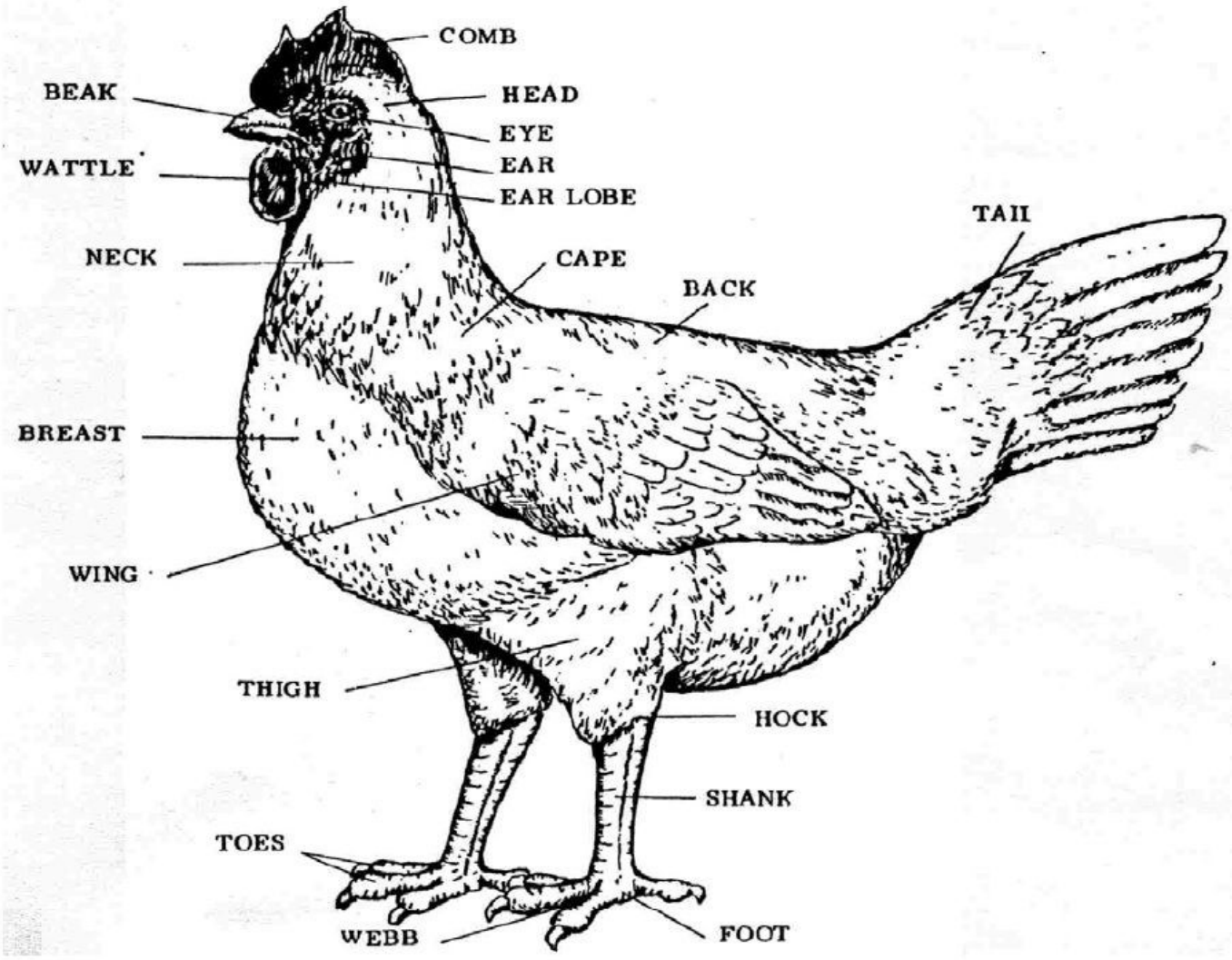
National Poultry Judging Manual



Department of
Animal & Food Sciences
Martin-Gatton College of Agriculture, Food and Environment

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.

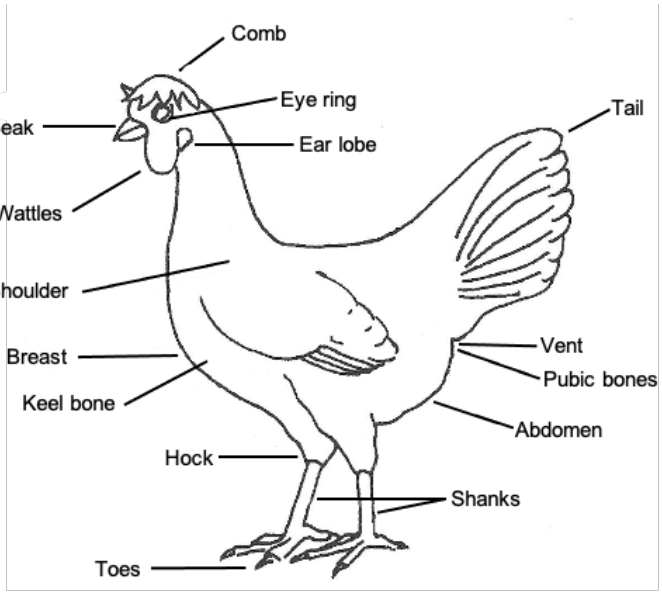


Figure 1. Parts of a Single Comb White Leghorn hen, giving common names used in poultry judging.

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.

GETTING STARTED

HEN #1	HEN #2	HEN #3	HEN #4
P-	**P-**	**P-**	**P-**
C-	**C-**	**C-**	**C-**
F-	**F-**	**F-**	**F-**
M-	**M-**	**M-**	**M-**
Notes	**Notes**	**Notes**	**Notes**
Class placing: - - -			

First, prepare to take notes on each hen as you study her production characteristics. An example of a notetaking table is shown above where:

P = PIGMENT loss

C = Abdominal CAPACITY

F= Abdominal FAT

M = MOLT

The NOTES area is for anything else you see as important to note in your oral reasons like indicators of health and vigor.

An example of notetaking using such a table is shown below.

HEN #1	HEN #2	HEN #3	HEN #4
P- Through bottom of the foot, most intense yellow in shanks	**P-** Throughout	**P-** Well into shanks, slight yellow over top of toes and shanks	**P-** Through shanks with slight yellow on toes
C- 2x2	**C-** 3x4	**C-** 2x4	**C-** 3x4
F- Fat, hard abdomen	**F-** Soft, pliable abdomen	**F-** Soft, pliable abdomen	**F-** Fat, hard abdomen
M- One feather in each wing	**M-** None	**M-** None	**M-** None
Notes: Small, pink comb	**Notes:** Bright eye, large red comb	**Notes:**	**Notes:**
Class placing: 2 - 4 - 3 - 1			

BEFORE HANDLING HENS IN A CLASS

To begin, stand back for 30 seconds and look at all four hens in the class (see Figure 2). Take notes of obvious pigment loss. If you can choose a top and bottom hen, make note of that observation. The top hen should have a beak and shanks that are well bleached. This will be the best egg producer in the class. Poor layers may have some pigment in the beak or shanks. They may also have dull, shrunken combs and wattles. **Remember that the hen with the most pigmentation loss has laid the most eggs, regardless of her current production factors or state of health**.

After seeing the class from a distance, remove each hen from the cage and make notes of your observations. Remove and observe only one hen from a cage at a time. Remember that in this contest the hens will be handled by many contestants so all effort must be taken to handle them gently. In the contest, you can only handle one hen at a time, and you must return her to the cage you took her out of before removing another hen from its cage. Do not pass hens from one person to another during the contest.

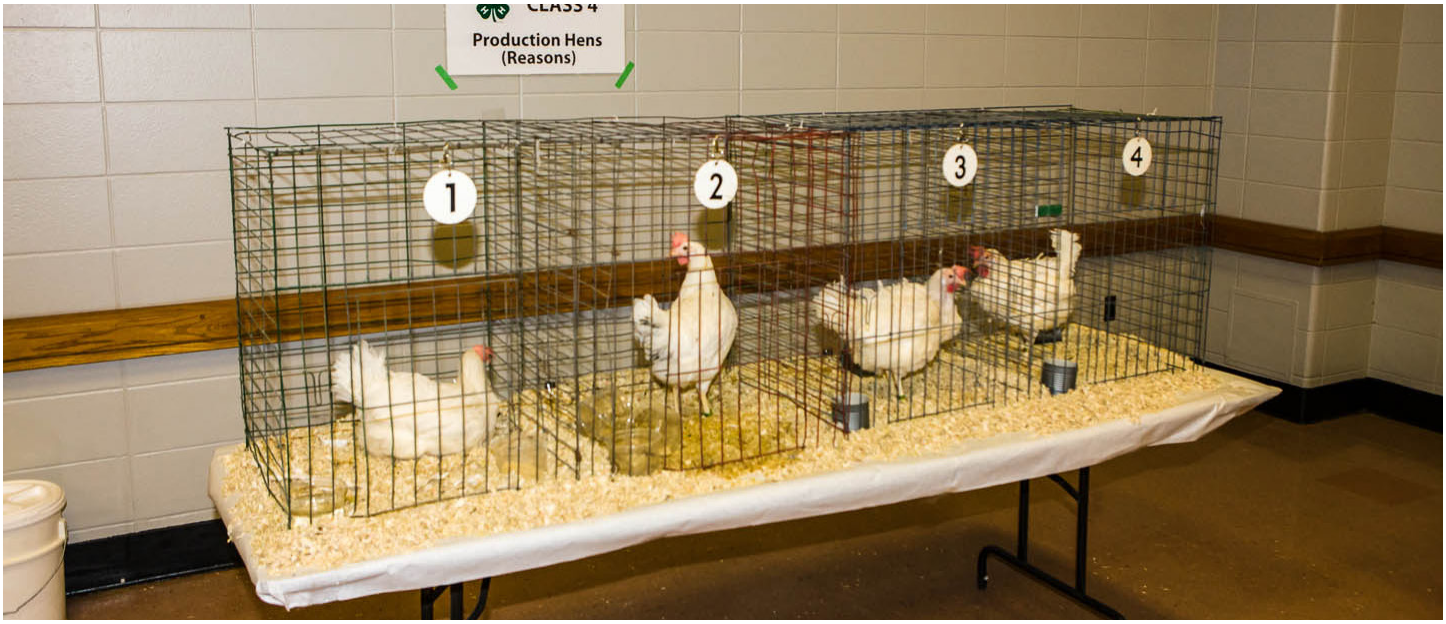


Figure 2. A class of past production hens at the national poultry judging contest.

EXAMINING HENS FOR PIGMENT LOSS

Lift the hen in front of you. Hold her in the palm of your hand. Your free hand should gently hold the neck and head. Look for pigment loss from the eye ring, ear lobe, and beak (Figure 3).

