of the formation and development of embryos
Encephalitis - inflammation of the brain
Endoparasite - an internal parasite
Enteric - affecting the intestines
Enteritis - inflammation of the intestines
Esophagus - the portion of the digestive tract that moves from the mouth to the stomach
Etiology - causes of a disease
Evaporation - changing a liquid into vapor
Exudate - fluid associated with an inflammation or swelling
Exudative diathesis - accumulation of fluid (exudate) under the skin or around the heart
Faking - the dishonest practice of concealing a defect or disqualification from a potential buyer or a show judge
Feather-legged - a description of those breeds of chickens with feathers growing down their shanks
Fecal - pertaining to the feces
Feces - droppings/manure
Feral - wild, untamed
Fertile - an egg that is fertilized and thus capable of having a chick develop (under the right environmental conditions)
Fertility - percentage of eggs that are fertile

Finish - the amount of fat under the skin of a meat bird
Flock - a group of birds living together
Flight feathers - the large primary and secondary feathers of the wings
Fluff - downy feathers
Foie gras - French for 'fatty liver' and is a food product made from the liver of a duck or goose that has been specifically fattened for this purpose
Fomite - inanimate objects such as shipping crates, feed sacks, clothing, shoes, and tires that may harbor disease-causing organisms and thus able to transmit the disease
Foot candle - a measurement of light intensity
Forage - to scratch the ground in search of food; also refers to the crops in a pasture
Forced-air incubator - an incubator that has a fan to circulate warm air
Fowl - domesticated birds raised for food or other similar purpose; also refers to a hen at the end of its productive life (a stewing hen)
Free-range - a term that does not have a legal definition but is typically used to refer to providing a flock with outdoor access
Frizzle - a feather that curls rather than laying flat
Fryer - a young meat-type chicken
Gander - a male goose
Germinal disc - the site of fertilization, if it occurs, in an egg
Germs - disease causing organisms
Giblets - the parts of a chicken carcass that consist of the heart, gizzard and liver.
Gizzard - a portion of the avian digestive tract with thick muscular walls that crushes and grinds food
Gobbler - an adult male turkey (also referred to as a 'tom')
Goose - a type of waterfowl; the female of the species is also referred to as a goose (the male is a gander)
Gosling - a young (baby) goose
Grade - to sort according to quality
Grit - small pebbles eaten by birds and used by the gizzard to grind up feed
Guinea hen - an adult female guinea fowl
Guinea pullet - a female guinea fowl under one year of age
Guinea cock - an adult male guinea fowl
Guinea cockerel - a young male guinea fowl under one year of age
Hackles - feathers over the back of a chicken which are pointed in males and rounded in females
Hatch - the process by which the chick comes out of the egg
Hatchability - the percentage of fertile eggs that hatch when incubated
Hatchery - a place where eggs are incubated and chicks hatched
Helminthes - a category of parasitic worms
Hen - adult female poultry including chicken, turkey, duck, pigeon, pheasant, etc.
Hen feathered- the characteristic of some breeds of chickens where the male has rounded feathers (rather than pointed) like those of a female
Hock - the 'knee' joint of a bird
Horizontal transmission - disease passed from mother to offspring via the egg
Host - an animal that has a parasite or an infectious agent living on or in it
Hover - canopy type brooding system
Humidity - the amount of water in the environment (usually measured with a wet bulb thermometer)
Hybrid - offspring of parents from different breeds (also referred to as crossbred); the artificial crossing of two different species
Immunity - resistance to disease (active immunity develops when an individual has had the disease or been vaccinated; passive immunity is passed from mother to chick through the egg)
Impaction - the blockage of a part of the digestive tract, typically the crop or cloaca
Inbred - offspring of closely related parents
Incubate - to apply the required conditions (heat and humidity) to eggs to allow embryos to develop

