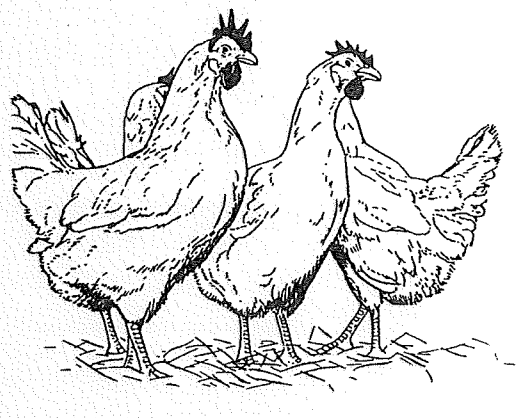
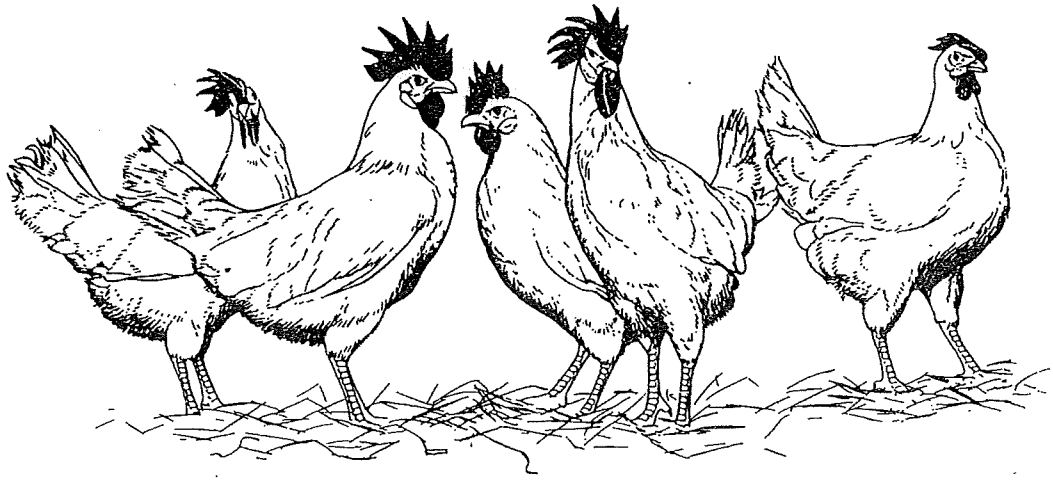


Poultry Judging



NATIONAL 4-H POULTRY JUDGING MANUAL
Revised February 22, 2021
PAST PRODUCTION HENS

In past production hen classes, four live laying hens are judged and ranked according to factors that help determine the number of eggs they have laid prior to the contest. The laying hens are judged on PAST PRODUCTION and CURRENT PRODUCTION factors. These judging factors are based on scientific principles and observations. These principles are still used today to cull poor producing hens from flocks.

The past production factor of **PIGMENT LOSS** is the best indicator of the number of eggs each hen has laid. This signifies which hen has had the longest period(s) of continuous egg production.

Current production factors indicate the hen's current rate of egg production which is determined by the traits of ABDOMINAL CAPACITY, ABDOMINAL FAT CONDITION, and MOLT.

Health and vigor are indicated by the shape and brightness of the eye, the proportional shape of the head, and the condition of the comb and wattles. Health and vigor are NOT used in placing the hens but are suggested as describing factors when giving reasons.

When judging the class of production laying hens there is a very specific order of importance of these factors when placing the class.

The specific order of importance for factors when placing hens are:

1. Pigment Loss
2. Abdominal Capacity
3. Abdominal Fat Condition
4. Molt

The specifics for evaluating each factor will be discussed in future sections, but it is important to remember that pigment loss is always the first and most important characteristic that should be used to place the class. The hen that has bleached (lost pigment) and has the whitest shanks should always be placed first. If two hens have the same pigment loss, use the abdominal capacity to split that pair. The hen with a better abdominal capacity is placed above one with poorer abdominal capacity but only if they have the same level of pigment loss. If, in your judgment, two hens have equal pigmentation and have the same abdominal capacity, then place the hen with the least abdominal fat condition above the hen with the heavier abdominal fat condition. Finally, if you consider the top three factors (pigment loss, abdominal capacity, and abdominal fat condition) to be equal between two hens, split the placing of the two hens based on their molt condition. When all other factors are the same, the hen showing no current molt should be placed above one that shows active molt in the primary wing feathers.

This manual will guide you on how to handle and judge a hen, how to check for and describe factors previously mentioned, how to place the past production hen class, and then how to present oral reasons to defend your placing.

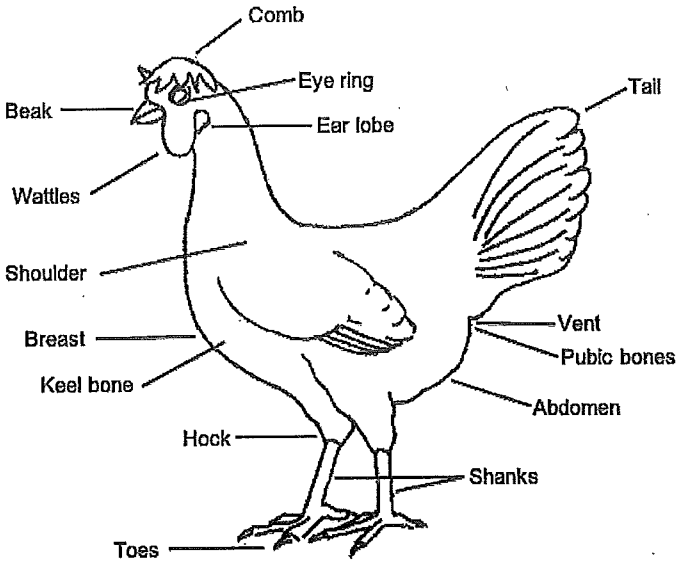


Figure 1. Parts of a Single Comb White Leghorn hen, giving common names used in poultry judging.

When judging past production hens and giving oral reasons, it is important to be familiar with the parts and anatomy of the hen as well as the proper terminology to describe what you are observing.

Figure 1 shows the parts of a White Leghorn hen important in production judging. The pubic bones are found on either side of the vent. The abdomen is located between the pubic bones and the tip of the keel (breast bone).

1. PIGMENT LOSS/ BLEACHING

The most important factor in determining past egg production is the loss of pigment from the skin and shanks of the hen. This is referred to as bleaching. These standards apply to any breed that has yellow-pigmented skin and shanks. In the national contest, Leghorn hybrids are used for egg production classes since they have yellow pigment in their skin and shanks. They are also a common breed and easy to find. For practice, other breeds having yellow-pigmented skin and shanks can be used if Leghorns are not available. Examples are production sex-linked reds, or American class breeds like Plymouth Rocks, Rhode Island Reds, or New Hampshire Reds which are commonly raised in small flocks.

The yellow pigment is deposited in the skin, beak, shanks, and feet while the chicken is a growing pullet. At sexual maturity, which occurs at 17-20 weeks of age, the pullet starts to lay eggs. The pigment then bleaches from the pigmented areas in a definite order according to the approximate number of eggs the hen has laid. By knowing the order of pigment loss or bleaching, you can easily rank the hens for past egg production. Learning the order of pigment loss is critical prior to judging any hen classes.

Pigmentation loss is displayed in the following order:

1. Vent
2. Eye ring
3. Ear lobe
4. Beak (corner of the mouth toward the tip)
5. Bottom of the foot
6. Pigment loss over the entire shank (front, back, and sides)
7. Hock and top of the toes

Hens can regain their pigment when they go into a molt and stop egg production. The pigment returns to the skin in the same order it is bleached: vent, eye ring, ear lobe, beak, the bottom of the foot, entire shank, hock, and top of the toes. Hens that show signs of regaining their pigment tend to be poor producers.

2. ABDOMINAL CAPACITY

Abdominal capacity refers to the size of the laying hen's abdominal area. The larger the abdominal capacity, the better the current level of production. The abdominal spread is a term used to refer to the measurement associated with the width and depth of the abdomen. Abdominal capacity is usually measured by comparing the number of fingers you can get 1) between the pubic bones and 2) between the pubic bones and the tip of the keel. The first number in the spread refers to the width between the pubic bones and the second number refers to the depth of the abdomen. For example, if you can fit two fingers in between the pubic bones, and three fingers for the depth of the abdomen, then you would refer to the spread as 2 x 3.

3. ABDOMINAL FAT CONDITION

A hen uses the energy in the feed she eats to produce eggs. If she is not laying eggs, she does not require as much dietary energy and much of the energy from the feed she eats is deposited as fat. The amount of fat in the abdomen, therefore, is a good indicator of the hen's level of production. Abdominal fat condition refers to the fat content in the abdominal area. The fat in the abdominal area is referred to as the abdominal fat pad.

4. MOLT

Molt is another factor used to evaluate hens' current production. Molt is the loss of primary feathers that occurs when a hen stops producing eggs. Molt is evaluated by counting the number of primary wing feathers. In a non-molted hen, there are 10 primary feathers that are separated from the secondary feathers by a single, smaller feather known as the axial feather. If there are primary feathers missing, or if new primary feathers are growing in to replace lost feathers, that indicates that the hen is in a molt.

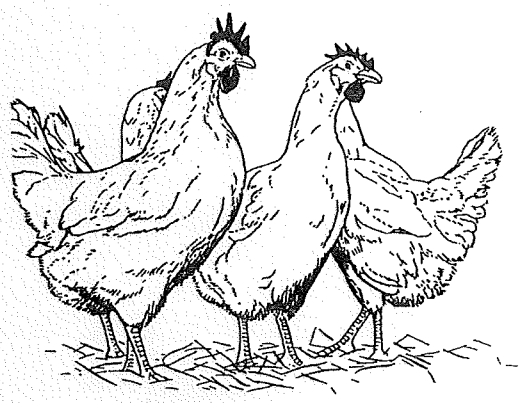
The main concept to understand about molt is that feather growth and egg production both require a large amount of protein. A hen cannot be replacing long feathers (molting) and lay eggs at the same time. So, when a hen is molting it is most likely not in production.

REMOVING HENS FROM THE CAGE

When evaluating live animals, the welfare of animals is important and should be considered. Being well-trained in handling hens is important to prevent discomfort or harm to them. In order to maintain the welfare of the hens, the following procedure should be adhered to. Approach the cage slowly, open the door quietly, and prepare to remove the hen from the cage, headfirst. To remove the hen easily and properly, maneuver it until it stands with its head facing you. Place your hand above the hen and quickly, but gently, pin her to the floor of the cage. With both hands, hold the wings next to the body; lift the hen slightly off the floor, and turn her to face the cage door. Then slide your non-dominant hand, palm up along the hen's keel or breastbone, place your thumb on the outside of one leg, your index finger between the hen's legs, and the rest of your fingers to the outside of the second leg. Hold the legs gently but firmly at the hocks and lift the hen off the floor of the cage. Steady her with your free hand. Hold the legs gently but firmly above the hocks. Put your index finger between the hocks, your thumb around one leg, and your remaining fingers around the other leg. Carry the weight of the hen with the hen's breast in the palm of your hand. Then bring the bird out of the cage, headfirst, keeping its head toward you. It is recommended that you practice moving the bird from one hand to the other to allow you to use both hands when opening the wings. Also, holding the birds in your non-dominate hand allows your dominant hand to be available to take written notes. While resting the hen's body on the palm of your hand you can open both wings and check for a molt.

Placing the hen's head between your body and arm will help to control it. One hand is then free to examine the hen and take notes. If you are right-handed it is best to hold the hen with your left hand so that your writing hand is free to take notes. If you are left-handed, hold the hen with your right hand. Never hold a laying hen upside down by their legs or allow them to flap their wings. Always return the hen to the coop headfirst and lower the hen gently to the floor of the coop before releasing her. You are only allowed to handle one hen at a time and cannot compare your hen with a different hen that someone else is handling. NEVER HANDLE OR COMPARE TWO HENS AT ONE TIME.

To examine the hen, hold her back against your stomach, with her head slightly downward. From this position, you can see the vent and check for pigment loss, abdominal capacity, and abdominal fat condition.



Understanding the Food Poisoners

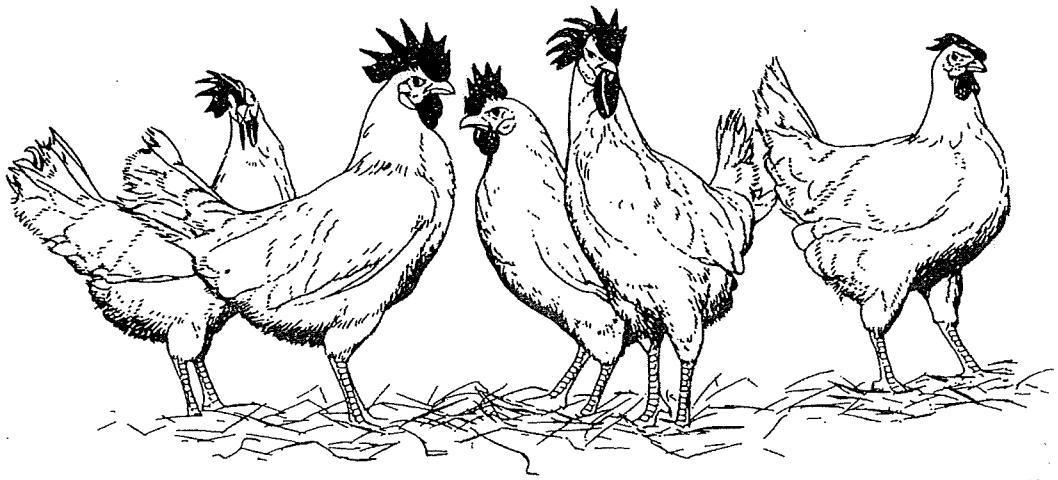


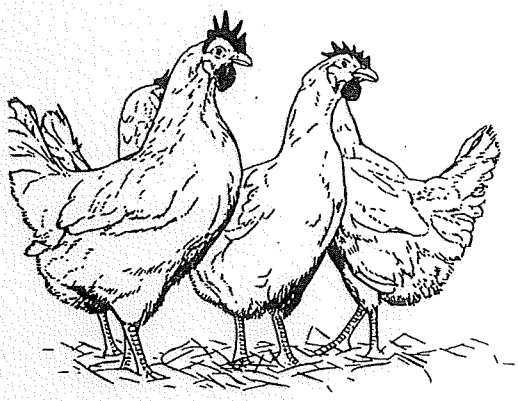
Table 4. Understanding the Food Poisoners

What is food poisoning? Food poisoning, caused by harmful bacteria, normally produces intestinal flu-like symptoms lasting a few hours to several days. But in cases of botulism or when food poisoning strikes infants, the ill, or the elderly, the situation can be serious.

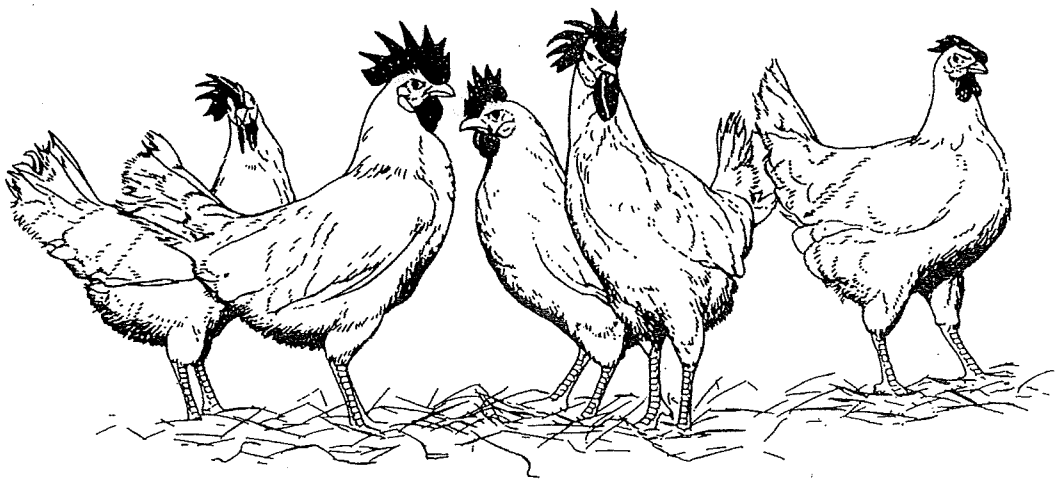
Where do these bacteria come from and how can they be stopped? Food poisoning bacteria, microscopic in size, surround us—in the air, soil, and water, in our own digestive tracts, and in those of many animals. The only way they can effectively be stopped is by careful attention to food handling rules like those outlined below.