To examine the hen further, hold her back against your stomach, with her head slightly downward. From this position, you can check the hen for pigment loss in the back of the shank and bottom of the foot (see Figure 4). You can also look at the shanks and top of the toes (see Figure 5). They should be bleached through the hocks and top of the toes. Record your observations in your notes.

You have now looked for bleaching from the vent, eye ring, ear lobe, beak, the bottom of the foot, entire shank, hock, and top of the toes. Record the last area that has bleached. In other words, select the part of the hen that seems to be the last part that shows color when taking notes. If a hen has a white beak, white skin at the bottom of the foot but shows a good bit of yellow in the shank, that hen should be noted as bleached through the bottoms of the feet. After you observe all the hens you may wish to add more specific notes about the level of color (yellow) intensity in the shank or other areas.

Figure 3. Head of a Single Comb White Leghorn hen

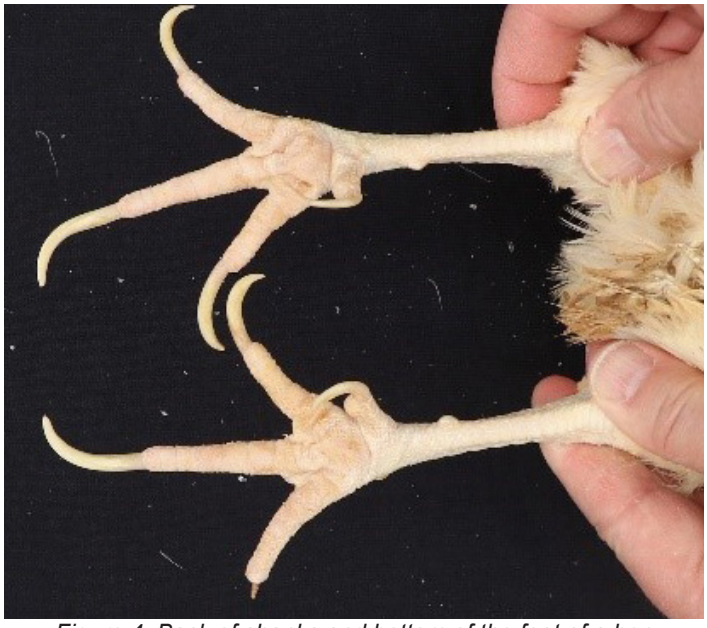


Figure 4. Back of shanks and bottom of the foot of a hen

Figure 5. Front of shanks and tops of toes of a hen

Figure 6. Hen with white shanks and a few bright yellow scales at the base of the shank

Figure 7. Hen with pale yellow in the shanks and scales that are not as bright at the base of the shank as those in Figure 6.

One area of confusion is the few heavy scales at the base of the shank that do not shed as quickly as the other scales. It is not uncommon for a hen that looks totally bleached in the shanks to have a few bright yellow scales at the base of the shank. It is important to consider the overall degree of pigment in the entire shank, not just a few bright yellow scales at the base of the shank. A hen with pearly white shanks and few bright yellow scales at the base of the shank (Figure 6) should be placed over a hen with pale yellow in the shanks and scales that may not be as bright at the base of the shank (Figure 7). So, do not consider the scales at the base of the shank as the main factor unless all other parts have a similar level of bleaching.

Remember to consider the pigment loss over the entire shanks (front, back, and sides) before making your notes. Pull the feathers back from the hock to see the last of the scales in this area. A few of them may have pigment. If you don't look, you can be fooled.

COMPARING A GOOD AND BAD LAYER

Vent

The good producer has a bleached vent (see Figure 8). Look at its outer edges of the vent. Notice its moistness. Also, the vent is large and oblong in shape. This is the appearance of the vent of a high-performing layer. Notice the yellow pigment in the vent of the poor producer (Figure 9). It has some moistness, but the vent is small and round.

Figure 8. The vent of a good layer with good bleaching.

Figure 9. The vent of a poor layer with considerable yellow pigment.

Face

There is total bleaching of the eye ring, ear lobes, and beak of the good layer (Figure 10). The comb and wattles are large, red, and glossy. Yellow pigment is present in all parts of the poor layer's head (Figure 11). The comb is small and pale.

Figure 10. Head of a good egg producer with no pigment in beak and eye ring.

Figure 11. Head of a poor egg producer with pigment remaining in beak and eye ring.

Feet

Turn the hen so you can observe the bottom of the feet and back of the shanks. Figure 12 shows the bottom of the feet and back of the shanks of a good layer. The bottom of the foot webs are pink and show a loss of yellow pigment. The back of the shank has bleached from the base of the shank to the hock. The color is in the web between the toes and next to the footpad. The footpad is often light-colored or stained from walking. There is no pigment to be seen in the area up to the hock (where fingers are holding the shank).

Figure 13 shows the back of the shank and bottom of the feet of a poor egg producer. There is a large amount of pigment in the bottom of the foot webs and toes. There is some yellow color at the bottom of the shank and on up to the hock.

Figure 12. Back of the shank and bottom of the feet of a good egg producer showing good bleaching.

Figure 13. Back of the shank and bottom of the feet of a poor egg producer showing considerable piogment remaining.

Figure 14. Front of the shanks and tops of toes of a good egg producer showing good bleaching.

Figure 15. Front of the shanks and tops of the toes showing considerable pigment remaining.

Turn the hen so you can see the front of the shank and top of the toes. Figure 14 shows the front of the shank and the top of the toes of a good egg producer. There is some yellow pigment at the base of the shank (where the shank meets the top of the toes). Some very good layers may never bleach this part of the foot. Start at the top of the shank and study the loss of pigment down the front toward the foot. The good layer has bleached this area of the shank.

Figure 15 is an example of a poor layer. Poor layers show intense pigmentation down the front of the shank and the pigmentation extends down over the tops of the toes.

Remember to consider the pigment loss over the entire shanks (front, back, and sides) before making your placings. Pull the feathers back from the hock to see the last of the scales in this area. A few of them may have pigment. If you do not look, you may miss pigment in this area.

The good producer is bleached in the hock and tops of the toes. Yellow is present in the hock and toes of the poor layer.

Remember, your placing is based on bleaching or pigment loss from the vent, eye ring, ear lobe, beak, the bottom of the foot, entire shank, hock, and top of the toes, in that order. The more parts that are bleached, in order, the more eggs the hen has laid. Hens with identical bleaching are split on abdominal capacity. abdominal fat condition, and molt.

Remember that Pigment loss is the most important factor in placing the class.

EXAMINING THE HENS FOR ABDOMINAL CAPACITY

Next, holding the hen in the palm of your hand, tipping the hen slightly forward to examine the abdominal capacity.

1. Place your hand gently over the vent opening and place your fingers between the pubic bones (bones located on each side of the vent) to see how many fingers fit between the two pubic bones. Count the number of fingers between the pubic bones. This is abdominal width. See Figure 16 which shows a two-finger width between the public bones.

2. Then place your index finger just below the bottom of the pubic bones and place as many fingers as you can between the bottom of the pubic bones and the rear tip of the keel bone. Count the fingers to find the abdominal depth. See Figure 17 which shows a four-finger depth between the tip of the keel and the pubic bones.

Record the number of fingers between the public bones and between the public bones and the rear tip of the keel. Always record width first and depth second for true comparisons. Record this information in your notes consistently to avoid mistakes. Depth is usually greater than width, but not always. You are using your fingers to help you make a comparison in the size of abdominal capacity among hens. DO NOT use the number of fingers when discussing hen abdominal capacity in oral reasons. The number of fingers does not matter as much as if there are differences in capacity between hens. Different people have very different finger sizes so a 2x3 capacity for one person may be a 3x5 capacity for someone with smaller hands. It is best to state that a hen has a “greater spread between the pubic bones and the keel bone” than the hens in the lower placing.

Figure 16. Hen with a two-finger width between pubic bones.

Figure 17. Hen with a four-finger width depth between the pubic bones and the tip of the keel.

EXAMINING THE HENS FOR ABDOMINAL FAT CONDITION

While holding the hen with its back against your stomach, pinch the skin on the abdomen between the vent and the tip of the keel (Figures 18 and 19). Pinch and roll the skin gently between the thumb and finger to feel its thinness. Feel the softness or hardness of the abdomen. Softness and thinness mean a lack of fat. Hardness and thickness mean fat in the abdomen. A soft, pliable abdomen will feel like you are pinching and rolling the skin on your cheek.

A lean, trim condition of the abdomen means good current production. Record this information in your notes. Good abdominal fat condition is usually expressed as “Thin and Pliable abdomen.” Poor abdominal fat condition is usually expressed as “Hard or Fat Abdomen.”

Figure 18. Hen with very little abdominal fat indicating she is a good egg producer

Figure 19. Hen with extra abdominal fat indicating she is a poor egg producer

EXAMINING THE HENS FOR MOLT

To observe molt, place the hen in the palm of one hand and pull the wing open like a fan with the other hand. The first ten long feathers closest to the wingtip are the primary feathers. The short feather in the middle is the axial feather. You can find the axial feather by running your index finger under the wing at the joint between the wingtip (metacarpus bone) and the wing flat (ulna bone) and gently pushing up. The long feathers in the wing growing between the axial feather and the hen's body are the secondary wing feathers.

The feathers that are most important to observe are the 10 primary feathers that grow on the outside of the axial toward the wing tip. Hens molt from the axial to the tip. Old feathers that have not molted will be worn on the ends and may be broken or dirty. New or molted feathers will have smoother ends and appear clean. They also may have different lengths if the hen is currently growing in new primary feathers. The good producer will have old, worn feathers, indicating she has not molted. A poor producer will have some short new feathers just outside the axial, showing she is now in a molt.

Some hens will continue to lay while molting, but usually at a much-reduced rate. This means they will have laid fewer eggs than those that have not molted. Preferably, a hen should not molt until she has completed 12-14 months of production.

Record information about any hens that are molting and how many feathers molted so you can mention this in your oral reasons. Although molt seldom helps you place your class, it may be helpful in giving a more complete set of reasons for a class.

Figure 20 illustrates what the wing feathers look like showing a normal wing with the axial feather dividing the primaries from the secondary feathers. Figure 21 is a wing with primaries 1 through 5 (counting out from the axial feather) being molted. The more primaries molted, the longer the hen has been out of production and the fewer eggs she has laid.