and chicks to hatch out
Incubation period - the time it takes for an egg to hatch once incubation starts; also refers to the time from exposure to a disease causing agent to the time when the first symptoms of the disease appear
Incubator - a piece of equipment especially designed to incubate eggs
Infectious - capable of invading living tissue and multiplying so as to cause a disease
Infertile - an egg that is not fertilized and therefore will not hatch
Infertility - the inability to reproduce (can be with either the male or female and can be a temporary or permanent condition)
Infundibulum - The beginning of the oviduct that picks up the ovulated yolk when it is released from the ovary (also called the funnel)
Ingest - to eat
Intensity of lay - how well a hen is laying right now
Intraocular - in the eye
Intranasal - in the nose
Intravenous - injection into a vein
Iris - colored circle that surrounds the black center in the chicken's eye
Isthmus - the part of the female reproductive tract where the inner and outer shell membranes are added
Jake - a young male turkey
Jejunum - a portion of the small intestine
Jenny = a young female turkeyKeel - the breast bone of birds
Keet - a young (baby) guinea fowl
Keratin - key structural material of feathers (as well as wool, hooves, and human skin, hair and nails)
Knob - protrusion from the skullLacing - border of contrast color around the entire web of a feather
Litter - material scattered on the floor of a poultry house to absorb moisture and manure (also called bedding)
Lopped comb - a comb that falls to one side
Magnum - the portion of the avian oviduct in which the thick white (albumen) is added
Mandible - upper or lower bony portion of the beak
Mechanical transmission - disease causing agents carried on a surface (such as shoes, tires, shovels, etc.)
Membrane - a thin, soft, pliable layer
Metabolism - the physical and chemical processes that produce and maintain a living body
Mite - a type of external parasite
Molt (Moult) - a part of the hen's reproductive cycle when she stops laying and loses her body feathers
Morbidity - a health problem of a bird that typically requires it to be put down
Mortality - death due to disease or accident
Mossy - indistinct, irregular, or messy-looking markings that break up or destroy the intended color pattern on feathers
Mottled - plumage where a percentage of feathers are tipped with white; a discoloration of egg yolk caused by damage to the yolk membrane
Muff - fluffy feathers on the face of chickens (tufts are feathers that protrude from the face)
Mounting - when the rooster mates with a hen
Necropsy - a postmortem (after death) examination of an animal (equivalent to a human autopsy)
Necrotic - pertaining to dead tissue
Nematode - a roundworm
Nest egg - artificial egg placed in a nest to encourage hens to lay there
Nest run - ungraded eggs
Neural - pertaining to the nerves
NPIP - National Poultry Improvement Plan
Ocular - pertaining to the eye

Oil sac - large oil gland on the back of birds at the base of the tail and used by the bird to preen or condition feathers (also called the uropygial or preen gland)
Organic - a legalized regulated term related to production of food products according to pre-set standards
Osteomyelitis - inflammation of the bone marrow
Osteoporosis - thinning and weakening of the bones
Ova - female germ cells that become eggs
Ovary - a part of the female avian reproductive tract which holds the female genetic material and collects the yolk material normally associated with eggs
Oviduct - a part of the female avian reproductive tract where the egg white (albumen), shell membranes, shell and bloom (cuticle) are added to form a complete egg
Oviposition - the laying of an egg
Ovulation - the release of a yolk from the ovary
Ovum - the female germ cells in the ovary (plural = ova)
Pasting - loose droppings sticking to the vent area
Pathogen - disease-producing organism
Pathogenic - able to cause disease
Pathogenicity - the degree to which an organism is able to cause a disease
Pathology - the study of damage caused by disease
Pecking order - the social rank of individuals within a flock
Peachick - a young (baby) peafowl
Peacock - an adult make peafowl
Peahen - an adult female peafowl
Peep - a term for chick sometimes used by small flock owners
Pellets - a form of feed where the contents are compressed into bite-sized morsels
Penicled - crosswise lines or bars on feathers that form a pattern
Pendulous crop - a crop that is impacted and enlarged and hangs down in an abnormal manner
Perch - a place where chickens can get off the floor (also called a roost)
Perosis - malformation of the hock joint
Perch - the area above the ground where birds will sit, primarily for sleeping at night (also called roosts)
Persistency of lay - the ability of a hen to lay eggs steadily over a long period of time
pH - a number that indicates acidity or alkanity (7 is neutral, above 7 is alkaline and below 7 is acid)
Pick out - vent damage caused by other chickens' pecking
Pigeon milk - a cottage-cheese looking crop substance produced by both the male and female pigeon to feed the young from hatch till about 10 days of age
Pigmentation - the color of a chicken's beak, shanks and vent
Pip - when a chick breaks through the shell
Pipping - breaking through the shell prior to hatch
Pin bones - pubic bones
Pin feathers - a developing feather on a bird
Plumage - the total set of feathers covering a bird
Post - to conduct a postmortem (after death) examination
Poult - young (baby) turkey or pheasant
Poultry - a term for domestic fowl raised for meat, eggs, feathers, work or entertainment
Preen gland - an oil sack on the back and near the base of the tail of birds providing oil used in preening (also called the oil or uropygial gland)
Preening - to straighten and clean feathers, typically with oil
Prolapse - when there is vent damage, typically caused by laying an very large egg (also referred to as a blowout)
Proventriculus - the true stomach of birds where pepsin and acid are produced
Pubic bones - two bones that end in front of the vent of birds