BACTERIA	HOW IT ATTACKS	SYMPTOMS	PREVENTION
Staphylococcus aureus (Staph)	Staph spreads from someone handling food. It is found on the skin and in boils, pimples, and throat infections. At warm temperatures, staph produces a poison.	2 to 8 hours after eating, you could have vomiting and diarrhea lasting a day or two.	Cooking won't destroy the staph poison so: -Wash hands and utensils before preparing food. -Don't leave food out over 2 hours. Susceptible foods are meat, poultry, meat and poultry salads, cheese, egg products, starchy salads (potato, macaroni, pasta, and tuna), custards, and cream-filled desserts.
Salmonella	You can get salmonella when infected food—such as meat, poultry, eggs, or fish—is eaten raw or undercooked. Other causes include cooked food coming into contact with infected raw food or an infected person contaminating food.	In 12 to 36 hours you could have diarrhea, fever, and vomiting lasting 2 to 7 days.	Keep raw food away from cooked food and: -Thoroughly cook meat, poultry, and fish. -Be especially careful with poultry, pork, roast beef, and hamburger. -Don't drink unpasteurized milk.
Clostridium perfringens	This "buffet germ" grows rapidly in large portions of food that are cooling slowly. It can also grow in chafing dishes which may not keep food sufficiently hot and even in the refrigerator if food is stored in large portions which do not cool quickly.	In 8 to 24 hours you could have diarrhea and gas pains, ending usually in less than a day. But older people and ulcer patients can be badly affected.	Keep food hot (over 140°F) or cold (under 40°F) and: -Divide bulk cooked foods into smaller portions for serving and cooling. -Be careful with poultry, gravy, stews, and casseroles.
Campylobacter jejuni	You drink untreated water on an outing. Your pet becomes infected and spreads it to the whole family, or you eat raw or undercooked meat, poultry, or shellfish.	In 2 to 5 days you could have severe (possibly bloody) diarrhea, cramping, fever, and headache lasting 2 to 7 days.	Don't drink untreated water or unpasteurized milk and: -Thoroughly clean hands, utensils, and surfaces that touch raw meats. -Thoroughly cook meat, poultry, and fish.
Clostridium botulinum	Often occurs in home-canned or any canned goods showing warning signs—clear liquids turned milky, cracked jars, loose lids, swollen or dented cans or lids. Beware of any jar or can that spurts liquid or has an off-odor when opened.	In 12 to 48 hours your nervous system could be affected. Other symptoms include double vision, droopy eyelids, and difficulty speaking, swallowing, or breathing. Untreated botulism can be fatal.	Carefully examine home-canned goods before use, and: -Don't use any canned goods showing danger signs. -If you or a family member has botulism symptoms, get medical help immediately. Then call health authorities.

Note: While the chart highlights the preventive measures most important in avoiding each type of bacteria, you should understand that all the rules of prevention should be followed with all food.



Avian Systems



THE REPRODUCTIVE SYSTEM

Female Reproductive System

(See Figure 3)

The female reproductive system of the chicken is divided into two main parts: the **ovary** and the **oviduct**. The **ovary** is a cluster of developing **yolks** or **ova** and is located midway between the neck and tail of the bird, attached along the back. The ovary is fully formed although very small when the female chick is hatched. It is made up of 13,000 to 14,000 minute yolks or ova which grow by the addition of yolk fluid. The ovum, or yolk starts out as a single cell surrounded by a **vitelline membrane** which keeps water out. The color of the yolk or ovum, which is yellow/orange comes from fat soluble pigments called xanthophylls (*zantho fills*) contained in the hen's diet.

Ovulation is the release of the mature yolk from the ovary into the second part of the female reproductive system. The ova or yolk, which is enclosed in a sac, ruptures along the **suture line** or **stigma**. This release of the ova occurs 30 to 75 minutes after the previous egg has been laid.

The second major part of the female chicken's reproductive system is the oviduct. The **oviduct** is a long convoluted tube (25 to 27 inches long) which is divided into five major sections. They are the **infundibulum** or **funnel**, the **magnum**, the **isthmus**, the **shell gland**, and the **vagina**. Unlike mammals, there is only one functional oviduct in the chicken; the oviduct on the left side of the chicken is functional, the right ovary is **rudimentary** (imperfectly developed).

The first part of the oviduct, the **infundibulum** or **funnel**, is 3 to 4 inches long, and it engulfs the ovum released from the ovary. The ovum or yolk remains here 15 to 18 minutes, and the infundibulum also serves as a reservoir for spermatazoa so that fertilization can take place.

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. The ovum or yolk remains here 3 hours during which time the thick white or albumen is added.

The third section of the oviduct is the **isthmus** which is 4 inches long. The "egg" remains here for 75 minutes. The isthmus, as its name implies, is slightly constricted. In the isthmus, the shell membranes are added.

The next section of the oviduct is the **shell gland**. The shell gland is 4 to 5 inches long, and the "egg" remains here for 20-plus hours. Plumping is the addition of water in the shell gland and is vital to the creation of the thin albumen and chalazae. As its name implies, the shell is placed on the egg here. The shell is made up of **calcium carbonate**, and the hen mobilizes 47 percent of her body calcium from her bones and her diet to make the egg shell. Pigment deposition is also done in the shell gland.

The last part of the oviduct is the **vagina** which is about 4 to 5 inches long and does not really play a part in egg formation. The vagina is made of smooth muscle which helps push the egg out of the hen's body. There are also glands located in the vagina where spermatazoa are stored.

Male Reproductive System

(See Figure 4)

The male reproductive tract is comprised of two **testes**, both of which are functional. Inside the testes are the **seminiferous tubules**, where spermatozoa are produced. Leading from the testes is the **ductus deferens** which move the sperm to the outside of the body.

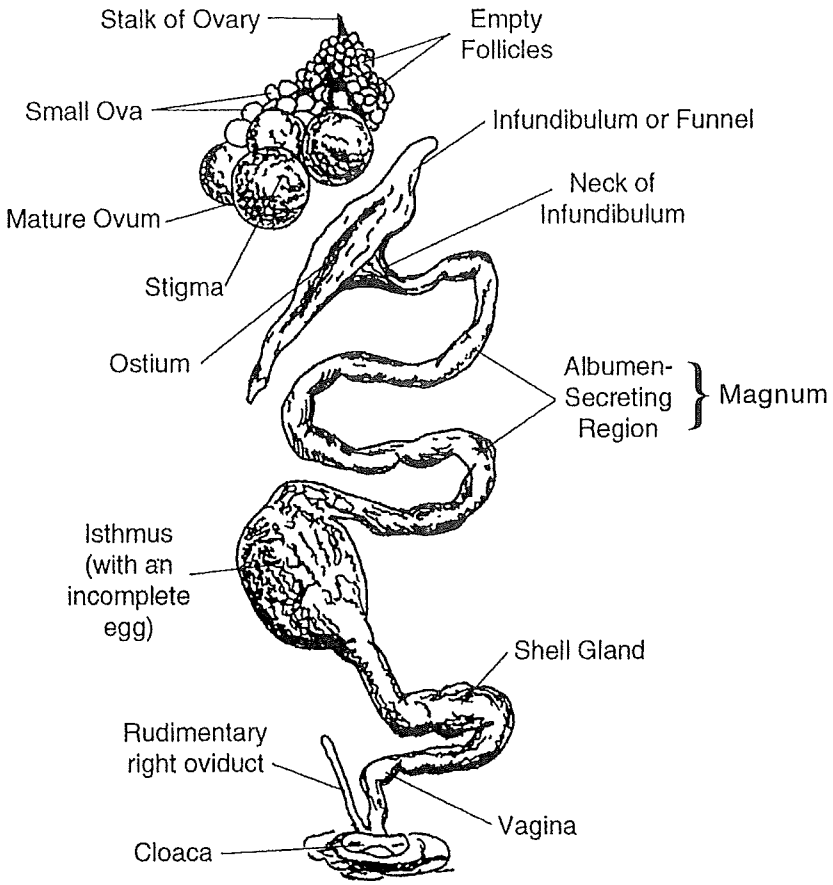


Figure 3. Female Reproductive System

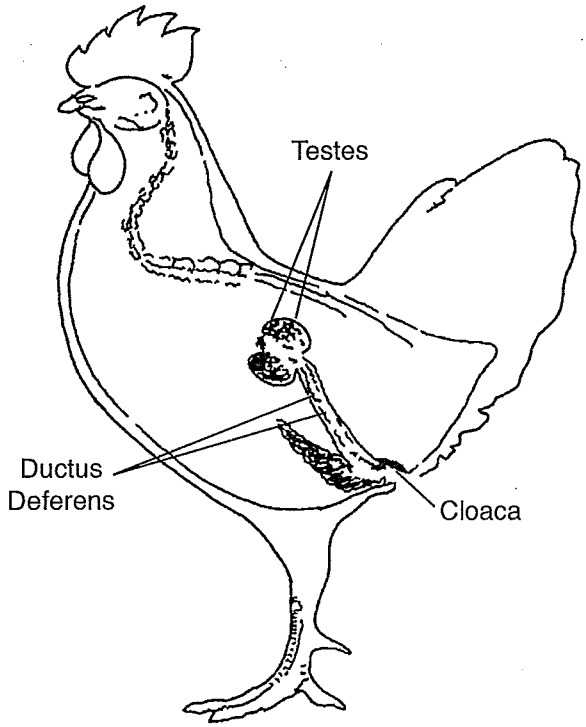
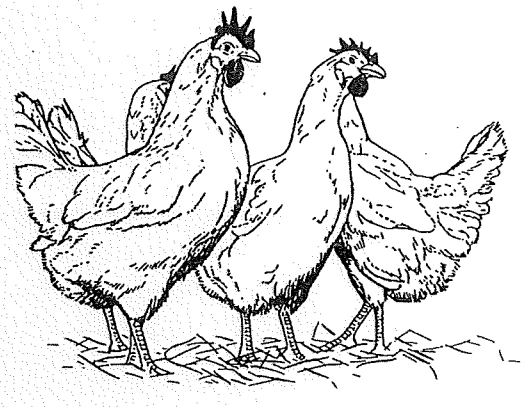
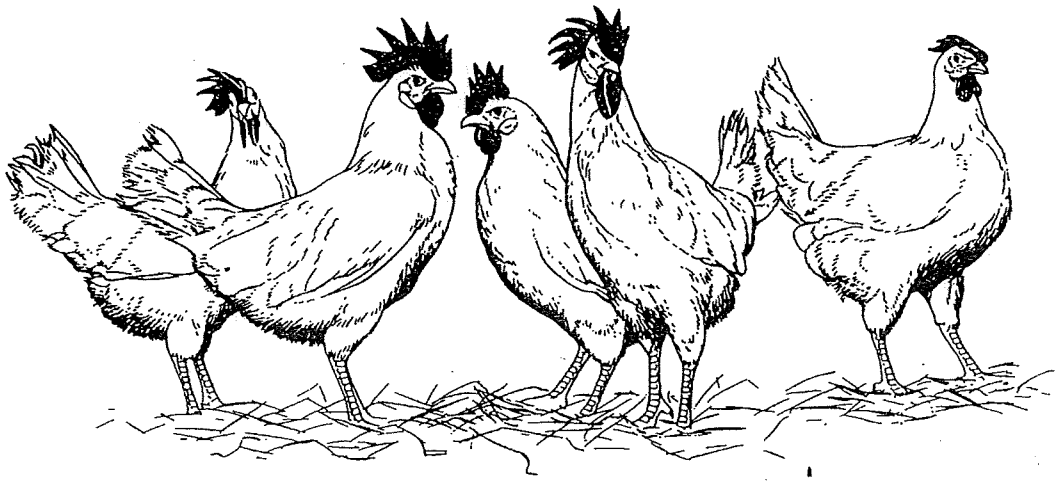


Figure 4. Male Reproductive System



Breeds, Varieties, and Strains



MEDITERRANEAN CLASS

Anconas

Varieties: Single Comb, Rose Comb.
Standard weights: Cock, 6 pounds; hen, 4½ pounds; cockerel, 5 pounds; pullet, 4 pounds.
Use: A small fowl that lays a fair number of rather small eggs.
Origin: Anconas take their name from the port city of Ancona, Italy, where they are said to have originated.
Characteristics: Anconas resemble Leghorns in shape and size. They are small, active, alert, and black with white tipped feathers evenly distributed. Anconas are noisy, good foragers, and considered non-broody. They were once a prime egg-producing breed, but today they are mainly kept as an ornamental fowl.

Blue Andalusians

Varieties: None.
Standard weights: Cock, 7 pounds; hen, 5½ pounds; cockerel, 6 pounds; pullet, 4½ pounds.
Skin color: White.
Eggshell color: White.
Use: An ornamental fowl with fairly good egg-production potential.
Origin: Developed initially in Spain, the breed has undergone considerable development in England and the United States.
Characteristics: Andalusians are small, active, closely feathered birds that tend to be noisy and rarely go broody. Andalusians are a typical example of the unstable blue color we see in the poultry industry. It is the result of a cross of black and white. When two blues are mated, they produce offspring in the ratio of one black, two blues, and one white. These whites and blacks when mated together will produce mainly blues. Andalusians are beautiful when good, but the percentage of really good ones runs low in many flocks because of this color segregation. Hence, they are not widely bred and never in large numbers.

Leghorns

Varieties: Single Comb Dark Brown, Single Comb Light Brown, Rose Comb Dark Brown, Rose Comb Light Brown, Single Comb White, Rose Comb White, Single Comb Buff, Single Comb Black, Single Comb Silver, Single Comb Red, Single Comb Black Tailed Red, Single Comb Columbian.
Standard weights: Cock, 6 pounds; hen, 4½ pounds; cockerel, 5 pounds; pullet, 4 pounds.
Skin color: Yellow.
Eggshell color: White.
Use: An egg-type chicken, Leghorns figured in the development of most of our modern egg-type strains.
Origin: Leghorns take their name from the city of Leghorn, Italy, where they are considered to have originated.
Characteristics: A small, spritely, noisy bird with great style, Leghorns like to move about. They are good foragers and can often glean much of their diet from ranging over fields and barnyards. Leghorns are capable of considerable flight and often roost in trees if given the opportunity. Leghorns and their descendants are the most numerous breed we have in America today. The Leghorn has relatively large head furnishings (comb and wattles) and is noted for egg production. Leghorns rarely go broody.

Minorcas

Varieties: Single Comb Black, Rose Comb Black, Single Comb White, Rose Comb White, Single Comb Buff.
Standard weights: Single Comb Black: cock, 9 pounds; hen, 7½ pounds; cockerel, 7½ pounds; pullet, 6½ pounds. All others: cock, 8 pounds; hen, 6½ pounds; cockerel, 6½ pounds; pullet, 5½ pounds.
Skin color: White.
Eggshell color: White.
Use: Developed for the production of very large chalk-white eggs, the Minorca is today principally an exhibition fowl.
Origin: Developed in the Mediterranean area, they take their name from an island off the coast of Spain. Development may have been as an offshoot of the Spanish breed.
Characteristics: The largest of the Mediterranean breeds, they are long, angular birds that appear larger than they are. They have long tails and large, wide feathers closely held to narrow bodies. Minorcas have relatively large combs and wattles. Good Minorcas are stately, impressive birds and can give a fair return in eggs, although in recent years they have not been intensively selected for that purpose. They are rather poor meat fowl because of their narrow angular bodies and slow growth. Minorcas rarely go broody and are very alert and fairly good foragers.

White-Faced Black Spanish

Varieties: None.
Standard weight: Cock, 8 pounds; hen, 6 1/2 pounds; cockerel, 6 1/2 pounds; pullet, 5 1/2 pounds.
Skin color: White.
Eggshell color: White.
Use: An egg-type bird that has, in recent years, had very little selection for that purpose.
Origin: Coming from Spain, this bird arrived in the United States via the Caribbean Islands. Spanish are the oldest breed of chickens that exist in the United States today. At one time known as "The Fowls of Seville," they were very popular in the South during the Colonial period.
Characteristics: The large area of snow white skin surrounding the face and wattles makes this breed unique. Actually this is an overdeveloped earlobe. Its color offers a marked contrast with the black plumage and the red comb and wattles. They are considered non-broody and hold their feathers close to their body contours. Spanish are active and noisy. Many birds are below recommended weight, and at this time, most of the population is highly inbred.

Other Breeds in the Mediterranean Class

Buttercups: A small, spritely breed from Sicily, their chief distinguishing feature is their cup-shaped comb. Buttercups are non-broody, lay a fair number of small eggs, and are kept strictly as ornamental fowl.
Catalanas: The Buff Catalana is a medium-sized bird noted for its hardiness. It is not well-known in the United States but is widely distributed through South America. Catalanas come closer to being a dual-purpose breed than any of the other Mediterranean breeds.

CONTINENTAL CLASS

Northern European

Hamburgs

Varieties: Golden Spangled, Silver Spangled, Golden Penciled, Silver Penciled, Black, White.
Standard weights: Cock, 5 pounds; hen, 4 pounds; cockerel, 4 pounds; pullet, 3 1/2 pounds.
Skin color: White.
Eggshell color: White.
Use: An ornamental fowl capable of laying fair numbers of relatively small eggs.
Origin: Hamburgs carry a German name but are generally considered to have originated in Holland.
Characteristics: Hamburgs are active, flighty birds. They are trim and stylish with delicate features and are wild in nature. They forage well and are capable of flying long distances. Although good egg producers, their eggs are often very small.

Campines

There are two varieties of campines, Golden and Silver. Campines are a fairly small, closely feathered breed with solid-colored hackles and barred bodies. They are chiefly an ornamental breed but will lay a fair number of white-shelled eggs and are non-broody. They are thought to have originated in Belgium.

Lakenvelders

An old German breed best know for its color pattern (black hackle and tail on a white body). They are quite small, non-broody, lay white-shelled eggs, and are rather wild and flighty.