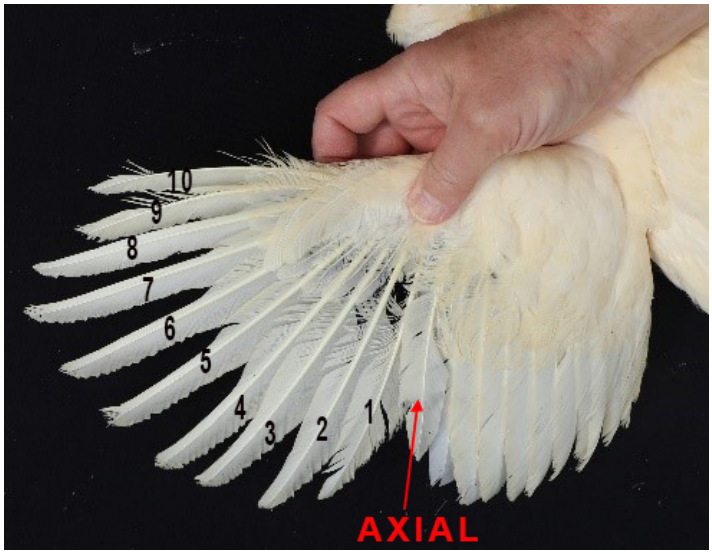


Figure 20. Wing of a chicken showing the ten primary feathers separated from the secondary feathers by the shorter axial feather.

Figure 21. Wing with new and developing primaries 1 through 5 (counting from the axial feather) during a molt. Feathers 6-10 are yet to molt.

PLACING A CLASS OF PAST PRODUCTION HENS

The following make-believe notes are used to demonstrate how this is done to make preparing oral reasons easier and more complete.

To place the class, the first rank the hens according to their pigment loss. Look at the notes. Hen number 2 is the only hen that is completely bleached through the hock and the top of the toes. This means she shows better past production and has likely laid more eggs than hen numbers 1, 3, and 4. She is placed first. Hen number 4 is placed second because she is bleached through the shanks but has some pigment on the top of the toes. Hen number 3, which is bleached into the shanks with some pigment in shanks and toes, is placed third. Hen number 1, with yellow shanks, has bleached only to the bottom of her feet, therefore she is placed fourth. The placing is now made ranking the hens 2-4-3-1.

HEN #1	HEN #2	HEN #3	HEN #4
P- Through bottom of the foot, most intense yellow in shanks	**P-** Throughout all parts, hock and the top of toes	**P-** Bleached well into the shanks, slight yellow over tops of toes and in shanks	**P-** Through shanks with slight yellow on toes
C- 1x2	**C-** 3x4	**C-** 2x4	**C-** 3x4
F- Fat, hard abdomen	**F-** Soft, pliable abdomen	**F-** Soft, pliable abdomen	**F-** Fat, hard abdomen
M- One feather in each wing	**M-** None	**M-** None	**M-** None
Notes: Small, pink comb	**Notes:** Bright eye, large red comb	**Notes:**	**Notes:**
Class placing: 2 - 4 - 3 - 1			

PREPARING ORAL REASONS

Like anything else, to become comfortable and proficient at oral reasons, you will need to practice with multiple and different classes. It is important to become comfortable giving reasons that discuss each specific class of hens you judge. Memorizing one set of reasons and using them for any class you judge is not appropriate and will be recognized by the reasons judge and will not score well. The reasons must be specific to the class you judged.

The contestants should wear business casual (professional) clothing that is comfortable and does not have anything that would identify your name, your club, or state to the judges. DO NOT wear hats or chew gum in the reasons room. Practice speaking at a confident, steady rate and at a volume that the judges can hear everything you say. Avoid long pauses, talking too fast, or speaking so loudly that it seems like you are shouting at the judges. Use proper terminology for the contest and only stress the key differences in the class. Adding a few comments that demonstrate your knowledge of the factors as they fit the class is okay if they are to the point.

A few points to avoid when preparing and giving reasons.

- Do not discuss the number of fingers between the pubic or pubic and tip of the keel. Discuss specifically where the spread is greater between two hens. The number of fingers does not matter since your fingers are of a different size than the judges.
- Do not recite the order of pigment loss for each pair.
- Do not try to tell the judges how many eggs the hen has laid or how long you think the hens have been in production.
- Do not talk about points that do not matter in the placing of the class (i.e., pretty feathers, nice personality, cleaner feet, etc).
- Have a solid understanding of the factors in judging the production hen class. Judges often will ask a question to know you understand the specific factors in placing a class.

As you prepare your reasons, think of organizing the reasons as a short news article. Give an opening statement to catch the judges' attention. Then give a short introduction to the main points of the first pair of hens in the placing. Then give a short paragraph discussing the details of the key differences. Do this with each pairing: 1st with 2nd place, 2nd with 3rd place, 3rd with 4th place. Mention the last place hen and any factors that were not used in the placing of your class and finish with a closing statement.

As you read the following set of reasons, study how each note describes the class, justifies a placing, describes a hen, or compares two hens. Notice how the terms bleaching, pigment loss, past Production factor, current production factors, abdominal capacity, abdominal fat condition, and molt are used.

Example of a set of oral reasons for the make believe notes on the previous page. Colors coincide with structural suggestions from the prior section.

Example of a set of oral reasons

Good Morning:

I am Contestant number 10. I place this class of White Leghorn production hens 2-4-3-1. I had a definite top pair, close middle pair, and an easy bottom pair.

I place hen number 2 at the top of the class and over hen number 4 because of pigment loss and Abdominal Fat Condition.

Hen number 2 is totally bleached through the hock and the tops of the toes. This indicates that hen number 2 displays the best past production in this class. Hen number 2's abdomen is soft and pliable, while hen number 4 has a hard abdomen showing signs of fatty deposits. Both hens had a similar abdominal capacity. Both hens had red and waxy combs.

I place hen number 4 second and over hen number 3 because of pigment loss and abdominal capacity.

I found that hen number 4 has slightly less pigment on her shanks than hen number 3. Hen number 4 also had a greater spread between the pubic bones than did hen number 3. I grant that hen number 3 has a softer and more pliable abdomen than hen number 4. However, I still placed hen number 4 over hen number 3 because hen number 4 has the best past production as shown by greater bleaching.

In the easy bottom pair, I placed hen number 3 over hen number 1 because of pigment loss, abdominal capacity, and abdominal fat condition.

Hen number 3 shows pigment loss in the shanks while hen number 1 has only bleached through the bottom of the foot and shows intense pigment over the entire shank. Hen number 3 also had a better abdominal capacity with a greater spread between the pubic bones and the pubic and keel bones than hen number 1. Hen number 3 has a softer abdomen, whereas hen number 1 has a hard, fat abdomen.

I placed hen number 1 last because she lacks Past Production traits as shown by the intense pigment in her shanks. Hen number 1 also lacks current production traits, because of her small capacity and fatty abdomen.

Although molt was not a factor in the placing of this class Hen number 1 showed a one feather molt in both wings.

All the hens showed signs of good health and vigor.

For these reasons, I placed this class of White Leghorn production hens 2-4-3-1. Thank you. Are there any questions?

SUMMARY

Remember, hens ranked for past production are first placed on pigment loss, then abdominal capacity, followed by the abdominal fat condition, and, finally, molt. Pigment loss indicates the past production traits or the number of eggs laid. A large abdominal capacity goes with high egg production. Good abdominal fat condition is characterized by the hen's leanness and trimness. Signs of molt mean the hen stopped or slowed her current production and did not lay as many eggs as she should have. These four factors are the keys to judging hens for past egg production.

MARKET POULTRY
IDENTIFICATION OF READY-TO-COOK POULTRY PARTS

Further processing of whole carcasses has allowed poultry to be sold in many forms. Identifying poultry parts commonly found in a retail store is important to the consumer. Below are photographs and definitions for 24 of the more common chicken parts found in a meat display case. Parts from any of the three weight groups (broilers, heavy broilers, and turkeys) may be used in the contest.

1. Whole Breast

The WHOLE BREAST is the intact breast separated from the remainder of the chicken at the junction of the vertebral and sternal ribs. The sternal ribs remain attached to the breast bone and the vertebral ribs are attached to the back. May be displayed with skin-side up or skin-side down.

2. Breast with Ribs

The BREAST WITH RIBS is the intact breast separated from the backbone at the juncture with the back. The entire rib cage is attached to the breast. It may be displayed with the skin side up or skin side down.

3. Breast Quarter

The BREAST QUARTER is half of the breast with the wing and back portion attached.

4. Breast Quarter Without Wing

As the name indicates, the BREAST QUARTER WITHOUT WING is the breast quarter with the back portion attached, but without the wing.

5. Split Breast

The SPLIT BREAST is the whole breast cut in half parallel to breast bone to create approximately two equal halves. One or both halves may be displayed with or without ribs.

6. Boneless Breast

The BONELESS BREAST is the whole breast with the bones removed. The skin can be attached or removed.

7. Boneless Split Breast

The BONELESS SPLIT BREAST is a half breast with the bones removed. The skin can be attached or removed.

8. Tenderloin

The TENDERLOIN is the inner pectoral muscle that lies up against the keel bone. It is the long slender muscle that is removed from the inner portion of the breast meat.

9. Leg Quarter

The LEG QUARTER is thigh and drumstick with a portion of the back attached.

10. Whole Leg

The WHOLE LEG is the thigh and drumstick with the back portion removed. The ribeye muscle or ‘oyster’ may be attached. The oyster is the piece of meat on the back that lies just in front of the hip joint. The tail may or may not be removed

11. Thigh with Back

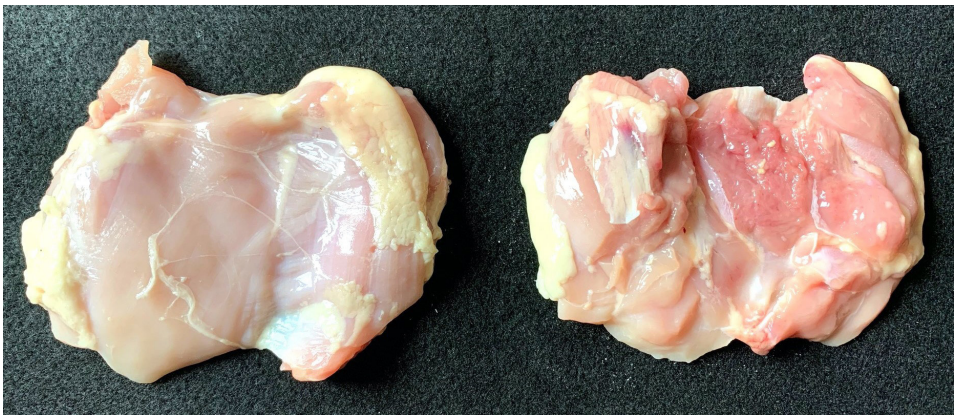
The THIGH WITH BACK is the upper portion of the leg quarter that is separated at the knee and includes part of the back beyond the hip joint

12. Thigh

The THIGH is the upper portion of the whole leg that is separated at the knee and hip joints. The back portion is not attached.

13. Boneless Thigh

The BONELESS THIGH is the whole thigh with the bone removed. The skin may or may not be attached.



14. Drumstick

The DRUMSTICK is the lower portion of the leg that is separated at the hock and knee joints.

15. Boneless Drumstick

The BONELESS DRUMSTICK is the lower portion of the leg that is separated at the hock and knee joints with the bone removed. The skin may or may not be attached.