Pullet - immature female bird (used with several species of birds, but most commonly with chickens)
Purebred - offspring from a hen and rooster of the same breed
Rales - any abnormal sounds coming from the airways of birds
Ration - a combination of feed ingredients formulated to meet a bird's nutritional requirements
Ratite - a type of domestic bird that does not have a keel bone and includes ostriches, emus and rheas
Renal - pertaining to the kidneys
Render - the process by which slaughter by-product are treated to convert them into protein products for use in animal feeds
Rigor mortis - stiffness following death
Roach back - deformed, hunched back (a disqualification when showing poultry)
Roaster - a meat-type chicken raised to a size that makes them suitable for roasting
Roost - a place where chickens can get off the floor (also called a perch)
Rooster - adult male chicken (also referred to as a cock)
Rumpless - genetic trait in some chicken breeds where they have no tail
Saddle - a part of a bird's back just before the tail
Sanitize - to clean and disinfect in order to kill germs
Scales - small, hard, overlapping plates that cover a chicken's shanks and toes.
Scratch - the habit of chickens to scrape there claws against the ground to dig up food items; also a term used for any whole grains fed to chickens
Sexed chicks - day-old chicks that are separated into separate groups of male and female chicks
Sex-feather - the curled feather on the tail of male ducks
Sex feathers - rounded hackle, saddle, and tail feathers on a hen; pointed hackle, saddle and tail feathers on a rooster
Sex-linked - an inherited factor linked to the sex chromosomes and used in developing specific crosses to make sexing day-old chicks easier
Shaft - part of the feather where the barbs are attached
Shank - the part of a bird's leg between the foot and the hock
Shell gland - the portion of the female avian reproductive tract where the shell is added to the egg (also called the 'uterus')
Sickles - long, curved tail feathers of some roosters
Side sprig - projection from the side of a single comb (a disqualification when showing single-comb breeds of chickens)
Spent (as in a spent hen) - a hen that is no longer laying eggs
Sperm - the male reproductive cells capable of fertilizing the ova from the female
Spike - round extension found at the end of a rose comb
Splayed legs - the legs are positioned such that the bird is unable to stand up (also called 'spraddle legs')
Spur - the sharp horny protrusion from the back of a bird's shank (typically larger in males than in females)
Squab - a young (baby) pigeon that has not yet left the nest; also refers to pigeon meat since pigeons are usually marketed before they leave the nest
Squeaker - a young pigeon still in the nest
Squirrel tail - tail that has more than a 90 degree angle
Snood - the flap of skin that hangs over the turkey's beak
Starve-out - a chick that has not eaten
Straight-run (chicks) - day-old chicks that have not been sorted by sex (also called unsexed)
Strain - a group of birds within a variety of a breed that has been bred by one person or company for generations
Stub - down on the shank or toe of a clean-legged chcken
Syndrome - a group of symptoms that occur in combination in a particular disease
Synergistic - working in cooperation

Testes - the male reproductive glands (located internally in birds)
Tin hen - slang for an incubator
Tom - an adult male turkey (also referred to as a 'gobbler')
Torticollis - twisted or wry neck
Toxin - a poison produced by microorganisms
Trachea - the windpipe
Trio - a male with two females of the same species, breed and variety
Type - the size and shape of a chicken that tells you what breed it isUnsexed - day-old chicks that have not been sorted by sex (also called straight-run)
Urates - uric acid (the avian form of pee)
Uremia - poisoning caused by accumulated wastes in the body, typically due to kidney failure
Uropygial gland - large oil gland on the back and at the base of the tail of birds providing oil for the birds to preen their feathers (also called the preen or oil gland)
Uterus - the section of the female avian reproductive tract where the shell is added to the egg (also known as the 'shell gland')
Vagina - the section of the female avian reproductive tract where the bloom/cutlicle is added to the egg just prior to being laid
Variety - subdivision of a breed, according to plumage color, comb type, etc.
Vector - the means by which a disease is spread
Vent - the common outside opening of the cloaca in birds through which the digestive, excretory and reproductive tracts empty
Vertebrae - bones in the spinal column
Verticle transmission - disease transmitted from parent to offspring through hatching eggs
Virulence - the level at which a disease-causing organism is able to cause a disease
Vitelline membrane - the thin membrane that surrounds the yolk
Vulture hock - feather-legged breeds where the feathers grow off the shank and touch the ground
Wattles - the flap of skin under the chin of a chicken or turkey
Web - the network of interlocking parts that give a feather its smooth appearance; a part of the feet of waterfowl
Wet-blub thermometer - a thermometer used to measure the amount of moisture or water vapor in the air (humidity)
Wing clipping - a procedure in which the primary wing feathers of one wing are cut to prevent flight
Wry tail - tail that lays to the left or gith side and is not symmetrical with the body lineXanthophylls - the yellow pigments found in leaves, grasses and green plants that are added as pigment to avian skin as well as providing the yellow color of egg yolksYolk - the round yellow mass upon which the genetic material of the female (and male if the egg is fertilized) is located and that provides nutrients for the devloping embryo
Yolk sac - the membrane that surrounds the yolk in the incubating egg
Zoning - laws regulating or restricting the use of land for a particular purpuse such as raising poultry
Zoonosis - a disease transmissible from an animal to a human (plural = zoonoses)