Polish

Polish

Varieties: White Crested Black, Non-Bearded Golden, Non-Bearded Silver, Non-Bearded White, Non-Bearded Buff Laced, Bearded Golden, Bearded Silver, Bearded White, Bearded Buff Laced.
Standard weights: Cock, 6 pounds; hen, 4 1/2 pounds; cockerel, 5 pounds; pullet, 4 pounds.
Skin color: White.
Eggshell color: White.
Use: Strictly an ornamental fowl.
Origin: Probably eastern Europe, although they are so old that their history has been obscured.
Characteristics: Polish are an unusual and beautiful breed. They have a crest (some also possess a beard and muffs) and are small, tightly feathered birds, fairly active despite restricted vision due to their large "head gear." They need plenty of space to avoid damaging each other's crests by picking. Ice forming in their crests from drinking water can be a problem in colder weather. Sometimes their crests restrict vision and cause them to be easily frightened.

French

Houdans

Varieties: Mottled, White.
Standard weights: Cock, 8 pounds; hen, 6 1/2 pounds; cockerel, 7 pounds; pullet, 5 1/2 pounds.
Skin color: White.
Eggshell color: White.
Use: An ornamental fowl that is also a good egg producer and fairly good as a meat bird.
Origin: Houdans originated in France where they enjoy a good reputation as a high-class table fowl.
Characteristics: Houdans possess a crest, beard, and muffs and have five toes on each foot. Their rectangular bodies are set on fairly short legs. They are one of the better ornamental breeds for general utility use. Because of their crest, they require plenty of space and feed and water containers that prevent them from getting the crest wet and dirty, especially in cold weather. Because of the fifth toe, baby Houdans often walk with a skipping gait.

Faverolles

An interesting breed that combines a beard and muffs with a single comb and feathered legs and feet. Faverolles are a medium-sized breed and fairly loosely feathered, giving them a rather large appearance. They also have a fifth toe on each foot and while chiefly ornamental, do possess some utility characteristics as well.

Crevecoeurs

A very rare, crested breed, solid black in color, Crevecoeurs are strictly an ornamental fowl.

La Fleche

A very rare breed with a pair of spikes in place of a conventional comb. La Fleche are black, of medium size, and very active. They are strictly an ornamental fowl.

All Other Standard Breeds Class

Games

Old English

Varieties: Black Breasted Red, Brown Red, Golden Duckwing, Silver Duckwing, Red Pyle, White, Black, Spangled.
Standard weights: Cock, 5 pounds; hen, 4 pounds; cockerel, 4 pounds; pullet, 3½ pounds.
Skin color: White.
Eggshell color: White or light tint.
Use: Old English Games are strictly an ornamental fowl.
Origin: Old English Games are the modern-day descendants of the ancient fighting cocks. They are associated with England, but their heritage is almost worldwide and they have changed little in shape or appearance in more than 1,000 years.
Characteristics: A small, tightly feathered bird, Old English Games are very hardy, extremely active, and very noisy. Old English have figured in the development of many other breeds. The mature cocks should be dubbed (have the comb and wattles removed) with a characteristic cut. This is in keeping with their heritage. Old English hens usually show broodiness but are so small and aggressive as well as defensive that they are not always the best choice as mothers. Old English are capable of considerable flight and may revert to a feral (wild) state in some areas. They are the domestic breed most like the old jungle fowl in appearance.

Modern Games

Varieties: Black Breasted Red, Brown Red, Golden Duckwing, Silver Duckwing, Birchen, Red Pyle, Black, White.
Standard weights: Cock, 6 pounds; hen, 4½ pounds; cockerel, 5 pounds; pullet, 4 pounds.
Skin color: White.
Eggshell color: White or light tint.
Use: Strictly an ornamental fowl.
Origin: Modern Games were developed in Great Britain.
Characteristics: A tightly feathered bird with long legs and neck, which give it a tall, slender appearance. The males of the Modern Games should have their combs and wattles removed to enhance their long, slim shape. The feathers of Modern Games should be short, hard, and held very close to their bodies. They do not stand cold weather well because of their short feathers and need plenty of exercise to maintain muscle tone.

Orientals

Malays

Varieties: Black Breasted Red.
Standard weights: Cock, 9 pounds; hen, 7 pounds; cockerel, 7 pounds; pullet, 5 pounds.
Skin color: Yellow.
Eggshell color: Brown.
Use: Strictly an ornamental fowl.
Origin: A very old breed coming from Asia, they have changed little in modern times.
Characteristics: Maylays are very tall and appear bold and perhaps cruel due to their projecting eyebrows. They are closely feathered with short feathers and carry their bodies inclined upward with tail low or drooping. They are rugged and have a reputation for vigor and long life. They require exercise to maintain muscle tone and hardness of feather. Most hens will go broody but are not a good choice because their long legs do not fit easily in a nest.

Sumatras

Varieties: None.
Standard weights: Cock, 5 pounds; hen, 4 pounds; cockerel, 4 pounds; pullet, 3½ pounds.
Skin color: Yellow.
Eggshell color: White or light tint.
Use: Strictly an ornamental fowl.
Origin: Sumatras come from the island of Sumatra from which they take their name.
Characteristics: Sumatras are a distinctive fowl which look less like domestic poultry than other chickens. They have rather long tails carried low enough to appear drooping. They have multiple spurs on each leg, dark purple faces, and a high degree of greenish luster on jet black plumage.

Cubalayas

A hardy bird developed in Cuba, they resemble a Sumatra in shape. Cubalayas exist in three varieties and should be considered a strictly ornamental fowl.

Miscellaneous

Sultans

Sultans come from Turkey. They are strictly an ornamental fowl of very distinctive appearance. They have a large crest, muffs and beard, together with profuse feathering of the feet and legs.

Frizzles

While listed in the *Standard of Perfection* as a breed, frizzling is a genetic modification that can be easily introduced into any population of chickens. It causes each feather to curl back toward the bird's head instead of lying naturally pointed toward the tail.

Naked Necks

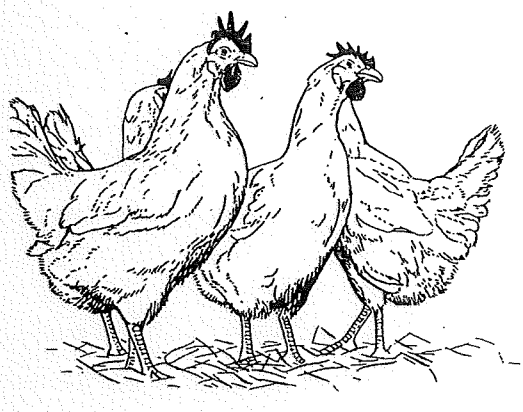
Turkens

The Transylvania Naked Neck is often called Turken. Some people think it is a cross between a chicken and a turkey because of the unfeathered area on the neck. This skin turns red when exposed to the sun, further paralleling the turkey. However, this is actually the result of a single gene that affects the arrangement of feather-growing tracts over the chicken's body. It can be easily introduced into any breed. Turkens have no feathers on a broad band between the shoulders and the base of the skull. They also have a reduced number of feathers on their bodies, but this is not evident until the bird is handled. Turkens should be given protection from extremely cold temperatures as they have far less insulation than their normally feathered cousins. This characteristic is a novel feature that does not detract from the utility of the bird.

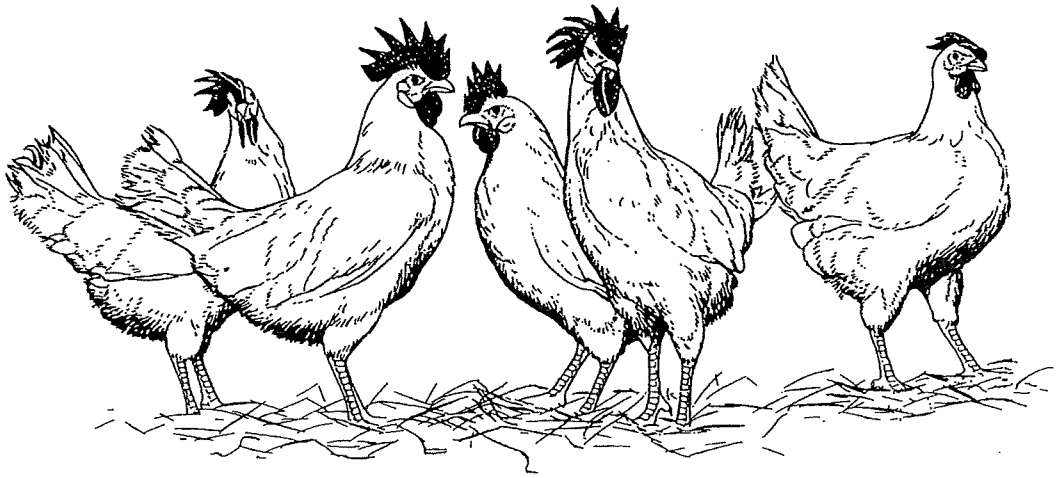
Araucanas

These fowls were discovered in South America. A few were brought to the United States but have been crossed with other chickens so much that characteristics of size, shape, etc., were dispersed. The trait of laying blue or greenish eggs persisted and now breeders are attempting to standardize the physical make-up of the population and gain them recognition as a breed. Some of the Araucanas were rumpless and possessed some interesting ear tufts. Probably at some time in the future, these fowls will be developed into an interesting breed with both economic and ornamental attributes.

Acknowledgments: John L. Skinner, Cooperative Extension Service, University of Wisconsin



Raising Game Birds



Disease Control

Most diseases affecting game birds are caused by microorganisms or viruses spread from bird to bird directly or indirectly. Some infections are airborne; others are transmitted by insects, rodents, free-flying birds, and other animals. Diseases can also be spread by mechanical means, such as tools, beak trimmers, chick boxes, and motor vehicles. Droppings or litter from a previous flock of birds can be a reservoir of disease-producing organisms. The greatest threat to any game bird operation is disease. For this reason, you should enforce the following good management practices at all times:

- Avoid introducing live birds. Live birds are a principal means of bringing disease organisms to susceptible birds. Even though a bird may appear perfectly healthy, it may have had a disease, recovered, and then become a carrier of the disease. If new stock must be introduced, the only relatively safe way is by means of hatching eggs or day-old baby chicks.
- Buy chicks from known sources. Purchase day-old chicks from a breeder with a reputation for producing disease-free stock.
- Separate age groups. Ideally, each species of game bird should be raised separately to eliminate disease and parasite problems. When raising two or more age groups on the same premises is unavoidable, separate the groups as far as possible. During the work day, care for the youngest birds first. Chicks are more susceptible to diseases than older birds.

Vaccination

There is no general rule for vaccination of game birds for specific diseases. Generally, the need for vaccination is determined by the kinds of diseases prevalent in your area. The purpose of a vaccine is to introduce a mild form of a disease into the bird and allow the body to produce antibodies against the organisms, thus building up an immunity. Bacterins (bacterial vaccines) do not produce infections, but will stimulate antibody production.

Sanitation

Preventative disease control is a crucial part of a successful game bird program. Many problems can be avoided if certain management practices are enforced:

- Keep brooder houses and growing pens off-limits to all visitors.
- Train employees to recognize the danger of spreading diseases from farm to farm.
- Thoroughly clean and disinfect all equipment and housing between groups of birds.
- Control predators and rodents, because they may be carriers of disease and external parasites.
- Test breeder stock annually for pullorum as a safeguard against future chick mortality.

Treatment of Disease

Should the birds appear unhealthy and mortality occur, isolate the sick birds immediately. Send a representative sample of sick live birds and some dead birds to the diagnostic laboratory closest to you. Most laboratories charge a small fee for the examination. Treat the sick birds as prescribed by the veterinarian. In acute outbreaks of disease, water medication is preferred over medication in the feed, because sick birds will often drink when they will not eat.

Understanding Diseases

Recognizing common groups of diseases and knowing how they can be prevented or controlled is an important part of a good disease management program.

Parasitic Diseases

Coccidiosis is a destructive protozoan disease that can occur in all species of game birds. It is predominantly a disease of young chicks and is characterized by symptoms of weakness, ruffled feathers, and unthriftiness. Droppings may be bloody. Affected birds are listless and show little interest in feed or water. As the disease advances, moderate to high mortality can be expected. Maintain dry litter and use a good coccidiostat in the feed or water to permit development of immunity in young growing chicks.

Blackhead is a destructive protozoan disease of pheasants, chukars, and grouse. It may spread directly through contact with contaminated feces or indirectly through the infected egg of the cecal worm, *Heterakis*. Infected birds appear droopy, stop feeding, and have a yellowish-brown stool that is watery and foamy. Acutely involved chukars may die very quickly without developing the blackhead syndrome. Several effective drugs are available to prevent or control blackhead.

Worms are often found in game birds at necropsy. Earthworms, slugs, snails, beetles, and other insects are involved in the spread of many parasitic diseases. The best protection against worms is to avoid wet spots around waterers and feeders and to provide well-drained, sloping pens. Phenothiazine and piperazine effectively control some worms.

Acute Infectious Diseases

Erysipelas is a bacterial disease that occurs most often in adult pheasants during the fall. Many deaths may occur before any symptoms are seen. Most affected birds are visibly sick for only a short period before death. General symptoms include weakness, listlessness, loss of appetite, and sometimes a yellowish or greenish diarrhea. Avoid the use of areas previously occupied by swine, sheep, or turkeys.

Fowl cholera generally strikes during the laying season or in mature birds late in winter, and causes very high death loss. It can be introduced onto the farm by wild birds, rodents, and other animals. Treatment consists of prompt cleanup of dead birds and use of antibiotics.

Viral Diseases

Newcastle is a very contagious viral disease, primarily of avian species, including most game birds. Among game birds, Newcastle is transmitted via fecal contamination, eggs, and offal of infected birds. In infected birds, the disease may be manifested by coughing and hoarseness followed by degrees of leg and wing paralysis, tremors, and twisting of the neck. There is no known effective treatment for Newcastle.

Marble spleen disease is a viral disease commonly found in pen-raised pheasants and is characterized by deaths with or without noticeable signs of illness. The most consistent internal symptoms are severe edema (fluid in tissues), enlarged grayish-tan mottled spleens, and inflammation of the lungs. There is no known treatment for this disease.

Quail bronchitis is a severe respiratory disease of quail caused by a virus-like agent. The disease affects young quail and is characterized by rapidly spreading respiratory signs (wheezing, coughing, and sneezing) and mortality ranging from 10 to 100 percent over a period of several weeks.

Fowl pox is a viral infection of most game birds characterized by many lesions (sores) on the skin and mucous membranes of the mouth and upper respiratory tract. Captive pheasants are probably similar to chickens with regard to severity and course of pox infections.

When exposure to these viruses is likely, for example, in areas of high chicken populations, vaccination is recommended. It is advisable to consult a veterinarian or poultry farm advisor before planning a vaccination program.

Controling Cannibalism

Cannibalism is found frequently in most chicken-like species of birds kept in captivity. This vicious habit may start as a mild form of feather or toe picking and develop into a full-scale attack on the flesh of other birds. As a consequence, the game bird industry suffers major economic losses. Birds of all breeds and ages are subject to outbreaks of cannibalism. The pheasant is more prone to cannibalize than are other species of game birds. Some factors contributing to cannibalism include:

Overcrowding. High-density housing brings the birds in close contact with one another. Picking may start as a result of boredom, idleness, and lack of adequate feeder space.

Temperature. Too high a brooding temperature may cause birds to become irate and pick one another.

Light. Bright brooder light increases activity and picking. Less picking occurs when chicks are brooded under natural daylight or artificial light of low intensity (0.5 foot-candle or less at the feed troughs).

Age. Cannibalism occurs in all age groups. Toe, beak, and feather picking are more common among baby chicks; vent, wing, and head picking are forms usually found in older birds.

Sanitation. Poor brooder-house ventilation and sanitation may induce certain irritations of the eyes and nostrils, which become prime targets for picking. Keep litter dry to prevent fecal buildup on the toes of young birds; such buildup can result in loss of toes.

Equipment. Poorly designed feeders and waterers with sharp edges can cause injuries that serve as picking points.

External parasites. Lice or mite infestations can cause itching, irritation, and picking of feathers.

Territorial aggression. Most males become very aggressive during courtship and mating. Conditions of overcrowding in range or small mating pens intensify picking.

Nutrition. The incidence of cannibalism is usually higher in flocks fed rations high in energy and low in fiber. Adding fiber in the form of oats may help reduce picking.

Cannibalism can occur under the most favorable management conditions, so daily observation of the birds' behavior is essential to detect a problem. The following management practices will help minimize problems with cannibalism:

- Provide adequate shelter and ground cover.
- Have adequate floor or pen space for the birds.
- Provide adequate feeder space and waterers.
- Eliminate obstacles from floor or pen that may cause injury.
- Remove dead, sick, or weak birds from the flock immediately.
- Don't introduce a few new birds into an established population.
- Avoid frightening the birds.
- Don't make sudden changes in texture of feed.
- Avoid sudden changes in temperature when moving young birds from brooder house to range.
- Use proper mechanical devices or methods for control of cannibalism:

  Lighting: Use dim red or white light in brooder house.

  Specs: Reduce picking and egg eating.

  Hoods: Several types of hoods can be used during the growing, holding, and breeding period.

  Bits: Reduce picking by preventing closure of beak.

  Beak trimming: Proper removal of no more than one-third of the upper bill can greatly reduce injury due to picking. Commercial hot-blade beak trimmers used for chickens work equally well for game birds. Heavy nail clippers can be used to cut and shape the bill.

Rodent and Predator Control

Norway rats and house mice are universal pests. They are best controlled by exclusion rather than removal, but they seem to be able to invade even the best and tightest of brooder houses and feed storage rooms in time.