16. Whole Wing

The WHOLE WING is the entire wing with all muscle, bone, and skin attached except that the wingtip may be removed.

17. Wing Drumette

The WING DRUMETTE is the part of the wing between the second and third joint (shoulder).

18. Wing Flat

The WING FLAT is the part of the wing between the first and second joints of the wing. This is the part of the wing with two bones between the wingtips and the drumette.

19. Back

The BACK is the back of the carcass beginning at the base of the neck and extending back to the tail. It includes the vertebral ribs, hip bones, and attached flesh. All or portions of the oyster may also be attached. The oyster is the piece of meat on the back that lies just in front of the hip joint. The tail may or may not be removed.

20. Neck

The NECK is composed of the neck bones with flesh attached. The skin may or may not be present.

21. Paws

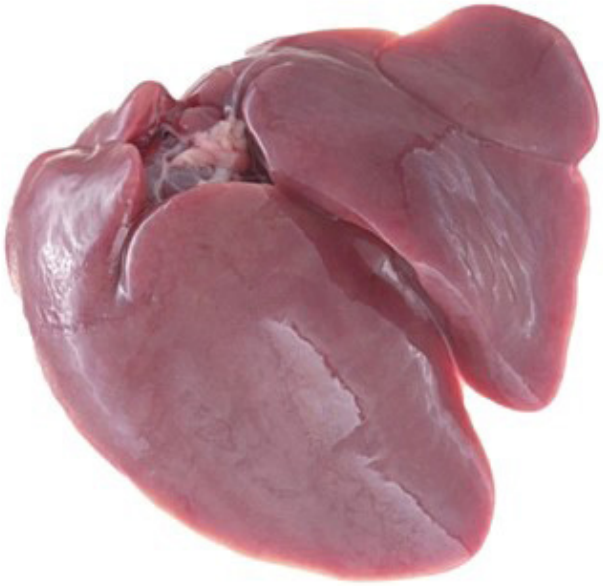
PAWS is the whole foot with the cuticle removed and cut midway to the hock joint.

22. Gizzard

The GIZZARD is the thick-walled muscular organ that has been cross-sectioned into two halves.

23. Liver

The LIVER is the reddish-brown, wedge-shaped organ with four lobes of unequal size and shape.



24. Heart

The HEART is the triangular-shaped, four-chambered muscular organ.

MARKET POULTRY
GRADING READY-TO-COOK POULTRY CARCASSES

Ready-to-cook (RTC) carcass grade scoring is based on the USDA quality grades A, B, and C. No Grade (NG) is an option only if the carcass has a major defect that exceeds meat removal that is allowed for a C grade. Factors used in judging ready-to-cook carcasses and parts in a 4-H Poultry Judging Contest are:

1. Exposed Flesh
2. Missing Parts
3. Disjointed and Broken Bones

Always select your score based on the lowest grade defect found on each carcass or part.

Because of the length of most judging contests, carcasses will dry out. You should not grade carcasses based on off-color areas that appear bruised, dried out, or discolored. In addition, feathers and pin-feathers are not used as a quality factor when carcass grading.

Carcasses used for contests will usually have Grade A fleshing, conformation, and fat cover. You should, however, be prepared to recognize poor fleshing and finish if such carcasses are available for a contest.

The carcasses you judge will be hanging from shackles. This method is used to make it easier to see all parts of the carcass. **Carcasses cannot be touched or handled during judging events.** It is permissible to turn the shackle to see the entire carcass as long as you do not touch the carcass. You can also tilt the shackle to check for broken bones. The carcasses can be hung from both legs, or just one (see Figure 1). If you do not have shackles for practicing and the ready-to-cook carcasses are placed on plates, judge the carcasses based on what you can see.

Figure 1. Ready-to-cook carcasses hung from shackles either by both legs (left photo) or one leg (right photo)

Ready-to-cook carcasses will be judged according to the quality specifications in Table 1. Table 1 includes three weight categories for determining the size of exposed flesh on the different parts of the whole carcasses. In a 4-H poultry judging contest, however, only the first two weight classes will be used. There are no weight ranges for missing parts, disjointed, and/or broken bones.

Learn a method of judging carcasses by looking at one part at a time. By definition, the six parts of the carcass are; each wing (2), each leg (2), the entire breast (including the rib area), and the entire back (width of the hip joints to the width of the wing joints).

EXPOSED FLESH

Cuts, tears, and trims are a result of a mis-cut or tearing of the skin during a processing operation. When ready-to-cook carcasses are downgraded for cuts, tears, and trims, it is based on the amount of exposed flesh, weight of the carcass, and the part where the exposed flesh occurs. The length of a cut or the amount of flesh showing on the part determines the grade. Cuts, tears, or trims must be completely through the skin so that the meat, called flesh, can be seen before putting the carcass in a lower grade.

Injection marination is a common practice for many poultry processors. **Marination injection marks should not be considered if they appear on carcasses and parts within a contest.** The presence of the marks will be announced by the contest officials during the contest orientation.

The grade is determined by the amount of exposed flesh as the length of the cut or amount of skin missing (Table 1).

Sometimes a carcass or part may have more than one cut, tear, or trim. When there is more than one exposed area on a particular part, add the length or amount missing to determine the grade based on that part only. Cuts and tears in the flesh are cumulative on a given individual part, but they are NOT cumulative across multiple parts. Each part is graded separately and the grade is determined by the part having the lowest grade on the carcass.

Figure 2 shows some typical cuts and tears resulting in missing skin (or exposed flesh) on the breast of 2-6 lb. carcasses. The Grade A carcass is permitted to have only cuts or tears on the breast that total less than 1/4 inch and no missing skin. The Grade B carcass can have up to 1/3 of the flesh on the entire breast exposed. The Grade C carcass has more than 1/3 of the flesh exposed on the entire breast.

Table 1. Summary of USDA specifications for standards of quality for individual whole carcasses

FACTOR		A Quality		B Quality	C Quality	No Grade
Exposed Flesh **Carcass weight** **Min**	**Max**	**Breast and Legs**	**Elsewhere (wing and back)**	**Entire carcass**	**Entire carcass**	**Entire carcass**
> 2 lb.	6 lb.	¼ inch	1½ inches	No more than ⅓ of the flesh exposed normally covered by skin exposed	Over ⅓ of the flesh exposed normally covered by skin No limit on exposed flesh provided meat yield not affected	Flesh removed from any part in which the normal meat yield is materially affected (>⅛ inch deep and diameter of a quarter coin or larger)
> 6 lb.	16 lb.	½ inch	2 inches			
> 16 lb.	none	½ inch	3 inches			
Disjointed and broken bones		1 disjointed No broken bones		2 disjointed *or* 1 disjoint and 1 non-protruding broken *or* 1 non-protruding broken	Any protruding broken or cut bones No limit on disjoints or broken bones	N/A
Missing parts (whole carcass only)		Wing tips Tail removed at base		Wing to 2nd joint Tail and back area not wider than base of tail and extending up to halfway between base of tail and hip joints	Wing to 3rd joint (entire wing) Tail and back area not wider than base of tail extending up to hip joints	Back area removed wider than the base of the tail and/or extending beyond the hip joints Flesh removed from any part in which the normal meat yield is affected (>⅛ inch deep and diameter of a quarter coin or larger)
The parts of the carcass shall be: each wing (2), each leg (2), the entire breast (including rib area), and the entire back (width of hip joints to the width of the wing joints).						

Figure 3 shows deep cuts on various parts of a carcass that remain Grade B based on the amount of exposed flesh. **Cuts on the carcass that are deeper than 1/8 inch without any meat removal will not change the grade beyond what is designated for the exposed flesh.**

A trim is when meat is removed. Trims that do not exceed 1/8 inch in thickness (approximately the thickness of a nickel coin) and the area of 0.75 inches in diameter (approximately the size of a quarter coin) do not affect the grade. **Any time meat is removed from the breast and legs of the carcass that exceeds these parameters, the carcass would be marked as a NO GRADE.** Figure 4 shows trims on carcasses where the meat yield is affected.

Parts such as wings and the back portion (considered 'elsewhere') on a 2-6 lb. carcass can have a cut or tear up to 1½ inches for a Grade A carcass. Grade B carcasses are allowed to have up to 1/3 of the flesh exposed. Any part with more than 1/3 flesh exposed on the entire part is a Grade C carcass. Length, such as that from a knife cut, is as important as the width that is a result of a tear in determining carcass grade. Figure 5 shows examples of back and wing cuts with the corresponding grade.

Refer to Table 1 for the section on cuts and tears for the lengths and amount of exposed flesh that is allowed. If a cut is less than 1½ inches in the wing of a 2-6 lb. carcass (Grade A) and also cuts into the meat more than 1/8 inch or the trim

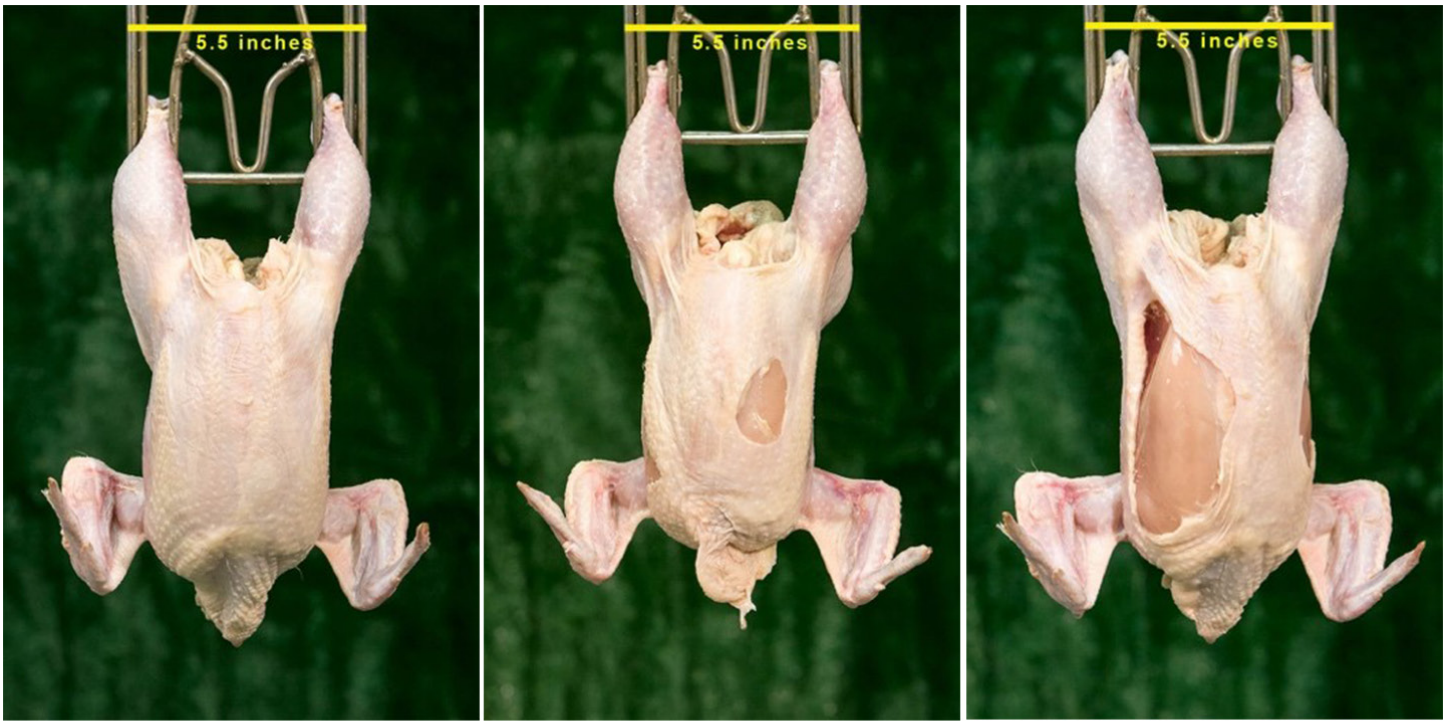


Figure 2. Grading carcasses based on cuts and tears on the breast.

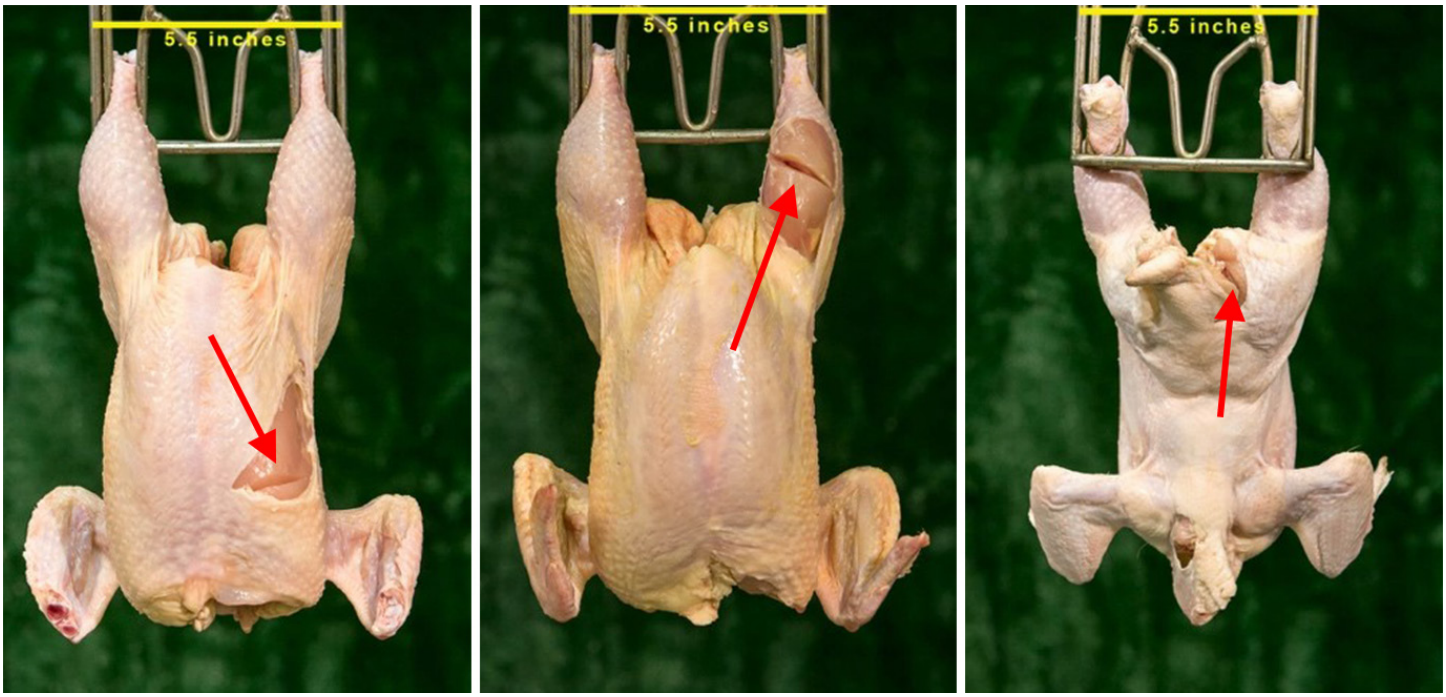


Figure 3. Grade B carcasses based on cuts deeper than ⅛ inch without meat loss where the grade is not altered.

appreciably alters the appearance, the carcass should still be graded by the size of the exposed flesh since it is a part that can be removed.

Processing cuts near the vent and/or breast opening less than 1-inch beyond the opening are acceptable and should not be considered in grading the carcass. If a processing cut is larger than 1-inch, as demonstrated in Figure 6, downgrade the carcass to a Grade B.

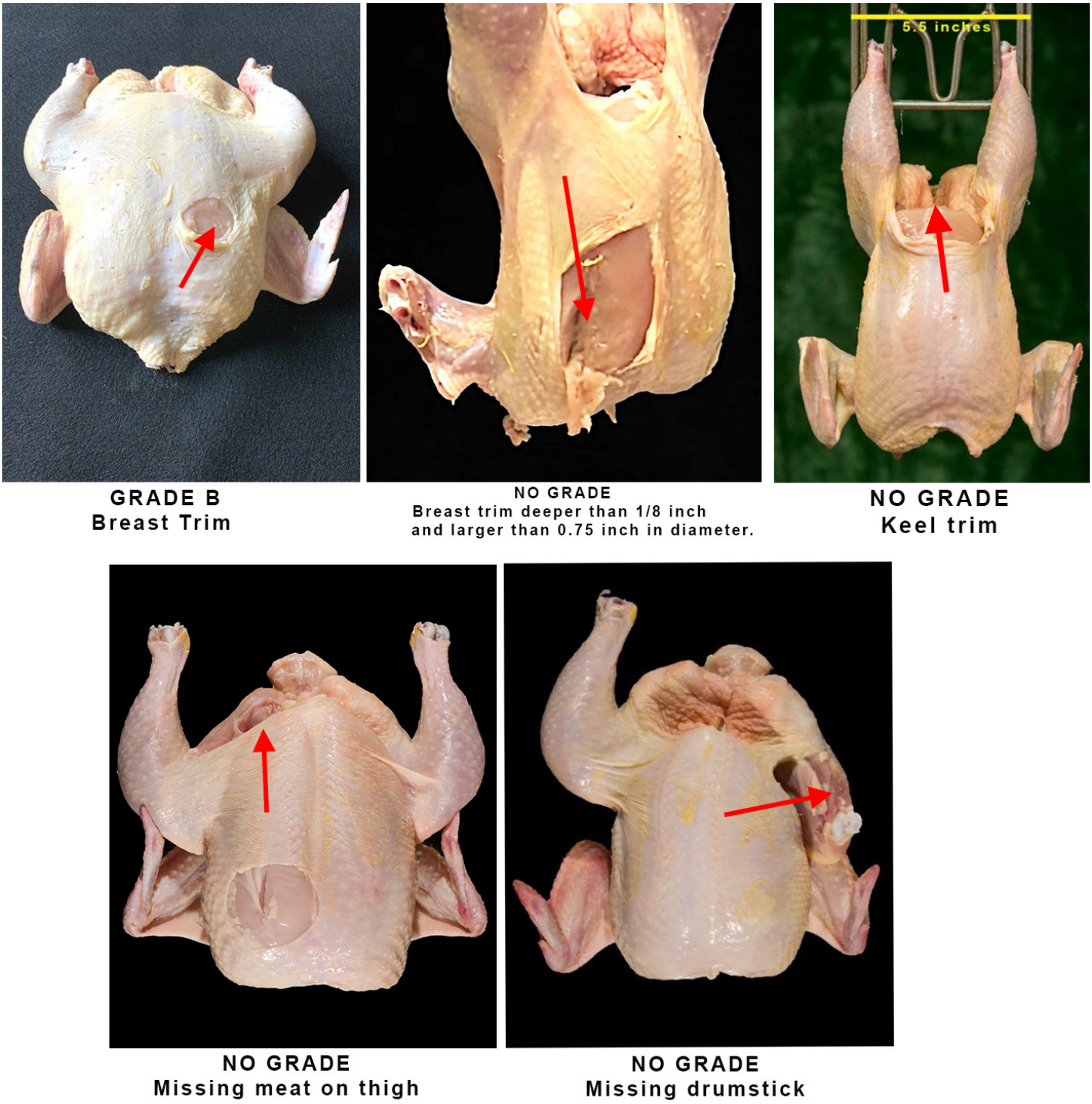


Figure 4. Different carcass grades based on meat trim where meat yield may be altered.

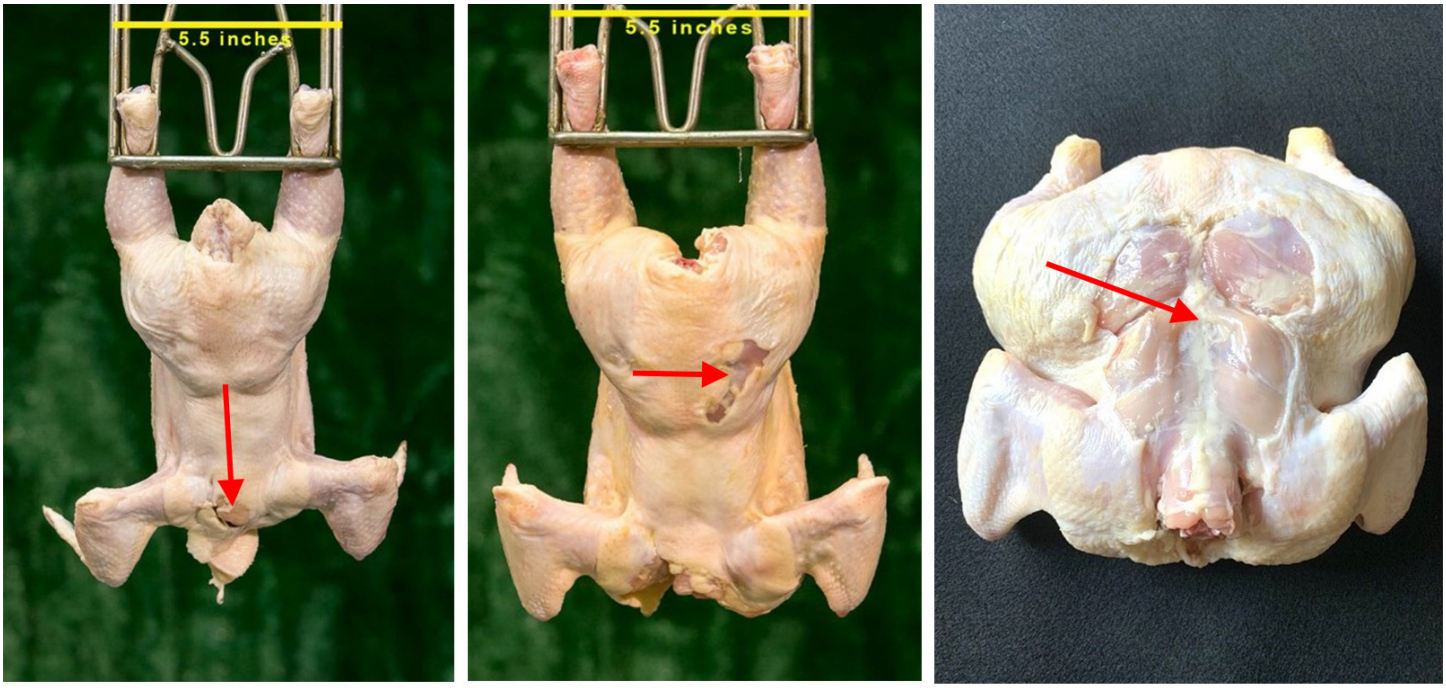


Figure 5. Grades based on cuts and tears on the back or wing.