Control of rats and mice by poison baits can be difficult because of the competition offered by an abundance of attractive feeds. In such cases, traps must be used, and this can be slow, never-ending work. Because of their great differences in living and eating habits, rats and mice are controlled by different techniques and even different poisons. A common error is to consider rats and mice as one problem and try to solve it with one control effort. This usually fails.

There are many poisons that, if properly used, can control rat and mice populations. Contact your local agricultural commissioner, Cooperative Extension farm advisor, the State Department of Fish and Game, or the State Department of Food and Agriculture to find out which poisons and poisoning techniques are recommended.

Trapping rats or mice is more an art of *where* than *how*. There are many good baits; almost any food that can be placed on the trigger is effective. Runway setting without bait is sometimes more effective. For both rat and mouse traps, an enlarged bait pan made from cardboard or light screen wire greatly improves results. It is important to set traps across the paths used by rats and mice—next to walls and between obstacles. Boxes or sacks may be used to form obstacles to force the rodent to pass over the trigger. Two or more traps set close together work well where there are many rats and mice or where there are trap-shy individuals. Use plenty of traps if you are going to trap at all. If travel is overhead, rat or mouse traps can be fastened to pipes, walls, or rafters. It is not necessary to clean or boil the traps or handle them with gloves; rats and mice are accustomed to human odors.

In dealing with predators, exclusion is perhaps even more important than in protection against rodents, because even one visit by a fox, mink, racoon, bobcat, or skunk can be very costly in birds killed. Enclosed flight pens, if properly constructed, should do the job. However, the mesh ordinarily will not exclude weasels or snakes and certainly not rats and mice.

Damage to birds can result from fright if a predator outside the wire panics them, even if no entrance is made for direct killing. Therefore, some reduction of predators in the surrounding area may be necessary.

Skunks seem to be everywhere and are an important nuisance. In attacking bird flocks, skunks usually kill only one victim, and the predator can usually be identified by its clumsy mauling of the bird.

Opossums also maul their victims and also do a messy job of smashing eggs in pens if they get at them.

Weasels are very neat killers, usually biting the bird through the skull, the back of the neck, or under the wing. They don't stop with one, though; they may kill many birds in one night and place them in a neat pile.

Rats, too, are ruthless killers and, like the weasel, often pile their victims in a corner. They usually kill by slitting the bird's throat and are very slick at not disturbing the entire flock. Rats usually eat more from the carcass than do weasels, often pulling the bird partly into their burrows. Young birds and eggs will disappear completely.

Foxes don't usually kill a great number of birds at one time, and they carry off their victims.

Raccoons eat the heads off as many birds as possible, and they are persistent. Raccoons are clever, very strong, and excellent hunters.

Feral (wild) dogs and cats are a menace to any ground-dwelling wild birds. The cats are more likely to be a problem if there is sufficient heavy cover in which they can hide.

For all these predators, if control is deemed necessary, the selective method is shooting. Trapping with steel traps is effective if it can be done without endangering bird dogs or other nontarget animals, and if the operator has the right trap and knows how to use them. In many cases, a live trap is easier for an inexperienced trapper to use, and it is safer. Animals accidentally caught can be released unharmed.

Processing Game Birds

The procedures used to process fowl can be modified and used for most game birds. The size of equipment and degree of mechanization will depend upon the number of birds to be processed. Following is a procedure for processing game birds:

Slaughter

Hang the bird by its feet on the killing rack, sever the jugular vein behind the lower jaw, and allow the blood to drain. This method removes from 34 to 50 percent of the total blood of the body.

Picking

To remove the feathers, immerse the bird for 60 to 90 seconds in water heated to subscalding about 140 °F (60 °C). Test ease of feather removal by pulling a few tail or wing feathers. Remove feathers by hand or machine immediately after subscalding. A tub-type of picking machine equipped with rubber fingers on the side and bottom of the drum is preferred over the reel type of picker that requires the operator to hold each bird when removing the feathers. After the feathers are removed, scrub the carcass thoroughly to remove soiled areas and also to reduce the number of surface microorganisms.

Evisceration

Remove feet at the hock joint. Remove the oil gland on the tail: start 1 inch (2.5 cm) forward of the gland, then cut to the end of the tail. Cut the head off. Split the neck skin, starting from the shoulders and going to the end of the neck, and pull skin from the neck. Remove the trachea (windpipe) and esophagus (gullet) with the crop, and cut off the neck. Cut around the vent and gently pull until a few inches of the intestines are out. About half-way between the tip of the breast and vent make a crosswise cut about 3 inches (7.6 cm) long. Pull the vent and intestine through the cut and remove the viscera. Remove the heart, liver, and gizzard (giblets) and place them in a clean container for further processing. Remove all other organs, especially the lungs, making sure the body cavity is clean.

Packaging

Wash the carcass and giblets thoroughly. Chill in ice water kept at 40 °F (4 °C) for several hours. Remove from the water and drain. Place giblets in a small plastic bag, or wrap them in wax paper and place them inside the carcass. Tuck the legs of the carcass under the strip of skin left by the crosswise cut below the breast. Place the carcass in a plastic bag, draw out as much air as possible, and tie the bag with a wire tie. Air can be forced out of the plastic bag with a vacuum pump or by submerging the bag in water until it covers the carcass without entering the bag.

The dressed bird can be placed in containers and covered with crushed ice or dry-packed with CO_2 snow (dry ice) for shipment to market. *(Caution: Do not handle dry ice with your bare hands; it freezes the skin quickly.)*

Meat Quality

The quality of game bird meat may mean different things to different people. The present-day consumer judges quality on the basis of tenderness, moisture, and flavor. The old method of developing a "gamey" taste in game birds was to allow the bird to hang with feathers and viscera intact for several days. Federal and state regulations no longer permit birds to be "aged" in this manner, if the operation comes under the conditions where inspection is required.

Two factors affecting the quality of game bird meat are scalding and aging temperatures. The freshly cleaned carcass should be placed for several hours in slush ice (for chilling) and refrigerated. Aging time for adequate tenderization of the meat should be about 18 to 24 hours. Thereafter, the meat can be cooked or frozen.

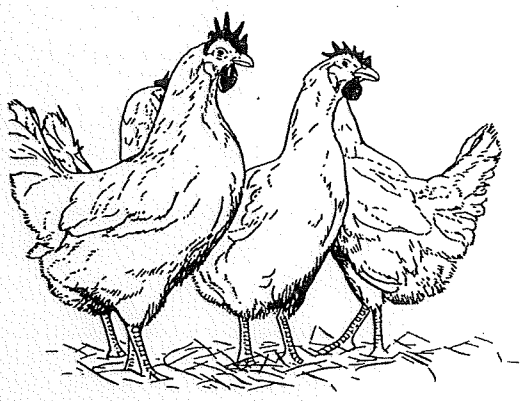
Spoilage

The processor must produce a wholesome product through proper handling and storage. Spoilage of game bird meat is due mainly to the development of microorganisms. Only a few species of psychrophilic (cold-loving) organisms cause spoilage in the meat. Freshly killed poultry contains approximately 1 to 10,000 microorganisms per square centimeter (1 square inch = 6.45 square cm). Spoilage in poultry usually occurs when the number of bacteria reaches 1 to 10 million per square centimeter. The first sign of spoilage is off-odor. Certain organisms also cause flavor changes as their numbers exceed the safe level. To help sanitize processing plants, some processors use chlorinated water to clean equipment and chill the birds.

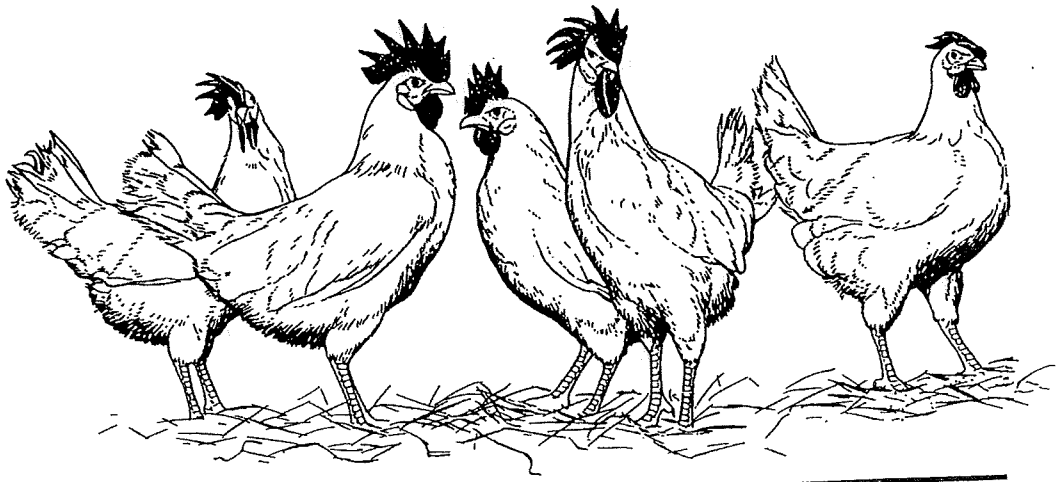
Laws

Laws regulating the processing and sale of game bird meats differ among states. Therefore, you should check with your State Department of Agriculture (food inspection) and local agencies for requirements on the processing of game bird meats.

Acknowledgments: Allen E. Woodard, Specialist, Department of Avian Sciences, University of California, Davis (UC Davis); Ralph A. Ernst, Poultry Specialist, Cooperative Extension, UC Davis; Pran Vohra, Professor, Department of Animal Sciences, UC Davis; Lewis Nelson, Jr., Associate Professor, Department of Wildlife Resources, University of Idaho, Moscow, formerly Wildlife Specialist, Cooperative Extension, UC Davis; and Fred C. Price, Farm Advisor, Stanislaus County



Eggcyclopedia



Partnership For Food Safety Education

Composed of government agencies, organizations such as American Egg Board, and other nonprofit groups, the Partnership works to educate consumers on the proper handling of foods to prevent foodborne illness.

www.befoodsafe.org
www.fightbac.org
www.befoodsafe.gov

The Be Food Safe and Fight Bac! programs of the Partnership are based on four simple steps:

Clean

Wash hands and surfaces often.

Separate

Don't cross-contaminate.

Cook

Cook to proper temperatures.

Chill

Refrigerate promptly.

– *See Cooking Methods, Doneness Guidelines, Egg Safety, Fight BAC!, Raw Eggs, Salmonella*

Pasteurized Eggs

Eggs that have been exposed to heat in order to destroy potential bacteria. Due to the heat process, pasteurized eggs may have slightly lower amounts of heat-sensitive vitamins, such as riboflavin, thiamin and folic acid.

Along with updating recipes to cook them properly -- using pasteurized egg products and shell eggs is an option for safely preparing recipes calling for raw or undercooked eggs. Although the rate of egg contamination with Salmonella bacteria is only about 1 in 20,000 eggs, it's best to choose one of these options when you make raw or only partially cooked recipes – especially when you serve the very young, the elderly, pregnant women or anyone whose immune system is impaired.

Pasteurized shell eggs are especially suitable for preparing egg recipes that aren't fully cooked, but you can also use them for other recipes, too, including baked goods. The heating process may create cloudiness in the whites and increase the time you need to beat the whites for foam formation. Allow up to about four times as much time for full foam formation to occur in pasteurized egg whites as you would for the whites of regular eggs. Prepare other recipes as usual.

Pasteurized shell eggs must be kept refrigerated. You can store them for at least 30 days from the pack date.

Pasture-Fed Hens

– *See Free-Range Eggs*

Pavlova

– *See Hard or Swiss Meringue*

Peeling

Removing the shell and membranes from a hard-boiled egg.

Opinion among researchers is divided as to whether or not salt in the cooking water helps make hard-boiled eggs easier to peel. Some research indicates that a 1 to 10% salt level (2 to 4 tablespoons per gallon of water) makes unoiled eggs easier to peel, but peelability of oiled eggs is not significantly affected. About 90% of the eggs available at retail are unoiled.

A nicely centered yolk makes very attractive deviled eggs and garnishes. However, as an egg ages, the white thins out which gives the yolk more opportunity to move about freely. This can result in a displaced yolk when you cook the egg. Using the freshest eggs possible will minimize this displacement, but very fresh eggs are more difficult to peel after hard boiling. The air cell that forms between the shell membranes as the egg ages helps to separate shell from egg but, in very fresh eggs, the air cell is still small. The best compromise for attractive eggs with centered yolks that are relatively easy to peel seems to be using eggs that have been

refrigerated for about a week to 10 days. Some new research suggests that yolk centering may be better if you store eggs small-end up for 24 hours before hard-boiling.

Immediately after cooking, thoroughly cool eggs in a bowl of ice or under running cold water; five minutes isn't too long. Peel the eggs right after cooling for immediate use or refrigerate them in the shell in the carton for use within one week. To peel an egg, crackle the shell all over by gently tapping the egg on a table or countertop. Roll the egg between your hands to loosen the shell. Then peel off the shell, starting at the large end. Hold the egg under running water or dip it in water to make peeling easier.

– See Air Cell; Composition; Cooking Equipment, Piercer; Cooking Methods, Hard-Boiled

Pet Food

Eggs are often an important part of prepared pet-food formulas. Some pet owners also feed eggs to their pets as treats or prepare homecooked pet food using eggs.

Pickled Eggs

Hard-boiled eggs marinated in vinegar and pickling spices, spicy cider, or juice from pickles or pickled beets.

Unopened containers of commercially pickled eggs keep for several months on the shelf (see specific product for details). After opening, keep refrigerated and use within seven days. Home-prepared pickled eggs must be kept refrigerated and used within seven days. Home canning of pickled eggs is not recommended. Although the acidity of the pickling solution is usually sufficient to prevent the growth of bacteria, it eventually causes the eggs to disintegrate.

– See Cooking Methods, Hard-Boiled; Peeling

Poached Eggs

– See Cooking Methods, Poached

Popovers

An egg-rich, hollow bread baked in small cups or pans. A very hot oven creates the steam inside the batter that pops the individual breads to magnificent heights.

Pot de Crème

– See Custard-Baked

Preservation

Refrigeration, drying or freezing are the best ways to preserve egg quality. Fresh eggs are so readily available that long storage periods are rarely necessary. However, centuries before modern methods of egg production, transportation and refrigeration became known, people did their ingenious best to preserve the egg intact.

The ancient Chinese stored eggs up to several years by immersion in a variety of such imaginative mixtures as salt and wet clay; cooked rice, salt and lime; or salt and wood ashes mixed with a tea infusion. Although the Chinese ate them with no ill effects of which we are aware, the eggs thus treated bore little similarity to fresh eggs, some exhibiting greenish-gray yolks and albumen resembling brown jelly.

Immersion in different liquids too numerous to mention was explored, lime water being a favorite in the 18th century. During the early 20th century, water glass was used with considerable success. Water glass, a bacteria-resistant solution of sodium silicate, discouraged the entrance of spoilage organisms and evaporation of water from eggs. It didn't penetrate the eggshell, imparted no odor or taste to the eggs and was considered to have somewhat antiseptic properties. However, it did a rather poor job at relatively high storage temperatures. Eggs preserved in a water-glass solution and stored in a cool place keep 8 to 9 months.

Dry packing in various substances ranging from bran to wood ashes was used occasionally, but costs of transporting the excess weight of the packing material far exceeded the dubious advantages.

In an attempt to seal the shell pores to prevent loss of moisture and carbon dioxide, a great variety of materials including cactus juice, soap and shellac were investigated with varying degrees of success. The only coating considered fairly efficient was oil, which still is used occasionally today. Thermostabilization, immersion of the egg for a short time in boiling water to coagulate a thin film of albumen immediately beneath the shell membrane, was rather extensively practiced by housewives of the late 19th century. Mild heating

destroyed spoilage organisms but didn't cook the eggs. If kept in a cool place, thermostabilized eggs coated with oil keep several months, although some mold growth may take place.

During the first half of the 20th century, storing eggs in refrigerated warehouses was a common practice. Preservation was later improved with the introduction of carbon dioxide into the cold storage atmosphere. Today, very few, if any, cold storage eggs find their way to the retail market.

– See Cold Storage, Oiling

Price Per Pound

An easy way to compare the price of eggs with other protein foods.

– See Buying

Profiteroles

–See Cream Puffs

Production

Egg Production during the year ending November 30, 2011 totaled 91.9 billion eggs, up slightly from 2010. Table egg production, at 79.0 billion eggs, was up 1 percent from the previous year.

Breeds

Maximum production of top-quality eggs starts with a closely controlled breeding program emphasizing favorable genetic factors. The Single-Comb White Leghorn hen dominates today's egg industry. This breed reaches maturity early, utilizes its feed efficiently, has a relatively small body size, adapts well to different climates and produces a relatively large number of whiteshelled eggs, the color preferred by most consumers. Brown-shelled eggs are now available in most markets, but have long been the traditional favorite in the New England region. Commercial brown-egg layers are hens derived from the Rhode Island Red, New Hampshire and Plymouth Rock breeds which predominated in that area of the country.

– See Color, shell

Resistance to Disease

Selective breeding is reinforced by good sanitation and vaccination.

Environment

Light Control

Of primary importance during both the growing and laying periods, controlled, low-intensity light can be used in house systems to delay sexual maturity until the bird's body is big enough to produce larger eggs. Intensity and duration of light can be adjusted to regulate production.

Temperature

Laying houses maintained between 57° and 79°F (14° and 26°C) are desirable.

Humidity

A relative humidity between 40 and 60% is optimal.