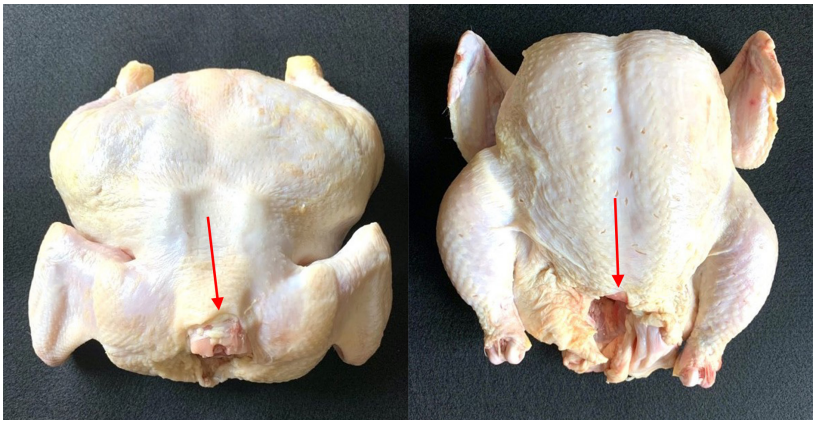


Figure 6a. Grade A carcasses with processing cuts at the neck (left) or tip of the keel (right). Note: Ignore all marination injection marks on the breast)

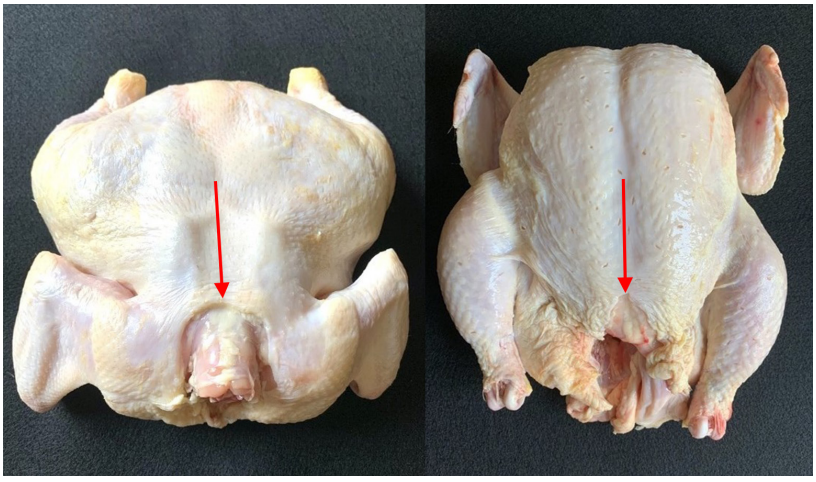


Figure 6b. Grade B carcasses with processing cuts at the neck (left) or tip of the keel (right). Note: Ignore all marination injection marks on the breast)

MISSING PARTS

Missing parts to be considered in judging are the wings, tail, and back. Carcass weight is not a factor when judging for missing parts.

Use the lowest grade that you see for the wings, tail, and back that may be missing. **Any part, or flesh missing from anywhere else, and the carcass will be considered a NO GRADE.** The NO GRADE designation implies a loss of marketable product and is intended for excessive trim beyond what is designated for the A, B, or C grades (allowable loss of wings and back areas). Excessive trim of a wing into the breast muscle, or tail trim wider/deeper than that which is allowed for a Grade C, would result in a NO GRADE designation. For example, if significant meat (deeper than 1/8 inch and larger than 0.75 inches in diameter) is missing from the breast as the result of an excessive wing removal, or the tail is cut wider than the base of the tail or is cut beyond the hip joints, the carcass should be considered a NO GRADE.

A Grade A carcass can have one or both of the wing tips removed. The Grade B carcass would be missing one or both of the wings to the second joint. A Grade C carcass will have one or both whole wings cut off cleanly at the juncture of the body without removing breast meat. A NO GRADE carcass has breast meat trimmed with the removal of the whole wing. See Figure 7 for different examples.

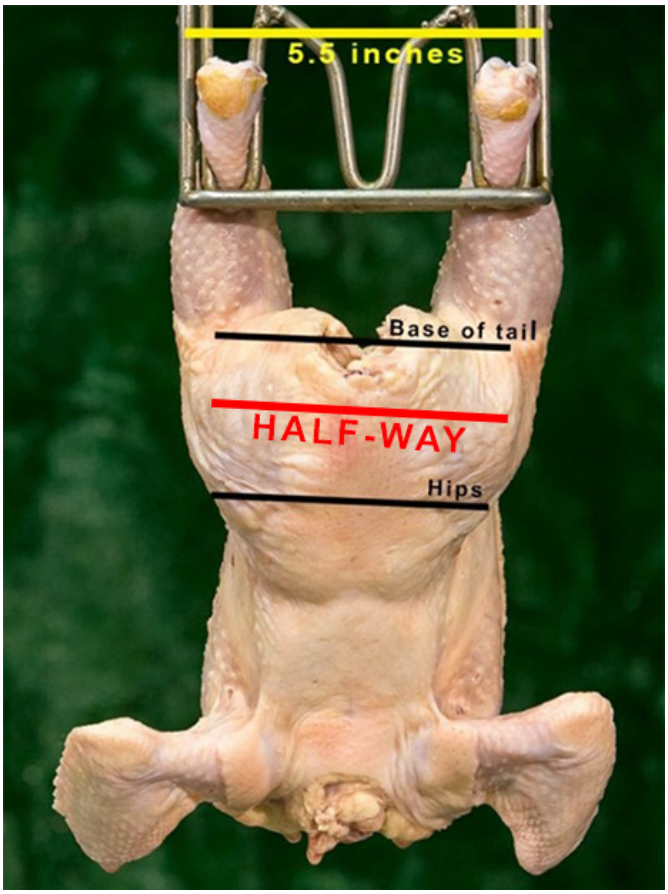


Figure 8a. Anatomical references for missing back portions.

GRADE A
Missing one wingtip

GRADE B
Missing wingtip plus flat section

GRADE C
Missing entire wing

NO GRADE
Breast trim with wing removed

Figure 7. Carcasses with different grades based on missing wings

A photo showing the anatomical reference points for the tail and back is found in Figure 8a. Figure 8b shows examples of carcass grades based on tail and back removal. The Grade A carcass has the tail removed at its base. For the Grade B carcass, the back area, not wider than the tail's base and halfway to the hip joint is removed. The Grade C carcass has the back area removed not wider than the tail's base and extended beyond the hip joints. **The NO GRADE carcass has been trimmed wider than the base of the tail resulting in meat loss.**

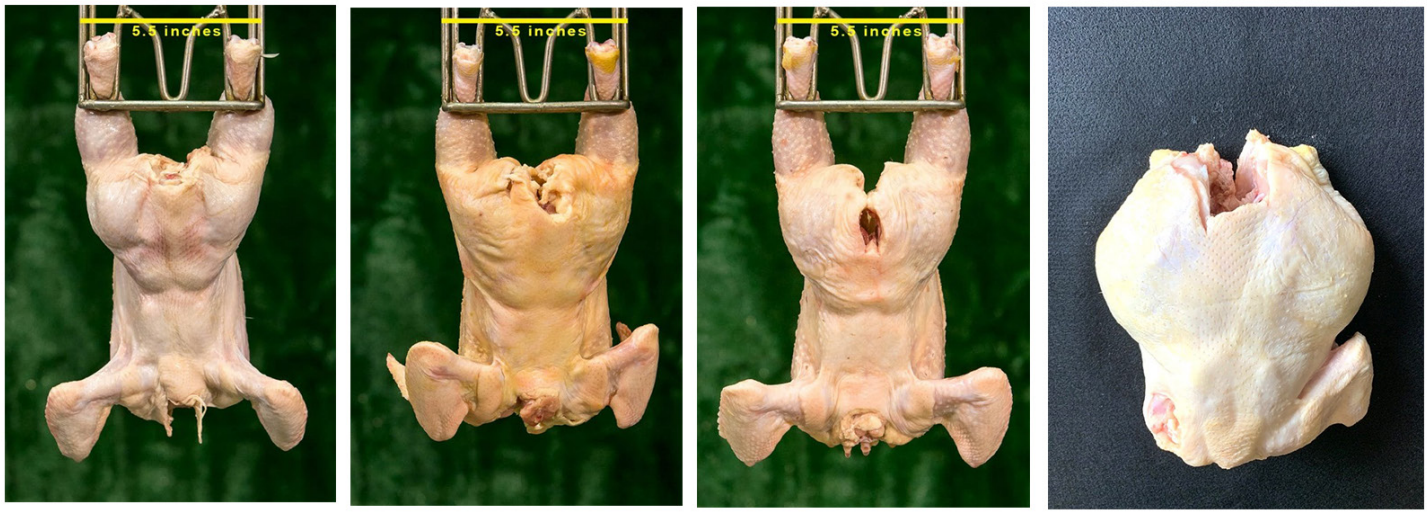


Figure 8b. Carcass grades based on missing tail and back portion.

DISJOINTED AND BROKEN BONES

A disjointed bone is where the ball end portion of a joint is out of the socket. In other words, the part that is disjointed is still whole and not broken. You may be able to see the end or ball portion of the joint underneath the skin.

Broken bones occur between the two ends of a bone and are typically not associated with a joint. They can be broken such that the bone either does or does not come through the skin. When the broken bone does not come through the skin it is called non-protruding. When the broken bone ruptures through the skin, it is referred to as a protruding bone. The wing tips will not be considered for disjointed or broken bones.