Housing Systems

America's egg farmers are committed to producing a fresh, high-quality product and therefore are committed to the health and well-being of their hens. Housing systems today vary, but all ensure the hens are provided with adequate space, nutritious feed, clean water, light and fresh air. America's egg farmers produce eggs from multiple production systems – conventional, cage-free, free-range, and enriched colony. All organic systems are free-range.

Conventional: Eggs laid by hens living in cages with access to feed, water, and security. The cages serve as nesting space as well as for production efficiency. In this type of hen house, the birds are more readily protected from the elements, from disease and from natural and unnatural predators.

Cage-free: Eggs laid by hens at indoor floor operations, sometimes called free-roaming. The hens may roam in a building, room or open area, usually in a barn or poultry house, and have unlimited access to fresh food and

water, while some may also forage for food if they are allowed outdoors. Cage-free systems vary and include barn-raised and free-range hens, both of which have shelter that helps protect against predators. Both types are produced under common handling and care practices, which provide floor space, nest space and perches. Depending on the farm, these housing systems may or may not have an automated egg collection system.

Free-range: Eggs produced by hens that have access to outdoors in accordance with weather, environmental or state laws. In addition to consuming a diet of grains, these hens may forage for wild plants and insects and are sometimes called pasture-fed hens. They are provided floor space, nesting space and perches.

Organic: Eggs produced according to national U.S. Department of Agriculture organic standards related to methods, practices and substances used in producing and handling crops, livestock and processed agricultural products Organic eggs are produced by hens fed rations having ingredients that were grown without most conventional pesticides, fungicides, herbicides or commercial fertilizers.

Enriched Colony: A production system that contains adequate environmental enrichments to provide perch space, dust bathing or a scratch area(s), and nest space to allow the layers to exhibit inherent behavior. Enriched colony systems are American Humane Certified.

Feed

Since more is known about the nutritional requirements of the chicken than of any other domestic animal, feed rations are scientifically balanced to assure layer health along with optimum quality eggs at least cost. Automatic feeders, activated by a time clock, move feed through troughs that allow for feeding ad libitum. Birds are also provided water at all times via nipple valves separate from the feed troughs.

Poultry rations are designed to contain all the protein, energy (carbohydrates), vitamins, minerals, and other nutrients required for proper growth egg production, and health of the layer hen. Feed might be based on sorghum, grains, corn, cottonseed meal or soybean meal, depending on the part of the country in which the ration is produced and which ingredient is most available and cost effective. The hen's ration may contain the same types of additives approved for human food. Antioxidants or mold inhibitors (also used in mayonnaise and bread) are added to maintain the quality of the feed. An additive is not approved for use in poultry feed unless adequate research has been undertaken to determine its pharmacological properties and possible toxicity and to discover any potentially harmful effects on animals.

Federal regulations prohibit the feeding of hormones to any kind of poultry in the U.S. Antibiotics are only rarely used when chickens are ill, at which time they seldom lay eggs. If antibiotics are used, FDA regulations require a withdrawal period for laying hens to ensure eggs are free of antibiotics.

How much a layer eats depends upon the stage of life, the hen's size, the rate of egg production, temperature in the laying house and the energy level of the feed. In general, about 4 pounds of feed are required to produce a dozen eggs. A Leghorn chicken eats about 1/4 pound of feed per day. Layers of brown-shelled eggs are slightly larger and require more feed. The type of feed affects egg quality. Shell strength, for example, is determined by the presence and amounts of vitamin D, calcium and other minerals in the feed. Too little vitamin A can result in blood spots. Yolk color is influenced by yellow-orange plant pigments in the feed. Maximum egg size requires an adequate amount of protein and essential fatty acids.

Flock Management

Molting, or loss of feathers, is a natural occurrence common to all birds regardless of species. In the wild, egg quality declines as the hen ages and, at about 18 to 20 months of age, molting occurs and egg production ceases. In conventional egg production, a fairly common practice is to place the flock into a controlled molt. A low-protein diet minimizes stress on the birds as they go through this transition period. After a rest period of 4 to 8 weeks, the birds start producing eggs again. Researchers have found that two periods of controlled molting, one at 14 months and another at 22 months, increases egg production more than one molt at 18 or 20 months, though few egg farmers place flocks into two controlled molts. Controlled molting is not permitted in organic flocks, though natural mottling can occur.

Egg Handling

In most commercial egg production facilities, automated belts gather eggs every day. Gathered eggs are moved into refrigerated holding rooms where temperatures are maintained between 40° and 45°F (4° and 7°C).
– *See Cleaning*

Egg Processing and Distribution

Some producers sell their eggs nest-run (ungraded) to processing firms which clean, grade, size and carton the eggs and ship them off to retail outlets. Most farms and ranches carry out the entire operation.

– See Egg Products, Egg Products Inspection Act, Grading, Nest-Run Eggs

Protein

A combination of amino acids, some of which are called essential, meaning the human body needs them from the diet because it can't synthesize them. Adequate dietary protein intake must include all the essential amino acids your body needs daily. The egg boasts them all: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. These amino acids are present in a pattern that matches very closely the pattern the human body needs, so the egg is often the measuring stick by which other protein foods are measured. In addition to the nine essential amino acids, there are nine other amino acids in an egg.

Many different ways to measure protein quality have been developed. According to the Protein Digestibility Corrected Amino Acid Score (PDCAAS), whole egg, whey protein, casein and soy-protein concentrate all score 1 on a scale of 0 to 1. Whole egg exceeds all other protein foods tested with a score of 1.21 (above human needs) in the Amino Acid Score (AAS) rating system. At 3.8, the Protein Efficiency Ratio (PER) of eggs also outscores other proteins. When Nitrogen Protein Utilization (NPU) is evaluated, whole egg at 98% falls just below whey protein and casein (both at 99%). On a scale with 100 representing top efficiency, the Biological Value (BV) of eggs is rated between 88 and 100, with only whey protein rated higher (100).

Altogether each large egg provides a total of 6.29 grams of high-quality, complete protein. For this reason, eggs are classified with meat in the Protein Foods Group. One egg of any size equals one ounce of lean meat, poultry, fish or seafood. In addition to about 12.6% of the Daily Reference Value (DRV) for protein, a large egg provides varying amounts of many other nutrients, too.

– See Biological Value, Buying, Daily Reference Values (DRVs), Food Guide Pyramid, Meat Replacement, Nutrient, Density

Pullet

A young female chicken less than 1 year old. For egg layers, a pullet is a young female before she reaches sexual maturity and starts laying eggs, around 17-18 weeks.

Quiche

An unsweetened, open-faced custard pie, served hot or cold as a main dish, appetizer or snack. A quiche requires only a few ingredients: eggs, milk, seasonings and whatever else you might want to add in the way of flavoring, such as shredded cheese or chopped cooked vegetables, meat, poultry, fish or seafood. You can make a familysized quiche in a regular pie plate or in a quiche dish. Custard cups make handy holders for individual quiches. A traditional quiche is made in a pastry crust. For less fat, you can also make a crust out of cooked rice or cereal, bread or cracker crumbs, mashed beans or potatoes, or chopped spinach. You can line custard cups with bread for toast cups or use won ton wrappers or tortillas in place of pastry. Visit www.IncredibleEgg.org for quiche recipes.

– See Cooking Equipment, Custard Cups, Quiche Dish

Quiche Lorraine

A classic quiche flavored with bacon and Swiss cheese. Frenchmen claim that this savory custard pie originated in the province of Lorraine, but Germans insist it's a creation from Alsace.

Raw Eggs

Since raw eggs may contain the bacteria Salmonella enteritidis, it's recommended that you don't consume raw or undercooked eggs. Salmonella may be found inside the egg, most likely in the white, so it's necessary to properly cook all eggs and egg dishes before eating. For safety, many recipes that contain raw or undercooked eggs can be revised with a cooking step. Pasteurized shell eggs or pasteurized egg products are also safe alternatives to use in these recipes.

– See Cooking Methods, Doneness Guidelines, Products, Egg Safety, Fight BAC!, Partnership for Food Safety Education, Pasteurized Eggs, Salmonella

Recommended Daily Allowances

A term used to denote nutrient recommendations for 26 nutrients for 18 different population subgroups. RDAs are based on information on nutrient allowances for healthy people from the National Research Council of the National Academy of Sciences. In 2005, a broader set of dietary reference values, known as the Dietary Reference Intakes (DRIs) replaced the RDA and RNIs intended to help individuals optimize their health and prevent disease. This information is revised about every five years and is used to determine the Daily Value and Reference Daily Intake figures used on food labels.

Reference Daily Intakes

A term that replaced the U.S. Recommended Daily Allowances (U.S. RDAs). RDIs are based on a population-weighted average of the latest RDAs for vitamins and minerals for healthy Americans over 4 years old. RDIs are not recommended daily intake figures for any particular age group or sex. They are simply average values for the entire U.S. population. For vitamins and minerals, RDIs are: – See Daily Reference Values (DRVs), Daily Values (DVs), Recommended Dietary Allowances (RDAs), U.S. Recommended Daily Allowances (U.S. RDAs)

Vitamin and Mineral Reference Daily Intakes (RDIs)

Vitamins		Minerals	
A*	5000 IU	Calcium*	1000 mg
C*	60 mg	Iron*	18 mg
D	400 IU	Phosphorus	1000 mg
E	30 IU	Iodine	150 mcg
K	80 mcg	Magnesium	400 mg
Thiamin (B1)	1.5 mg	Zinc	15 mg
Riboflavin (B2)	1.7 mg	Selenium	70 mcg
Niacin	20 mg	Copper	2 mg
B6	2 mg	Manganese	2 mg
Folate	400 mcg	Chromium	120 mcg
B12	6 mcg	Molybdenum	75 mcg
Biotin	300 mcg	Chloride	3400 mg
Pantothenic Acid	10 mg		

Listing the percentage of RDI for this nutrient is mandatory on food labels. Listing the percentage of RDI for other nutrients on food labels is optional. Source: http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/FoodLabelingGuide/ucm064928.htm#.T3SOqywnUM4.email

Remoulade

Classic French mayonnaise-based sauce with mustard, capers, chopped gherkin pickles, herbs and anchovies. *– See Mayonnaise*

Restricted Eggs

Ungraded eggs, specifically checks, dirties, incubator rejects, inedibles, leakers and loss eggs.

Checks have a broken shell or a crack in the shell, but the shell membranes are intact so that the egg contents don't leak.

Dirties may have adhering dirt, prominent or conspicuous stains, or moderate stains covering more than one-fourth of the shell surface.

Incubator rejects have been subjected to the incubation process for a period of time. Inedibles are moldy, musty or sour or exhibit rot, blood rings, green whites, stuck yolks or embryo chicks.

Leakers have a crack or break in both shell and shell membranes so that the contents are leaking.

Loss eggs are leakers, inedibles and any eggs that have been cooked, frozen or contaminated.

The Egg Products Inspection Act (EPIA) controls the disposition of restricted eggs to prevent them from getting into consumer channels.

Checks and dirties may be sent to U.S. Department of Agriculture (USDA) -inspected egg-products plants where they can be handled and processed properly. They can't be sold in the shell to restaurants, bakeries, food manufacturers or consumers unless such sales are specifically exempted by section 15 of the Act and not prohibited by state law. All other restricted eggs must be disposed of according to approved procedures.

Roasted Egg

An egg which appears on the Jewish Passover plate as part of the ritual. The egg is hard-boiled, then roasted in the oven until the shell becomes brown.

Sabayon Sauce

– See Zabaglione

Salmonella

One of several types of bacteria which can cause foodborne illness (salmonellosis) if ingested in large numbers. The Salmonella group of bacteria can be found in the intestinal tract of animals, birds, insects, reptiles, fish, seafood and people. Salmonella can be passed to humans through the consumption of contaminated foods that have been in contact with unwashed hands, raw meat or poultry, eggs, seafood, milk, or by coming in contact with contaminated animal feces. It was once thought that inside of the chicken egg was sterile, the shell protecting the contents from any kind of contamination. Dr. St. Louis and colleagues discovered in the late 1980's that a bacteria, Salmonella Enteritidis, could indeed get inside the egg through the hens reproductive tract. Since this discovery, researchers, egg producers, and government agencies have worked hard to implement and maintain practices to ensure that the hen does not have the ability to shed SE into the egg. The chance of an egg becoming infected with SE is very low. If it is present in the egg, producers can control the growth through refrigeration and kill it with processes like pasteurization. SE will not grow at temperatures below 40°F (4°C) and is killed at 160°F (71°C). Temperatures between 40°F (4°C) and 140°F (60°C), known as the danger zone, are ideal for rapid growth. Eggs are required to be refrigerated at or below 45°F (7°C) no later than 36 hours after being laid.

The majority of salmonellosis outbreaks have been attributed to foods other than eggs – nuts, vegetables, chickens, beef and fish – and through cross contamination of utensils and other foods used during preparation. Of the outbreaks involving eggs, most have occurred in foodservice operations and have been the result of inadequate refrigeration and insufficient cooking. You can avoid illness from SE through adequate refrigeration, proper cooking and sanitary kitchen and food handling procedures.

– See Buying, Cooking Methods, Doneness Guidelines, Egg Safety, Fight BAC!, Partnership for Food Safety Education, Raw Eggs, Storing

Saturated Fat

– See Fat

Sauces

In addition to the primary function of thickening sauces, eggs enrich flavor, add color and increase nutritive value.

You can use a milk or cream sauce thickened with eggs to bind casseroles and meatloaves or serve a sweetened egg-thickened sauce with a dessert.

Butter sauces are emulsions of butter and other liquids. When heated, the egg both thickens and strengthens the emulsion. Hollandaise is the best known sauce of this type.

Other egg sauces include those in which chopped hard-boiled eggs are an ingredient.

– See Custard, Stirred; Hollandaise Sauce

Schaum Torte

– See Hard or Swiss Meringue

Scotch Eggs

Hard-boiled eggs coated with sausage, breaded and deep-fried.

Scrambled Eggs

– See Cooking Methods, Scrambled

Serving Sizes

A serving of an individual food is defined by U.S. Department of Agriculture (USDA) for dietary guidance and by FDA for food labels. One egg equals one serving.

– See My Plate

Shell

The egg's outer covering, accounting for about 9 to 12% of its total weight, depending on the egg size. The shell is the egg's first line of defense against bacterial contamination.

The shell is largely composed of calcium carbonate (about 94%) with small amounts of magnesium carbonate, calcium phosphate and other organic matter, including protein.

Shell strength is greatly influenced by the minerals and vitamins in the hen's diet, particularly calcium, phosphorus, manganese and vitamin D. If the diet is deficient in calcium, for instance, the hen will produce a thin or softshelled egg or possibly an egg with no shell. Occasionally an egg may be prematurely expelled from the uterus due to injury or excitement. In this case, the shell has not had time to be completely formed. Shell thickness is also related to egg size which, in turn, is related to the hen's age. As the hen ages, egg size increases. The same amount of shell material which covers a smaller egg must be stretched to cover a larger one, hence the shell is thinner.

Seven to 17 thousand tiny pores are distributed over the shell surface, a greater number at the large end. As the egg ages, these tiny holes permit moisture and carbon dioxide to move out and air to move in to form the air cell. The shell is covered with a protective coating called the cuticle or bloom. By blocking the pores, the cuticle helps to preserve freshness and prevent microbial contamination of the contents. Egg shell uses vary from the thrifty, such as compost, to the creative, as in decorated eggs.

– See Air Cell; Bloom; Color, Shell; Composition; Decorating Eggs; Formation; Oiling

Shirred Eggs

– See Cooking Methods-Baked

Size

Several factors influence the size of an egg. The major factor is the age of the hen. As the hen ages, her eggs increase in size. The breed of hen from which the egg comes is a second factor. Weight of the bird is another. Pullets significantly underweight at sexual maturity will produce small eggs. Environmental factors that lower egg weights are heat, stress, overcrowding and poor nutrition. All of these variables are of great importance to the egg producer. Even a slight shift in egg weight influences size classification and size is one of the factors considered when eggs are priced. Careful flock management benefits both the hens and the producer.

– See Buying, Grading, Production, Treatment of Hens

Size Equivalent

Although you can use any size egg for frying, scrambling, hard-boiling or poaching, most recipes for baked items such as custards and cakes are based on the use of large eggs.

– See Buying

Egg Size Substitution

Large	Jumbo	X-Large	Medium	Small
1	1	1	1	1
2	2	2	2	3
3	2	3	3	4
4	3	4	5	5
5	4	4	6	7
6	5	5	7	8

Source: American Egg Board

Number of eggs equivalent to 1 cup.

Egg Size	Whole	Whites	Yolks
Jumbo	4	5	11
X-Large	4	6	12
Large	5	7	14
Medium	5	8	16
Small	6	9	18

Source: American Egg Board

Snow Eggs

– See Meringue-Poached Meringues

Soufflé

A puffy, delicate, light-as-air creation. Savory or sweet, hot or cold, soufflés are sensational and impressive whether served as a main dish, accompaniment or dessert.

Strictly speaking, a true soufflé consists of a thick white sauce blended with beaten egg yolks and leavened by stiffly beaten whites. It may also contain pureéd, shredded or finely chopped meat, poultry, fish, seafood, cheese or vegetables, and is always served hot. You can substitute a condensed cream soup or quick-cooking tapioca cooked in milk for the white sauce. For sweet or dessert soufflés, you can add sugar to the sauce.

Like many skills, making a successful soufflé is easy when you know how. A mastery of the following basics will have you turning out soufflés with the best of them.

If you don't have a traditional soufflé dish, use a straight-sided casserole dish or even a straight–sided uncoated saucepan of the proper size. For individual servings, you can use large custard cups or ovenproof coffee or soup mugs. As it bakes, the soufflé will increase in volume 2 to 3 times, so container size is important. If the container is too large, the mixture will not rise above the rim and have the lofty look that is part of a soufflé's charm. If the container is too small, the mixture may run over. Usually a 4-egg soufflé will fit a 1 1/2- to 2-quart container. Use a 2- to 2 1/2-quart container for a 6-egg soufflé. You can fill the container to within 1/2-inch of the top.

A soufflé needs to cling to the sides of the container to reach its maximum height. So, don't butter the container unless you also lightly dust the buttered bottom and sides of the container with grated Parmesan cheese, cornmeal or very fine, dry bread crumbs, which will lend flavor and a nice crusty texture. For dessert soufflés, you can dust with sugar, finely chopped nuts or cookie crumbs, if you like.

If your container is a tad too small or your beating and folding skills are exceptional, you can fit a collar around the top of the container to keep the soufflé in bounds. Make a 4-inch band of triple-thickness aluminum foil long enough to go around the container and overlap 2 inches. Butter and dust the band. Wrap the band around the outside of the dish with the dusted side in and fasten it with strong masking tape or string. The collar should extend at least 2 inches above the rim of the container.

– See Cooking Terms, add cream of tartar, gently folded, separated, stiff but not dry

Soufflé, Cold

A term loosely applied to a number of airy egg dishes with a texture closely resembling a soufflé. For the purist, however, cold soufflés are more accurately known as snows or sponges, chiffons or Bavarians. Snows or sponges are clear gels plus egg whites. To make one, you add unbeaten egg whites to a partially-set basic gelatin mixture and beat until soft peaks form. Then chill until firm. Chiffons consist of beaten egg whites added to custard gels. For the custard base, you cook egg yolks with gelatin. Then fold in stiffly beaten egg whites and chill the mixture. You can enjoy a chiffon as is or use it for a pie filling. Bavarians are custard gels you make with egg yolks, then add both beaten egg whites and whipped cream. These recipes are usually made with raw whites and/or yolks, but some can be cooked. – See Doneness Guidelines, Cooking Yolks and Whites for Recipes, Egg Safety, Partnership for Food Safety Education, Raw Eggs, Salmonella

Sponge Cake

An airy foam cake similar to angel food cake, except that sponge cake may be made with egg yolks or with whole eggs. True sponge cakes contain no fat or leavening agent other than eggs.

– See Angel Food Cake, Foams

Storing

The refrigerator is where you should store your eggs. It's best to place the eggs on an inside shelf. Repeated opening and closing of the door causes temperature fluctuations and slamming can result in breakage. The carton in which you purchase them helps keep the eggs from picking up odors and flavors from other foods and helps prevent moisture loss.

You can keep fresh, uncooked eggs in the shell refrigerated in their cartons for at least four to five weeks beyond the pack date or about three weeks after you bring them home. Properly handled and stored, eggs rarely spoil. If you keep them long enough, they are more likely to simply dry up. But don't leave eggs out. They'll age more in one day at room temperature than they will in one week in the refrigerator.

As soon as you've cooled them, refrigerate hard-boiled eggs in their shells and use them within one week. When storing hard-boiled eggs, you may notice a gassy odor in your refrigerator. It may be more noticeable when you open the refrigerator infrequently. The odor is caused by hydrogen sulfide, which forms when the eggs are cooked, is harmless and usually dissipates within a few hours.

Egg Storage Chart

Product	Refrigerator	Freezer
Raw eggs in shell	3 to 5 weeks	Do not freeze.
Raw egg whites	Up to 4 days	12 months
Raw egg yolks	Up to 4 days	Yolks alone do not freeze well. – See Freezing Eggs
Hard-boiled eggs	1 week	Do not freeze.
Egg substitutes, liquid		
Unopened	10 days	Do not freeze.
Opened	3 days	Do not freeze.
Egg substitutes, frozen		
Unopened	After thawing, 7 days, or refer to "Use-By" date on carton.	12 months
Opened	After thawing, 3 days, or refer to "Use-By" date on carton.	Do not freeze.
Casseroles made with eggs	3 to 4 days	After baking, 2 to 3 months.
Eggnog, commercial	3 to 5 days	6 months
Eggnog, homemade	2 to 4 days	Do not freeze.
Pies, pumpkin or pecan	3 to 4 days	After baking, 1 to 2 months.
Pies, custard and chiffon	3 to 4 days	Do not freeze.
Quiche with any kind of filling	3 to 4 days	After baking, 1 to 2 months.

Source: U.S. Department of Agriculture (USDA)

For outdoor eating occasions, you can keep eggs refrigerator-cold with ice or commercial coolant in an insulated bag or picnic cooler as long as the ice lasts or the coolant remains almost at freezing. Unless it's quite cold weather, for hiking, backpacking, camping and boating, when refrigeration or cooler facilities aren't available, use dried eggs which are usually available in sporting goods stores. You can reconstitute dried eggs with purified water and use them in most of the ways you would use fresh eggs. Pickling and other forms of preservation are additional possibilities.

Refrigerate leftover egg whites in a covered container for up to four days. Store leftover yolks in water in a covered container in the refrigerator and use them in a day or two. If you can't use the yolks quickly enough, hard boil them. If you find yourself with more eggs than you will use in several weeks, freeze them.

– See Egg Products, Freezing, Leftover Egg Parts, Pickled Eggs, Preservation

Strata

A custard mixture poured over layers of bread, cheese and sometimes additional ingredients, and baked. The strata casserole was created to use up stale bread.

Stuffed Eggs

– See Deviled Eggs

Syneresis

– See Curdling

Tartar Sauce

A mayonnaise-based sauce with chopped pickles, onion, traditionally served with fried fish.

Tempering

The technique used to blend uncooked eggs into hot mixtures. To temper, beat eggs and stir in a little of the hot mixture to warm (temper) the eggs. Then stir the warmed eggs into the remaining hot mixture. Tempering helps to prevent the eggs from curdling.

– *See Curdling*

Thickener

– *See Cooking Functions, Sauces*

Thousand Island Dressing

A mayonnaise-based with chili sauce, chopped pickles, onions, hard-boiled egg, green olives, green pepper.

– *See Mayonnaise*

Thousand-Year-Old Eggs

– *See Preservation*

Tortilla

Spanish term for a frittata.

– *See Frittata*

Treatment of Hens

Laying hens represent an egg producer's living and are treated with care. Like humans, hens seem to be more productive when they're healthy. In 1945, the average hen laid 151 eggs per year. Now as a result of breeding and better nutrition, housing and general management of facilities, the average hen lays between 250 and 300 eggs per year. America's egg farmers believe in consumer choice. Hens are raised and lay their eggs in a multitude of housi

ng systems subject to consumer's demand. No matter the system used, farmers are committed to the health and well-being of their hens. Without deference to the manner in which the eggs are produced, America's egg farmers follow guidelines to ensure the hens are provided with adequate space, nutritious feed, clean water, light, and fresh air.

The farming practices range from cage systems, cage-free, free-range, to organic systems. Proper lighting, housing, and diets are critical to the production process to ensure highquality egg production. Scientifically balanced feed insures that the birds are protected from improper or inadequate diets – a vast improvement over the days when hens foraged for food in barnyards or ate household scraps.

Chickens, like some other animals, may exhibit cannibalistic tendencies. To protect the birds from each other, part of their upper beaks or both lower and upper beaks are trimmed. The trimming process is done by a special machine which cauterizes the beak and may be compared to clipping a dog's claws. The birds are still able to eat and drink.

– *See Beak Trimming, Production*

Unsaturated Fat

– *See Fat*

Uses, Other

Beyond the culinary assets of eggs, numerous individual egg properties benefit mankind and other animals throughout a wide range of technologies:

Cosmetics

Egg white has long been used as a facial. Egg yolks are used in shampoos and conditioners and, sometimes, soaps. Cholesterol, lecithin and some of the egg's fatty acids are used in skin care products, such as revitalizers, make-up foundations and even lipstick.

Animal Feed

The excellent nutrition of eggs enhances various pet foods. Egg white is used as a protein reference in feeding laboratory animals. Eggshells from processing plants are often dried, crushed and fed to laying hens as a rich calcium source and high-quality protein source (from egg white left inside the shells).

Experiments

Microorganisms bred in laboratories often grow better if a small amount of egg yolk is added to the culture medium.

Medical and Pharmaceutical

Fertile eggs are used to manufacture many vaccines (including influenza shots), as a source of purified protein and as an aid in the preservation of bull semen for artificial insemination.

Nutraceutical

In some areas of the world, such as China, India and Eastern Europe, eggs have been used for centuries as the base for health potions. Today a number of nutraceutical uses of eggs are being employed and scientists are studying potential future egg benefits. Current applications include:

Lysozyme, an egg white protein, is used as a food preservative and as an antimicrobial agent in pharmaceutical products. (Nature also provides lysozyme in human tears and saliva for infection prevention.)

Avidin is an egg white protein and biotin is a vitamin found in egg white and, to a much greater extent, in egg yolk. Avidin-biotin technology is being used in various medical diagnostic applications such as immunoassay, histopathology and gene probes.

Sialic acid, an amino acid, has been shown to inhibit certain stomach infections.

Liposomes, fatty droplets found in eggs, are used as a controlled delivery mechanism for various drugs.

Immunoglobulin yolk (IGY), a simple egg-yolk protein which has immunological properties, is used as an anti-human-rotavirus (HRV) antibody in food products.

Phosvitin, a phosphoprotein found in egg yolk, provides antioxidant benefits in food products.

Choline, a B vitamin combined with lecithin in egg yolk, is important in brain development and is used to treat certain liver disorders. Eggs are one of the best food sources of choline.

Ovolecithin, a phospholipid found in egg yolk, has a high proportion of phosphatidycholine and contains fatty acids – such as arachidonic acid (AA) and docosahexanoic acid (DHA) – which have been shown to improve visual activity in infants and to improve fatty-acid status. Egg lecithin has both emulsifying and antioxidant properties and, beyond its usefulness in keeping the oil and vinegar of mayonnaise in suspension, it's used chiefly in medicine.

Shell-membrane protein is being used experimentally to grow human skin fibroblasts (connective tissue cells) for severe-burn victims and, in Japan, is being used in cosmetics.

U.S. Recommended Daily Allowances

A term that once indicated suggested intake levels for nutrients. U.S. RDAs simplified the RDAs of the National Academy of Sciences by providing a single recommended allowance for the general healthy population. With few exceptions, these allowances were based on the highest RDA for each nutrient – the amounts required for young adult males. Since these values were excessively high for children, women and the elderly, U.S. RDAs have been replaced by RDIs which represent average RDAs.

– See Daily Reference Values (DRVs), Daily Values (DVs), Recommended Dietary Allowances (RDAs), Reference Daily Intakes (RDIs)

Vegetarian Diets

Eggs can be an important source of complete protein in diets that omit meats. One egg equals one ounce of lean meat, poultry, fish or seafood. Since an egg contains all the essential amino acids in proportion to human needs in addition to vitamin B12, a nutrient not found in vegetarian sources, adding an egg to a vegetarian diet can improve the healthfulness of a vegetarian diet.

– See Nutrient, Protein, Reference Daily Intakes (RDIs)

Vegetarian Eggs

Eggs produced by hens fed rations containing only vegetable foods.

Vitamins

An egg contains varying amounts of essential vitamins but no vitamin C.

– See Biological Value, Nutrient, Reference Daily Intakes (RDIs)

Vitelline Membranes

– See Composition, Membranes

Washing Eggs

– See Cleaning

Water Bath

Also known as a bain-marie. Some delicate dishes, such as custard, are cooked in the oven in a water bath. Before baking, place the baking dish or pan holding the custard in a larger baking pan and add very hot water to within 1/2 inch of the top of the custard. The water insulates the custard from too much heat and promotes even cooking.

– See Custard, Baked

Water Glass

A solution of sodium silicate formerly used to preserve eggs.

– See Preservation

Weeping

– See Curdling; Meringue, Soft Meringue

Weight

– See Buying; Grading; Size

Well Beaten

– See Cooking Terms, Well Beaten

White

– See Albumen; Color, White; Composition; Foam

Xanthophylls

– See Lutein, Color-Yolk

Yolk

The yolk, or yellow portion, of an egg makes up about 34% of the liquid weight of the egg. It contains all of the fat in the egg and a little less than half of the protein. The yolk of a large egg contains about 55 calories.

With the exception of niacin and riboflavin, the yolk contains a higher proportion of the egg's vitamins than the white, including vitamins B6 and B12, folic acid, pantothenic acid and thiamin. All of the egg's vitamins A, D, E and K are in the yolk. Egg yolks are one of the few foods naturally containing vitamin D. The yolk also contains more calcium, copper, iron, manganese, phosphorus, selenium and zinc than the white.

Double-yolked eggs are often produced by young hens whose egg production cycles are not yet completely synchronized. They're often produced too, by hens which are old enough to produce extra large-sized eggs. Genetics is a factor, also. Occasionally a hen will produce double-yolked eggs throughout her egg-laying career. It's rare, but not unusual, for a young hen to produce an egg with no yolk at all.

In fertilized eggs, the yolk is the site of embryo formation. It's the yolk which is responsible for the egg's emulsifying properties.

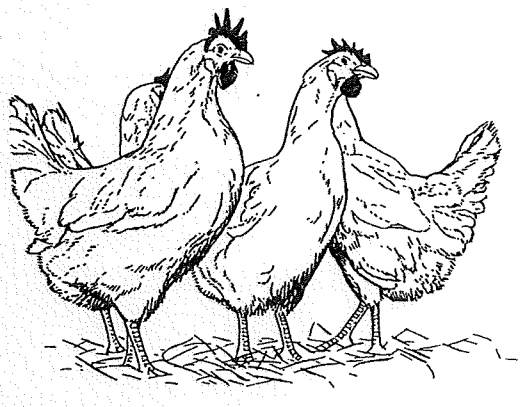
– See Breakout; Color, Yolk; Composition; Fat; Fertile Eggs; Formation; Germinal Disc; Grading; Nutrient

Zabaglione

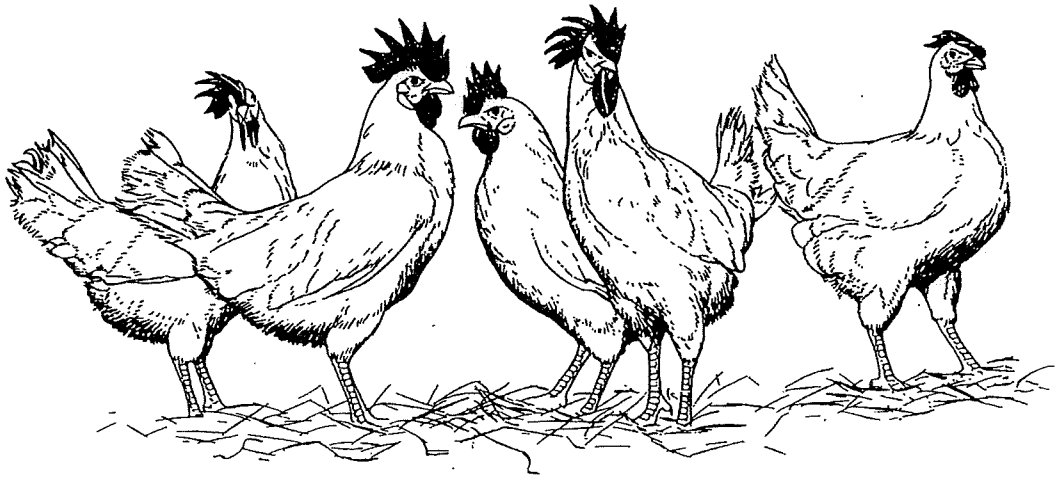
Italian dessert sauce made with egg yolks, marsala wine and sugar cooked over slow, simmering water. Called Sabayon in France.

Zeaxanthin

–See Lutein



Raising Your Home Chicken Flock



Raising Your Home Chicken Flock

A successful home chicken flock requires good breeding stock combined with careful management, disease control, and a feeding program adequate for the production or growth level expected for the flock.

Why Have a Small Flock?

A small flock offers the convenience of having fresh eggs or poultry meat right at home and the possible reduced costs of production incurred by using available housing and farm feedstuffs.

Poultry also can be kept as a hobby or as a learning experience for 4-H or FFA projects. Purebred poultry can be exhibited at fairs and poultry shows. There is also the pleasure of observing different shapes and colors in a home poultry flock. Purebred poultry may include chickens (large fowl and bantams), geese, ducks, turkeys, game birds, and guineas. Bantams are ideal for those who have only a small space available to keep chickens.

Before You Plan a Flock

Some local, county, state, and even federal zoning and environmental regulations prohibit poultry flocks. Zoning regulations are usually specific about animals and environmental considerations, such as flies, odor, and noise. Check with your county Extension agent or representatives of government agencies for approval before planning a flock. Also consider the proximity of your neighbors and their opinions.

Home flocks—even small ones—require water, food, and daily care including weekends, vacations, and holidays. The time and effort required for this care should be considered in weighing your desire for a home flock against other possible uses of your time and labor.

What Kind of Chicken?

There are two basic choices in the type of poultry to keep: a strain bred primarily for egg production or one that is bred for meat production.