As listed in Table 1, a Grade A carcass can have one disjointed, but no broken bones. A Grade B carcass can have either two disjointed bones or one disjointed and one non-protruding broken bone. If the broken bone is in the wing mid-joint it is considered one broken bone even though there are two bones present. More than two disjointed or non-protruding broken bones, or any protruding broken bones, would make the carcass a Grade C. Figure 9 shows some examples of broken and disjointed bones that you may see on carcasses.

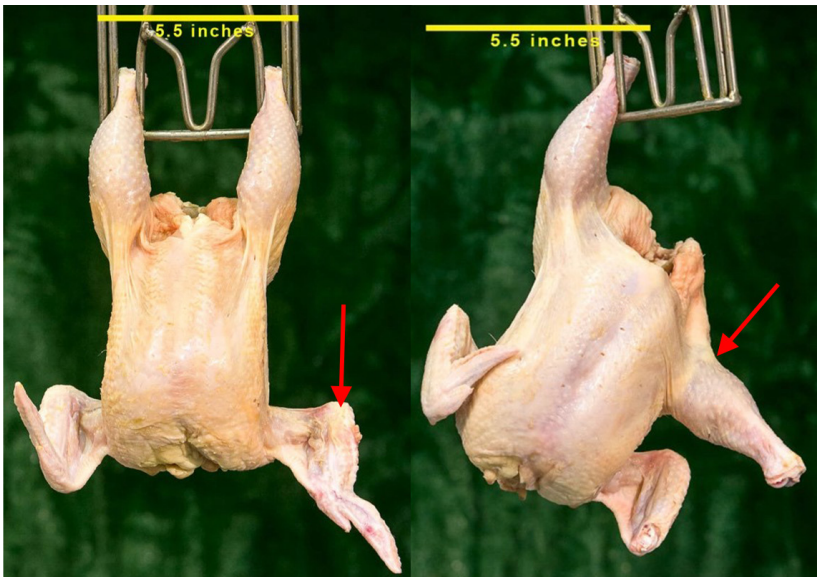


Figure 9a. Grade A carcasses each with one disjoint (wing in left photo and leg in the right photo). Compare the way the wings and legs hang when there are no disjoints (Figure 1).

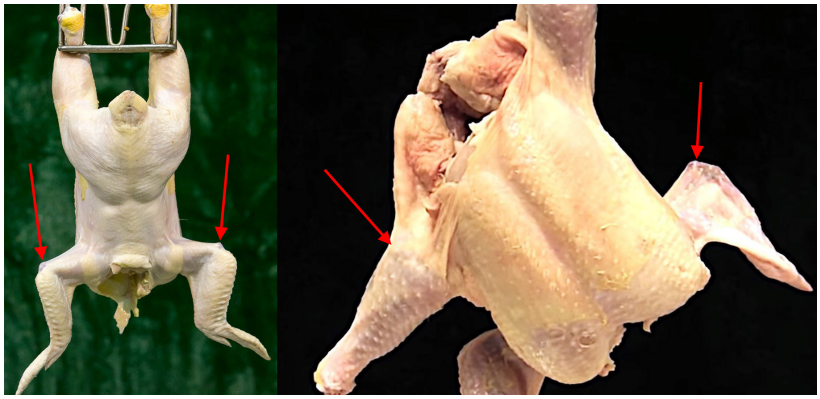


Figure 9b. Grade B carcasses each with two disjoints (both wings in left photo and one wing and one leg in right photo)

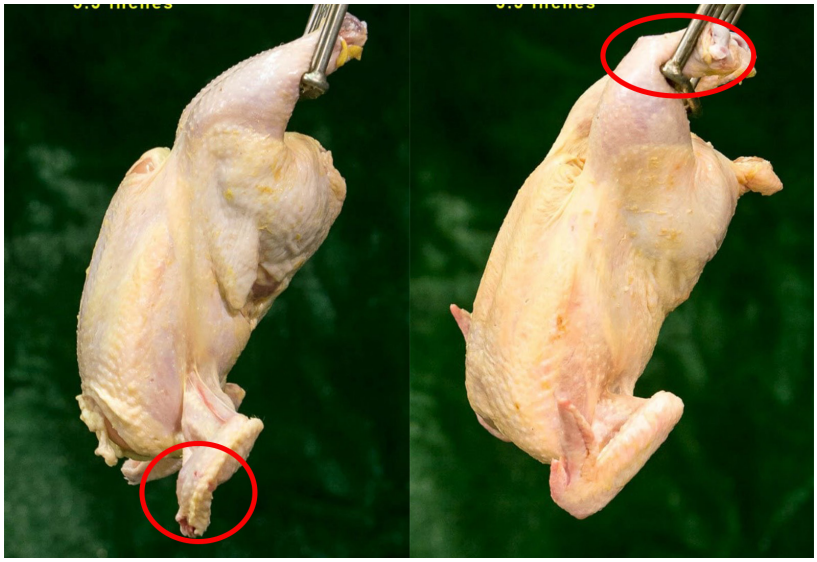


Figure 9c. Grade B carcasses each with one broken, non-protruding bone (broken wing in the left photo and broken drumstick in right photo)

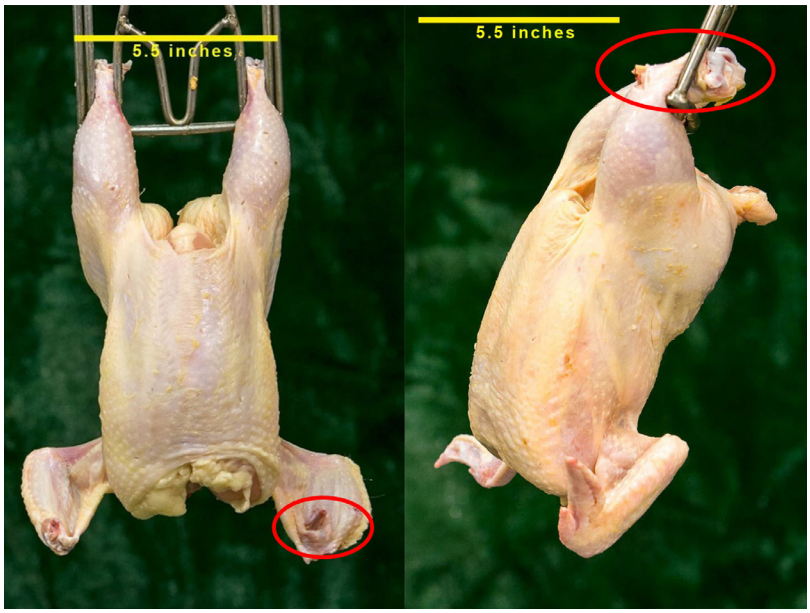


Figure 9d. Grade C carcasses each with one broken, protruding bone (broken wing in the left photo and broken drumstick in right photo)

MARKET POULTRY
GRADING READY-TO-COOK POULTRY PARTS

Ready-to-cook poultry parts are graded with a slightly different set of standards (see Table 1). Parts for any weight category can be used (broiler, heavy broiler, and turkey). To make parts grading standards more uniform and less confusing, we are only allowing the following parts to be used in the RTC parts grading class in 4-H:

1. Breast Quarter
2. Breast Quarter without Wing
3. Leg Quarter
4. Whole Leg
5. Thigh
6. Thigh with Back
7. Drumstick
8. Whole Wing
9. Wing Drumette
10. Wing Flat

Table 1. Summary of USDA specifications for standareds for quality for individual ready-to-cook parts.

FACTOR	A Quality	B Quality	C Quality	No Grade
All Parts* 2-6 lb. 6-16 lb. > 16 lb.	 ¼ inch ½ inch ½ inch	< ⅓ of the flesh on each part	> ⅓ of the flesh on each part A moderate amount of meat may be trimmed around the edge of a part to remove defects	Flesh removed from any part in which the normal meat yield is affected (>1/8 inch deep and diameter of quarter coin or larger)
Disjointed and broken bones	Thighs with back, leg quarters may have femur disjointed from hip joint	Wings may be disjointed	No limit	
*** For all parts, trimming of skin along the edge is allowed, provided that at least 75% of the normal skin cover associated with the part remains attached, and the remaining skin uniformly covers the outer surface and does not distract from the appearance of the part.**				

PARTS: EXPOSED FLESH

For all parts, trimming of skin along the edge is allowed, provided at least 75 percent of the normal skin cover associated with the part remains attached, and the remaining skin uniformly covers the outer surface and does not detract from the appearance of the part.

The amount of exposed flesh allowed on a Grade A poultry part depends on the weight category. For broilers (2-6 lb.), only allowed a ¼ inch cut in the skin is allowed for a part to stay a Grade A (see Figure 1). For the higher weight categories, the limit is ½ inch.

Grade B parts are graded the same for skin trim or removal as whole carcasses with up to 1/3 of the flesh on the entire part exposed (see Figure 2), and the Grade C carcass has more than 1/3 of the flesh showing on a given part (see Figure 3). A moderate amount of meat may be trimmed around the edge of a part to remove defects without affecting the grade. **However, if an appreciable amount of flesh is removed from any part in which the normal meat yield is materially affected, the part should be graded as a NO GRADE.**

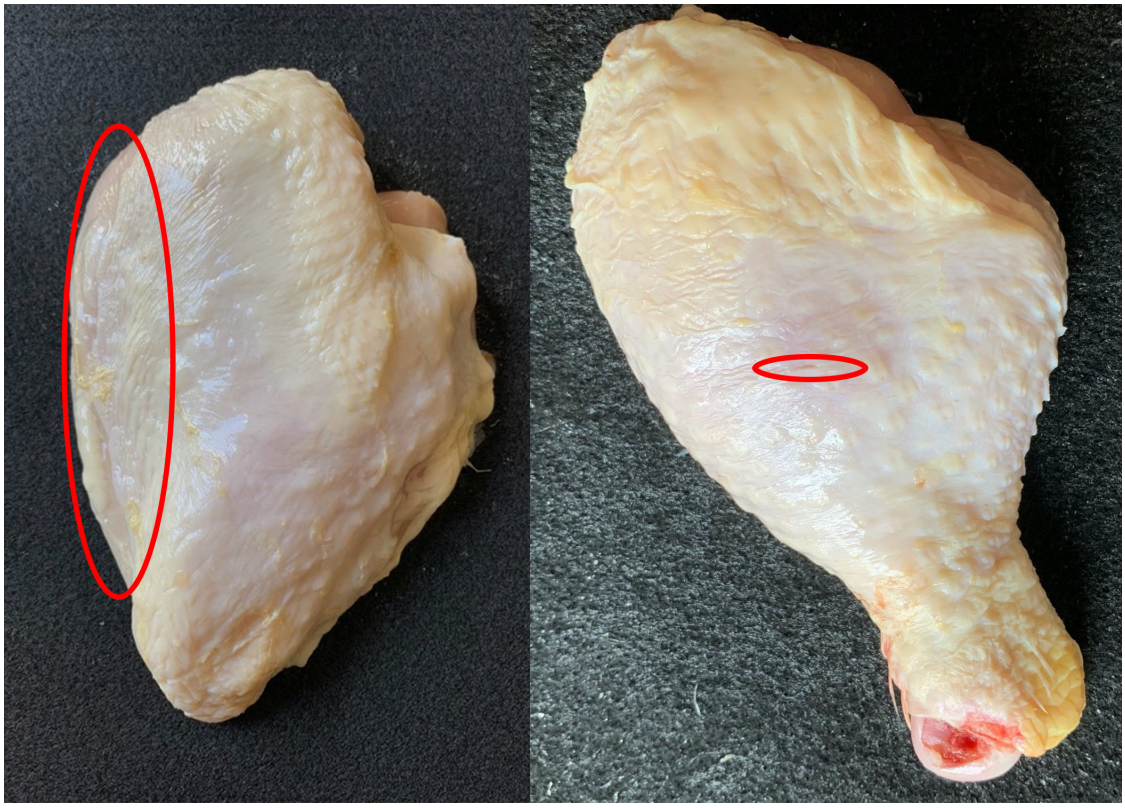


Figure 1. Grade A parts (breast quarter without wing and drumstick) with exposed flesh less than ¼ inch