Commercially available White Leghorn strains produce approximately 250 to 300 white eggs each year on a small amount of feed. Sexlinked hens, which are a little larger than Leghorns and lay brown eggs, produce approximately 180 to 240 eggs per year. Egg-producing stock can be bought as day-old chicks or as started pullets at 18 to 22 weeks of age. Yearling hens (hens with one year of production) can be purchased from a commercial egg flock.

The most economical meat production comes from commercial broiler-type birds, which can be used for broiler, roaster, and capon production. These meat birds typically produce few eggs.

Housing Requirements

Housing for home poultry production must keep the flock comfortable in all kinds of weather. The house should be tight, well-ventilated, and insulated. It is important to provide adjustable ventilation for adequate air movement in hot summer months and reduced air movement in cold weather. Litter is material such as shavings or sawdust spread on the chicken house floor. A concrete floor is recommended for sanitation and litter management; however, sandy soil may be adequate. Use a $^1/_2$-inch ($1^1/_4$-centimeter) mesh hardware cloth over windows to keep out birds, rodents, and predators.

Floor space in the house should allow 3 square feet (one square meter) per bird for layers and 1 square foot (315 square centimeters) per bird for broilers and bantams. Hanging cages are recommended as a means of preventing disease.

Brooding Equipment

Brooders

Baby chicks need heat during the first few weeks of rearing. There are many types of chick brooders that can be adapted to a small flock. Standard hover brooders can be used for starting a flock of up to 1,000 chicks. Battery brooders with feeders and waterers built in do a good job of starting chicks as well as supplying feeders and waterers for several weeks. The common infrared lamp is an inexpensive way to brood a small, 25- to 100-chick flock. The heat lamp should be at least 18 inches (45 centimeters) above the litter. In winter, make sure that the room temperature is warm enough to allow the heat lamps to be effective. A two-lamp unit provides safety in case one burns out during cold weather. Table 21 gives a temperature guide for brooding, but the behavior of the chicks is a better indicator of their comfort. If the chicks have loud, sharp chirps and are bunched near the heat source, they are cold. If they are panting and bunched in the corner away from the heat source they are too warm. A brooder guard usually is used to keep chicks near the heat source during the first week to 10 days. The guard is a circular barrier, 15 to 16 inches (38 to 46 centimeters) high, made of cardboard or other solid material, that confines the chicks and reduces drafts of cold air.

Feeders

Manufactured chick-feeder designs vary from the commercially used cardboard or plastic feeder lid to the metal trough type. Homemade boxes, egg flats, and similar low, open designs are acceptable as long as the chicks have easy access to the feed, and feed waste is controlled. Provide enough space so that nearly all the chicks can eat at the same time. To avoid feed waste, gradually change chicks to regular tube or trough feeders so that open feeders can be removed when the chicks are 10 days old.

Hanging tube and trough feeders for all ages are available from farm supply dealers. Hanging tube feeders are adjustable and can be used for chickens from one week through adulthood. Trough feeders have a limited capacity for adjustment, which makes it necessary to use at least three different sizes of feeders during the growing cycle of replacement pullets, roasters, or capons. At least two different sizes are needed to rear broilers.

A feeder can be built from scrap lumber, but it is critical that it be designed to avoid feed waste. The feeder must have a reel, grill, or other device to keep chickens from roosting on it or scratching in it. The feeder must have a lip to keep the feed from being spilled out. It is also essential that the feeder be the correct height (the back height of the chickens). See Table 20 for feeder space needs.

Waterers

Chicks must have easy access to water; much early chick mortality occurs when weak chicks cannot find water. Manufactured chick waterers are usually gallon or quart jars that screw onto special bases. Once filled, the waterers are inverted and the chicks drink out of the base. A simple homemade fountain, satisfactory for a dozen chicks, can be made by punching a hole with a 10-penny nail in the side of a standard can one-eighth of an inch (0.3 centimeters) to one-fourth of an inch (0.6 centimeters) from the open end. The can is filled with water and inverted in a deep saucer. Water fountains must be cleaned daily and filled as necessary.

Manufactured trough or low-pressure hanging waterers are usually used for growing flocks or adult home poultry flocks. Regardless of the waterer you use, make sure it has the following construction details: correct size and height from the floor (2 inches shorter than the back height of the chickens); a device to prevent roosting and wading; a design to control spillage; and a design for easy cleaning. Trough waterers usually can be adjusted for height; pan waterers do not have adjustments, but they work well over a pit area that catches spillage. Clean waterers daily so chickens have access to clean water at all times. Refer to Table 20 for water space needed.

Nests

Chickens kept for egg production should have access to nests at 19 to 20 weeks. Giving young pullets the opportunity to find nests 1 to 2 weeks before they start laying helps prevent them from developing the habit of laying in the litter. Both individual and colony nests are satisfactory. Leghorns should have a 12 by 14 by 12-inch (30 by 36 by 30-centimeter) individual nest; heavier hens should be provided with a 14 by 14 by 12-inch (36 by 36 by 30-centimeter) nest. Nail or glue a strip on the front of the nest to keep 1 to 2 inches ($2^1/_2$ to 5 centimeters) of nesting material in the nest. Provide one individual nest for every four hens in the flock.

A 2 by 6-foot (60 by 180-centimeter) colony nest is adequate for 50 hens. Nests may be placed on end walls or partitions. They should be installed high enough so hens can walk under them. Place nests with openings in the darker part of the house. Hens do not like to lay in nests with excessive light.

Roosts

Roosts provide comfortable sleeping for hens, replacement pullets, and capons. Roosts can be made easily by rounding edges of 2 by 2-inch (5 by 5-centimeter) or 2 by 4-inch (5 by 10-centimeter) boards. Allow 6 to 7 inches (15 to 18 centimeters) of roost space per bird. Dropping pits help with litter management: They catch a good portion of the birds' feces as well as water spillage. The dropping pit should be wire-covered and at least 12 to 16 inches (30 to 40 centimeters) off the floor. Clean the dropping pit regularly, particularly if wet conditions develop.

Light

Artificial light benefits all classes of poultry. One 40-watt bulb provides adequate light for 200 square feet (18 square meters) of floor space. If the ceiling is painted white or a light reflector is used, the quality of light is enhanced. A combination of natural and artificial light to give layers 14 hours of light is effective in maintaining egg production throughout the year. Broilers and roasters grow well with 24-hour light, but can be grown with only 8 to 10 hours, such as that provided by natural light.

Cages

Commercial table egg production utilizes cages in multiple tiers for more than 90 percent of eggs produced. Capital investment in cage layer facilities is high but labor efficiency is excellent. If hens are managed correctly and housed in well-built and well-ventilated buildings, their performance is comparable to that of floor layers. Odor and flies are major problems with cage rearing.

Table 20. Equipment Management Schedule

Chicken age	Brooding temperature	Feeding space	Water space
1 day to 1 week	90-95 °F (32-35 °C)	1 feeder lid per 100 chicks or 1 inch (2.5 cm) per chick trough (remove at 10 days)	1 gal (3.8L) per 100 chicks (remove at 10 days)
1 week to 3 weeks	1 to 2 weeks 85-90 °F (29-32 °C) 2 to 3 weeks 80-84 °F (27-29 °C)	2 inches (5 cm) per chick (one side of trough) or 3 tube feeders per 100 chicks	0.3-0.4 inch (0.75-1 cm) per chick (one side of trough with automatic fill or several 1 gal [3.8 L] fountain waterers or equivalent)

continued on next page

Chicken age	Brooding temperature	Feeding space	Water space
4 to 9 weeks	3 to 4 weeks 75-80 °F (24-27 °C) 4 to 5 weeks 70-75 °F (21-24 °C) After 5 weeks 70 °F (21 °C) room temp	3 inches (7.5 cm) per bird (one side of trough) or 4 tube feeders per 100 birds	0.5 inch (1.25 cm) per bird (one side of trough) or Several 2- to 5-gal waterers
10 to 20 weeks	Comfort zone 55-75 °F (13-24 °C)	3 to 4 inches (7.5-10 cm) per bird (one side of trough) or 5 tube feeders per 100 birds	1 inch (2.5 cm) per bird (one side of trough) or Several 2- to 5-gal waterers
Layers	Comfort zone 55-75 °F (13-24 °C)	4 inches (10 cm) per bird (one side of trough) or 5 tube feeders per 100 birds (oyster shell or soluble grit feeders should be 12 inches [30 cm] per 100 birds)	1 inch (2.5 cm) per bird (one side of trough)

Feeding the Flock

Feed represents about two-thirds of the cost of raising a chicken. Commercial poultry farms use bulk feed programs in which a single delivery of 12 to 30 tons of commercial poultry feed is common. Such high-volume handling results in a relatively low cost per pound (or kilogram) of feed and explains why supermarket prices for poultry products are also relatively low.

The small flock owner deals in smaller quantities of feed—typically 50 or 100 pounds (22.5 or 45 kilograms)—and thus pays a higher cost per unit for feed.

Chickens must be fed an adequate diet for maximum productivity. Birds of different ages and utility have specific nutrient requirements, which are met by mixing together different feed ingredients. The scientific balancing of poultry rations is too complex for the home flock owner; therefore, commercial feed should be purchased, even if it seems expensive.

Table 21 outlines typical feeding programs for chickens of different ages and utility. When commercial programs differ from those outlined in the table, the commercial program should be followed. Use Table 21 only as a guide.

Commercial dealers usually have three different types of feed programs: all mash, mash and grain, and grain and supplement. Any of these feed-mixing methods are acceptable as long as the birds' nutrient needs are met. When part of the nutrient requirements for layers are expected to be met by whole grains, extra attention should be given to supplying adequate calcium.

All mash (crumble or pellet) feed is a complete ration and, when used, should be the only feed. Mash and grain feeds are formulated so that grain can be added to the mash. This feeding technique is useful for floor layers—feeding small amounts of grain in the litter causes the layers to scratch in the litter, thereby keeping it in better condition.

The grain and supplement program is convenient and economical for flock owners who have their own grain. When whole grains are provided it is recommended that a higher protein layer feed be used to ensure adequate nutrients to maintain high egg production.

Table 21. Typical Feeding Programs [a]

Layer	Layer replacement[b]	Capon[b]	Broiler[b]	Roaster[b]
20 weeks-production cycle Laying mash	0-6 weeks Starter	Same as layer replacement to 10 weeks.	0-3 weeks Starter 3-6 weeks Finisher 6 weeks-market Withdrawal	Same as broiler to 7 weeks of age.
May be fed all mash or mash-grain method.	6-13 weeks Grower or Pullet developer (15% protein)	Grower or Developer and grain prior to market. Grain gradually increased in diet up to 2 weeks prior to marketing.		Broiler Finisher and corn or whole grains until 2 weeks prior to marketing at 12-14 weeks. Insoluble grit may be fed if whole grain is used.
Free choice: Calcium (oyster shell or limestone) may be fed for good egg shells. Soluble grit may be fed if whole grain is used.	13-20 weeks Developer	Feed high protein mash, crumbles or pellets only during last 2 weeks.		

[a] This schedule should be used as a guide only. Commercial company programs may vary from the one proposed. Choose a company's feeding program and follow it.

[b] A suitable coccidiostat must be included in feed for young chickens (see poultry disease section). Read the feed tag or make sure your feed store provides a starter or grower with a coccidiostat.

Disease Management

It is important to consider several factors that relate to the quality and health of the flock once the type or breed has been chosen. Purchase stock only from reputable breeders or hatcheries. Stock purchased from magazine advertisements, especially bargain offers, can mean serious problems later. Stock should be purchased from pullorum/typhoid-clean flocks under the National Poultry Improvement Plan (NPIP). Pullorum/typhoid is a highly contagious disease. NPIP breeders, hatcheries, and facilities have been checked for proper management and sanitation and the absence of seriously diseased birds.

Diseases

Because of the similarity of many diseases, diagnosis should be left to a professional veterinarian. With an accurate diagnosis, proper treatment can be given to the flock. When there is an outbreak in the flock, take one or two birds showing typical symptoms to a diagnostic laboratory. When the diagnosis has been made, treat the disease under the direction of a professional veterinarian or with the advice of your county Extension agent or Extension specialist.

Respiratory diseases. Respiratory diseases affect the respiratory tract and are the most common diseases in chickens. Table 22 shows some of the common respiratory diseases; most can be prevented by vaccination.

Leukosis (Marek's). Leukosis, also called Marek's, is one of the most common killers of chickens of all ages. Birds with leukosis show many symptoms. Visceral leukosis results

in tumors on the liver and other organs; the bird becomes thin and dies. Another symptom, enlarged nerves, results in paralysis, with the bird eventually lying on its side unable to move. Gray eye is another form of leukosis, in which the iris shrinks, the eye turns gray, and the bird goes blind. Leukosis also can cause visibly enlarged bones.

Coccidiosis. Coccidiosis is the single most common cause of death in young birds. It is caused by single-celled coccidia that attack different parts of the intestinal tract, causing an irritation of the lining that prevents the absorption of food. In minor outbreaks, the birds are droopy, have ruffled feathers, and lose weight. Egg production in older birds declines. Severe cases result in hemorrhage and death. Practically all poultry house litter contains coccidia; it is important to keep litter dry and to purchase feed that contains a coccidiostat. Chickens kept in cages normally do not have problems with coccidiosis.

Table 22. Common Respiratory Diseases

Disease	Symptoms
Infectious bronchitis	Rapid spread; gasping; wet eyes; coughing; swollen sinuses; drop in egg production; misshapen eggs; rough- or soft-shelled eggs; watery egg whites; death
Newcastle	Rapid spread; gasping; rattling; loss of appetite; coughing; huddling; paralysis of legs; twisted neck (stargazer); walking backward; drop in egg production; soft or misshapen eggs; death
Laryngotracheitis	Slow spread; coughing; sneezing; sitting hunched on floor; emitting a cawing sound; coughing bloody mucus; nasal discharge; swollen head and wattles; drop in egg production; death
Fowl pox	Skin - White to yellow bumps on comb, face, or wattles turning to scabs Internal - Cankers in membranes of mouth, throat and windpipe; difficulty breathing; nasal or eye discharge
Coryza	Thick nasal discharge with odor; swollen sinuses; ruffled feathers; difficulty breathing
Mycoplasma	Difficulty breathing; ruffled feathers; nasal discharge; rattling; facial and nasal swelling; weakness; drop in egg production; swollen joints; yellowish feces
Cholera	Droopiness; difficulty breathing; loss of flesh; drop in egg production; purplish swollen head, comb, and wattles; paralysis

External parasites. External parasites cause losses if proper prevention and treatment procedures are not followed. Chickens should be checked once a week for signs, as shown in Table 23. Consult with your county Extension agent for procedures and chemicals for prevention and control. Follow directions on packages of chemicals.

Internal parasites. Internal parasites are worms found in the digestive and respiratory tract. Often insects, such as beetles, act as the intermediate host. Insects carry the worm eggs, which are deposited in the chicken after the chicken eats the insect. Common internal parasites are listed in Table 24. Chemicals for the prevention and treatment of internal parasites should be administered under the direction of a competent authority.

Other diseases. Other diseases are not as common and require a professional diagnosis. Moldy feed causes mycotoxins and losses. Chickens develop nutritional deficiencies if they are not given a well-balanced diet. Highly pathogenic transmissible diseases, such as Exotic Newcastle and Avian Influenza, can be avoided with proper management and biosecurity measures.

Table 23. Common External Parasites

External parasite	Symptoms
Chiggers	Red, pimple-like irritations
Lice	Large, yellowish, transparent insects on the skin; low weight; blackish discoloration (dirty) in the vent and tail area; drop in egg production
Mites	
Red (roost)	Loss of weight; red specks; death
Northern fowl	Red or black specks around vent; unthrifty; drop in egg production
Feather	Loss of feathers; webs irregular with only shafts left in some cases
Scaley leg	Enlarged shanks and toes with raised, crusty scales

Table 24. Common Internal Parasites

Internal parasite	Symptoms
Large roundworm	Long, yellow-white worms in intestine; droopiness; weight loss; diarrhea; death
Capillary worm	Hair-like worms in crop and upper intestine; droopiness; weight loss; death
Cecal worm	Short worms in the ceca; unthrifty; weak; loss of flesh
Tapeworm	Long, white, flat, segmented worms in intestine; unthrifty; slow growth; weakness
Gapeworm	Red, forked worms in trachea; gasping; coughing

Sanitation

Lack of cleanliness is often the cause of poultry disease. There are several sanitation measures that should be taken in a home chicken flock: 1) complete cleaning and disinfecting of house and equipment before starting baby chicks or housing layers; 2) daily cleaning of waterers; 3) screened manure pits under roosts, feeders, and waterers; 4) managing litter to keep it dry and clean; 5) incinerating, burying, or composting all dead chickens; 6) raising young stock away from adult chickens; 7) isolating the flock from outside traffic (chickens raised off the farm, neighbors, birds, dogs, etc.); 8) practicing good housekeeping and rodent control; and 9) disposing of litter and manure by spreading and plowing or spading the manure under soil. Manure and litter should be spread or stored in areas not used by poultry.

Biosecurity

Biosecurity includes management practices that prevent the entrance of germs and disease into the flock and into neighboring flocks. There are several biosecurity measures that must be taken: 1) purchase healthy stock; 2) keep your birds confined—do not let them run loose; 3) keep dirty equipment and materials from other flocks away from yours; 4) do not mix domestic birds with wild or caged birds, such as parrots and canaries; 5) medicate properly and follow directions; 6) keep unfamiliar people and others who might be carriers of disease away from your birds; 7) control vermin, such as rats and mice; 8) practice an insect-control program; and 9) keep pen areas weed- and debris-free and keep buildings in good repair. Rely on professionals, such as veterinarians, Extension agents, animal health suppliers (those who sell vaccines and medicines), and universities for educational materials and help.

Beak Trimming

Chickens are cannibalistic. The best way to control cannibalism is with beak trimming. The chicken's beak is just like a human fingernail; this procedure is not painful. If chicks are beak trimmed at 1 day old in the hatchery, and again once or twice before they reach 16 weeks, they probably will not develop the pecking habit.

With a knife or scissors, cut off at least one-third of the upper and one-eighth of the lower beak. Commercial equipment uses electricity to cut and cauterize the beak (sear the cut tip). Cauterizing can also be simulated with a hot iron after the beak is cut. If cauterizing is not possible, cut only the amount of beak that can be removed without severe bleeding, in most cases about one-fourth.

Home Processing

The quality of a ready-to-cook chicken is only as good as the live bird. When choosing chickens to be processed, look for healthy, well-finished chickens that are free of pinfeathers. Consider the weight and age that are desirable for your particular need.

For good flavor, it is essential that the chicken be well bled. One of the best methods of killing and bleeding is to cut the jugular vein (on each side of the neck). During this process, the chicken should be hung so it will not bump other objects or get soiled.

Immersing the chicken in hot water so that feathers are easily removed is called scalding. Scald water temperatures for broilers, roasters, and capons should be 128 to 130 °F (53 to 54 °C) and 155 to 160 °F (68 to 71 °C) for older chickens (spent layers, etc.). Scald for approximately $1^1/_2$ minutes for adequate feather removal.

Remove the head, feet, and viscera. Wash the eviscerated chicken with clean water and chill it in ice water for several hours to reduce body heat. Chilling is necessary to produce a quality product and prevent spoilage. Add a teaspoon of chlorine bleach to each ten gallons of ice water for added protection.

Egg Handling

The egg is called nature's perfect package, but if it is soiled or broken, the package is of little value. A clean nest, ample nesting material, adequate space, and twice-a-day gathering (more often in hot weather) are the most important factors in producing sound, clean eggs. Once gathered, eggs should be refrigerated.

Poultry Product Sales

There may be times that you have a surplus of product and wish to sell it. Home flock products often command a premium price because of their quality and freshness. Become familiar with quality factors for meat and eggs before selling your product. Study educational materials on grading factors, packaging, storage, and marketing. Remember, you face the same risks in selling products as large producers do, and you want to ensure repeat sales to your customers.

Residues

Be sure that you do not sell products that contain residues of chemicals or drugs used on or around your home chicken flock. Residues are chemical compounds in meat or eggs. They are difficult to eradicate and can cause health problems in people who eat the products. The chemicals may have been in the flock's feed or water or come from pesticides or herbicides dusted or sprayed around birds or facilities. It is important to follow label instructions when using any chemicals around poultry. There is a withdrawal period for most drugs used in feed or drinking water; be aware of this period. Consult professionals when you have a question on the use of any chemical or drug product.

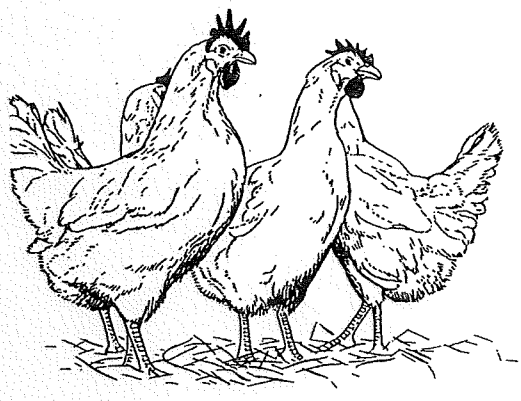
Exhibiting Poultry

Many small flock owners like to exhibit their birds at fairs or in poultry shows. You can enter commercial or purebred poultry in most fairs; poultry shows accept purebred poultry only. Purebred birds are shown by breed or class as identified in the American Poultry Association's *The American Standard of Perfection* or American Bantam Association's *The Bantam Standard*, which list the classes and descriptions for each breed and variety. A variety may be the shape, color, or comb type for a particular breed. Many breeds have several varieties. Selecting birds and carefully preparing for the fair or show are essential to providing a good exhibit and increasing your chances to receive a prize.

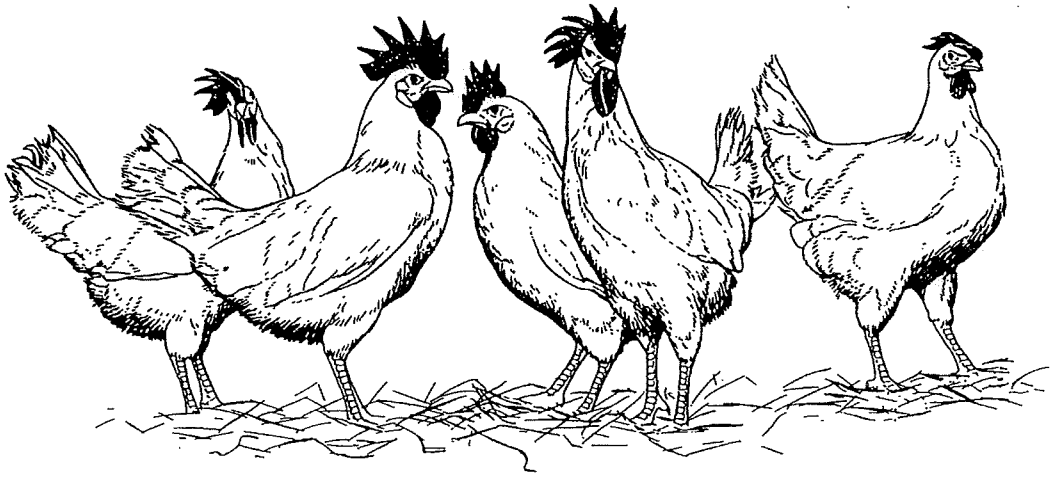
Conclusion

Raising a home chicken flock can be a good experience and a source of enjoyment. As a family project it teaches about living beings and responsibility. The home chicken flock also can be an excellent source of low-cost, high-quality poultry products. This chapter should provide the basic tools to start a successful flock.

Acknowlegments: Charles J. Wabeck, Extension Poultry and Food Products Specialist Lower Eastern Shore Research and Education Center, Princess Anne Facility



Fact Sheets



BIOSECURITY

BIOSECURITY

Biosecurity is a relatively new term that includes specific steps taken to prevent disease caused by infectious agents such as viruses, bacteria, fungi, or parasites in poultry flocks. Biosecurity includes practices that keep infectious agents off of your premises through isolation rearing and reducing disease-causing agents already on your farm through proper sanitation and disinfecting practices. Biosecurity is not just for the commercial producer of poultry, it is for ALL poultry producers.

DISEASE TRANSMISSION

Disease is the departure from health and includes any condition that impairs normal body functions. Disease results from a stress which weakens the bird and reduces the bird's resistance to infectious agents. Infectious agents — such as viruses, bacteria, fungus, or parasites that cause disease in poultry — can be introduced into a flock or transmitted by:

- Birds carrying an infectious agent within the flock;
- Recently acquired birds;
- Eggs from infected breeders;
- Human hands, hair, feet/shoes, or clothes;
- Wild birds, rodents, flies, parasites, or insects;
- Contaminated feed, water, or air;
- Contaminated vaccines and medications;
- Dust, feathers, and manure on equipment and supplies, such as trucks, coops, feeders, waterers, and egg flats.

INCREASED RISK

The risk of disease increases if a) new birds are introduced into your existing flock, b) different ages of birds are raised together, c) different types of fowl are raised together, and d) new birds are placed in contact with droppings, feathers, dust, and debris from a previous flock. Infectious agents usually only survive a short time, but if maintained in the proper environment such as cold, damp, unsanitary surroundings infectious agents can survive for a long time and travel hundreds of miles while clinging to drivers, trucks, crates, or egg flats.

The table on the back of this page lists common poultry diseases, their symptoms, and the survivability of the infectious agent which causes the disease.

ENFORCING BIOSECURITY AND DISEASE PREVENTION MEASURES

"Security" is the primary emphasis of any insurance program and this holds true for biosecurity. Security entails minimizing the number of visitors on your farm. Only authorized personnel who have been provided properly sanitized footwear, coveralls, and headgear should be allowed into your poultry houses. As caretaker, you should only visit other poultry facilities when absolutely necessary and then wear properly sanitized clothing, headgear, and footwear.

It is important to isolate new birds that are brought onto the premises before introducing them into the flock. Keep free-flying birds, waterfowl and migratory birds away from your flock. Your management should include a rodent and fly control program.

Ensure proper biosecurity by keeping only one age of bird on the premises at one time. Since small flocks generally have more than one age of bird on the premises, it is important to house different ages separately. Always take care of your young birds first, then move on to your older birds. Ideally, one should not keep various types of fowl, including pet birds, on the premises. If you keep other types of animals or birds on the premises, it is important to change coveralls, head-gear, and footwear from one animal facility to the next.

To avoid transmitting disease, thoroughly clean, wash, and disinfect any equipment such as feeders, waterers, coops, or egg flats, as well as equipment that has been on another farm, on a routine basis . Included with equipment are vehicles which come onto your farm, especially those which have been at other poultry facilities. Use only plastic coops since they are easier to wash and sanitize and do not harbor bacteria like wooden crates. Do not allow dead birds to accumulate; either compost or burn dead birds. Poultry houses should be thoroughly washed and disinfected at least once a year.

Another disease prevention measure is to have good ventilation, since large amounts of fresh air reduce infectious disease agents. Always do business with companies and other farms which enforce proper biosecurity measures. Biosecurity is a worthwhile investment for any poultry producer and it is the best insurance policy money can buy.

Disease	*Symptoms*	*Infectious agent*	*Life span away from poultry*
Bursal disease	Ruffled feathers, diarrhea, trembling, prostration	Virus	Months
Coccidiosis	Diarrhea, death	Protozoa	Months
Duck enteritis	Diarrhea, death	Virus	Days
Fowl cholera	Comb and face discolored and swollen	Bacteria	Weeks
Infectious coryza	Swelling around eyes and cold symptoms	Bacteria	Days
Avian influenza	Coughing, sneezing rales, lacrimation	Virus	Weeks
Laryngotracheitis	Gasping and coughing	Virus	Days
Mareks	Paralysis	Virus	Weeks
Mycoplasma	Chronic respiratory problems	Mycoplasma	Days
Salmonella	Diarrhea	Bacteria	Weeks
Avian TB	Weight loss, death	Bacteria	Years

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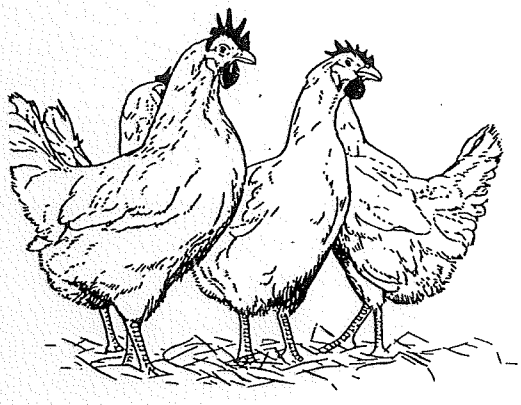
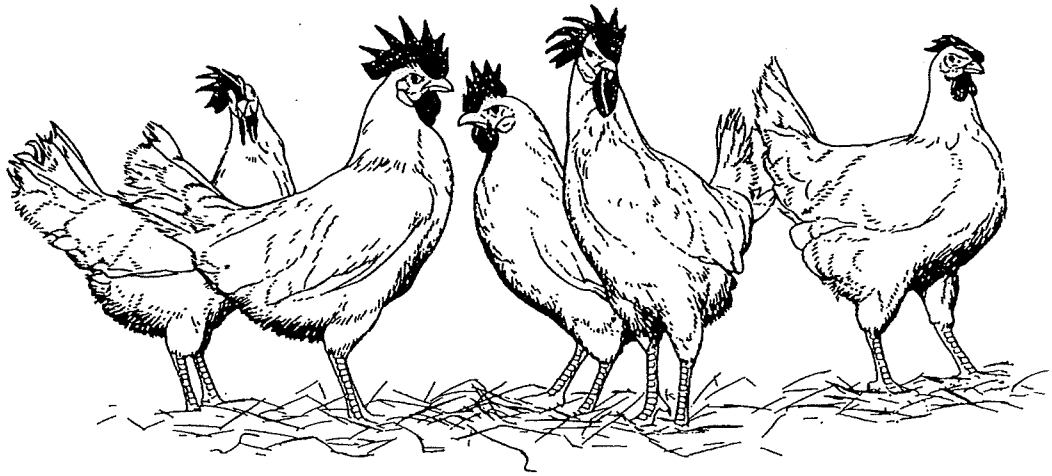


Avian Influenza



AVIAN INFLUENZA

Influenza is an acute contagious respiratory disease caused by a virus. Influenza can affect many animals such as horses, swine, and human beings. It is a disease with worldwide distribution and has been a costly disease to the poultry industry because of increases in production expenses which include extra feed, medication, additional care, quarantine measures, vaccines, cleaning and disinfection, decreases in carcass quality as well as losses of local and international trade.

Migratory waterfowl, imported pet birds, and live-bird markets are some of the sources of infection. Influenzas can be **zoonotic,** which means the disease can be transferred from animals to humans. Influenza is commonly referred to as the flu. The term "fowl plague" was used in the past when referring to avian influenza outbreaks resulting in high mortality. Today, an outbreak of avian influenza that results in high mortality is referred to as "highly pathogenic" avian influenza (HPAI).

Avian influenza can **affect** poultry (chickens, turkeys, ducks, pheasants, geese, guinea fowl, and chukars) as well as wild birds especially sea birds (sandpipers, sanderlins, ruddy turnstones, terns, swans, shearwaters, herons, guillemots, puffins and gulls). Avian influenza is caused by any Type A influenza virus belonging to the ***Orthomyxoviridae*** family. The disease syndromes associated with avian influenza can be **subclinical** or **mild**, meaning the bird is in the early stages of the disease and the signs of the disease are not apparent, to **acute** where the signs of the disease are severe and often lead to death. Many factors influence the outcome of infection. Some factors which determine whether the disease will be subclinical or acute are the biologic characteristics of the virus, environmental stresses, such as temperature, humidity, ventilation, crowding and the age and sex of the bird.

Avian influenza can be **transmitted** via air currents, feces, humans, vehicles, water, feed, equipment, supplies, clothes, flies, litter, beetles, and other birds dead from the disease. Transmission occurs when susceptible and infected birds are in close contact with each other or when infectious material from infected birds is introduced into the susceptible bird's environment. The virus can be excreted from the respiratory tract, conjunctiva, and feces of birds. This is known as horizontal transmission. There is no evidence to indicate avian influenza is transmitted vertically, from hen into the egg. Since the virus is readily transported by people and equipment, it is important to establish strict biosecurity measures.

Once avian influenza is transmitted, the **incubation period**, the time from when the bird first comes in contact with the disease until the first signs appear, can be a few hours to 3 days and up to 14 days. The incubation period is dependent on the dose of the virus, route of exposure, the species exposed and the ability to detect the clinical signs.

The **clinical signs** for avian influenza can vary widely depending on the species of bird affected, the age of the bird, whether the bird has another infection concurrently, the strain of virus, and environmental factors. The respiratory, reproductive, digestive, or nervous systems of the bird are affected with respiratory signs being most common. The most commonly reported signs of the disease are pronounced depression, decreased activity, decreased feed consumption and emaciation, with decreased egg production and increased broodiness in hens. Respiratory signs include coughing, sneezing, rales (abnormal respiratory sounds), excessive lacrimation (tearing) from the eyes, huddling or ruffling of feathers, along with edema (accumulation of fluid) of the head and face, cyanosis (turning blue due to lack of oxygen to the tissues) of unfeathered skin (legs, combs, wattles), nervous disorders, and diarrhea. These signs may occur alone or in any combination depending on the severity of the disease. All birds in a flock will become sick (moribund) but morbidity (death) will vary from very low to 100% depending on the strain of virus, the species affected, and other environmental factors.

To determine the **causative agent** of any disease, including avian influenza, the causative agent must be identified. In the case of avian influenza, the virus must be isolated and identified. The virus can be recovered from swabbing the trachea, and/or cloaca of live or dead birds or taking samples of every organ from dead birds. Also, blood can be taken from live birds and used to demonstrate the presence of antibodies to the avian influenza virus.

There is no practical **treatment** for avian influenza. Infected flocks must be quarantined by state animal-disease regulatory agencies and procedures recommended by the National Poultry Improvement Plan (NPIP). Quarantine continues until the flock is depopulated. All buildings should be cleaned and disinfected after the poultry have gone. Poultry litter/manure should be composted before application to cultivated lands. Any treatment for avian influenza is supportive and tries to relieve the respiratory distress. Antibiotics are not effective against viruses and are only used as supportive treatment for avian influenza to reduce the effects 'of secondary infections caused by bacteria or mycoplasmas.

Prevention is the only practical approach to avian influenza. **Biosecurity** should be the first line of defense in the prevention, and since other birds are the most likely source of infection, it is important to keep susceptible birds away from infected birds' excretions and secretions. Transmission occurs when birds are introduced to contaminated footwear, clothing, vehicles, insemination equipment, feed and water that have been exposed to avian influenza virus. The presence of the virus in fecal material is a likely means for movement by equipment and people. Another approach is serological monitoring at harvest of turkeys and chickens.

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