Figure 2. Grade B parts (breast quarter without wing on the left and drumstick on the right) because of excessive skin trim along the edges (more than ¼ inch but less than ⅓ of the part)

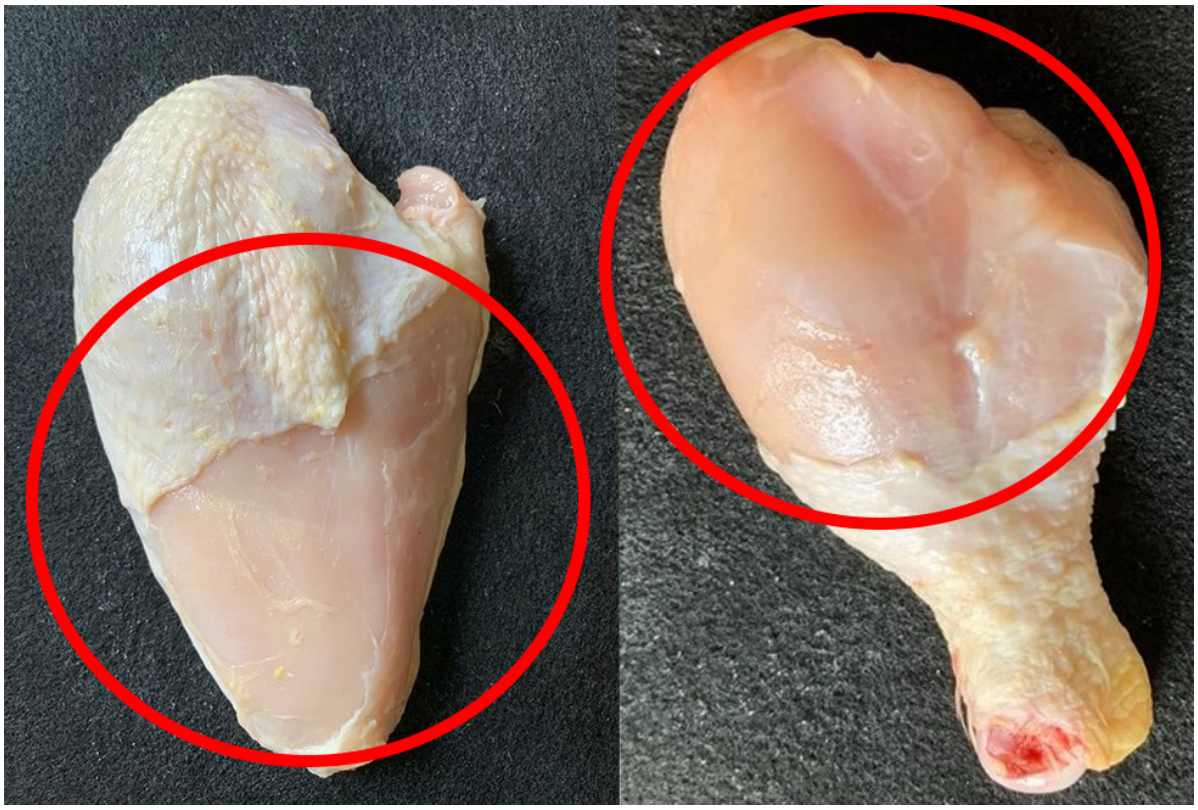


Figure 3. Grade C parts (breast quarter without wing on the left and drumstick on the right) with greater than ⅓ of the flesh missing

PARTS: DISJOINTED BONES

Thighs with back, whole legs, leg quarters, and whole wings are the only parts for possible disjoints. Grade A 'leg quarters' and 'thigh with back' may have the femur disjointed from the hip socket. Whole wings are not allowed to have a disjoint and remain a Grade A. **Any disjointed whole wings are automatically Grade B** (see Figure 4).

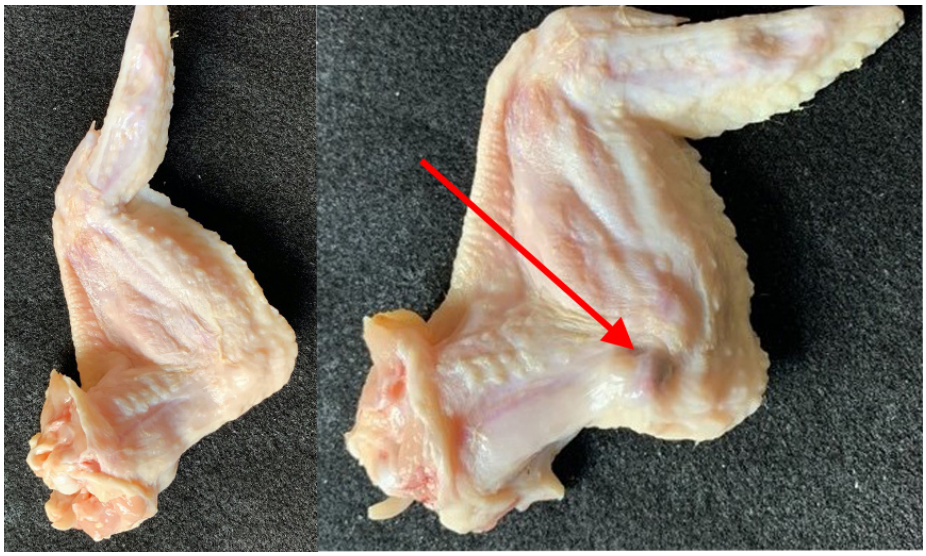


Figure 4. Grade A (left photo) and Grade B (right photo) wings based on the presence of a disjoint. Any disjoint in a wing automatically results in a Grade B part.

PARTS: DISJOINTED BONES

NO broken bones are allowed for Grade A or Grade B Parts. Any parts with a broken or cut bone are automatically assigned a Grade C. Figure 5 shows examples of miscuts on drumsticks that make them a Grade C.

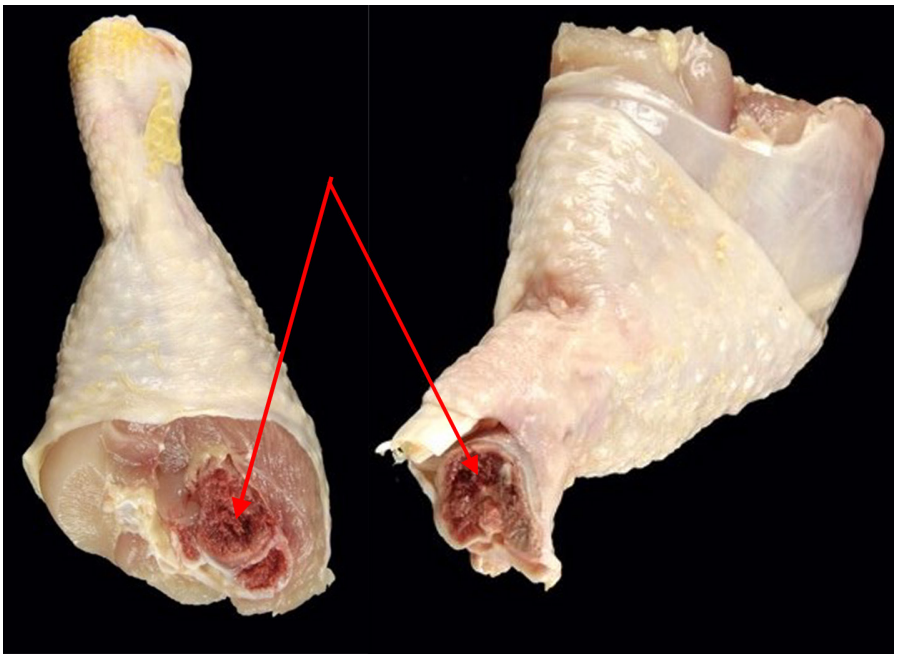


Figure 5. Grade C drumsticks based on cuts into the bone.

MARKET POULTRY
EVALUATING FURTHER PROCESSED POULTRY PRODUCTS

The 4-H poultry judging contest includes a class on breaded, boneless, processed poultry products. Boneless further processed poultry meat products are common in retail markets (e.g., precooked, poultry meat patties, tenders, nuggets, or other boneless products). The products will be displayed singly or in groups of three in order to help determine uniformity.

Criteria for evaluation of boneless, breaded products will include:

1. Coating defect
2. Consistency of shape/size
3. Cluster/aggregation of products
4. Completeness of products
5. Evidence of foreign material

1. COATING DEFECTS

COVERAGE

The thickness and evenness of the breading and how well it adheres to the surface of the meat are the most important factors when determining coating coverage. The product surface should be completely covered with a uniform texture and appearance. This defect **must be a continuous void** that exceeds the allowed limit of breading voids: >¼ inch on tenders and nuggets; and >½ inch on patties. Voids on a single product are not added together. If three pieces are shown, the amount of void is not additive over the three pieces.

COLOR

Boneless poultry products are breaded for taste and customer appeal. Typically, a golden-brown color is expected. Subtle differences are normal during the production of breaded products. You should expect the color to be uniform across all products displayed in a group as established by two or more of the products displayed. If one of the products is noticeably darker or lighter than the other two products, it is a color defect. For single items, the color should be uniform across the entire item and should not contain dark, burnt areas, or other contrasting colors in the coating of the product.

Figure 1. A chicken patty with a continious void greater than ½ inch in diameter. The defect would be listed as a COATING DEFECT

Figure 2. A chicken patty with a continious void less than ½ inch in diameter so there is no defect

Figure 3. A chicken patty with two continious coating voids but each less than ½ inch in diameter so there is no defect.

Figure 4. Uneven color on a chicken patty with burnt breading. The defect would be listed as COATING DEFECT.

2. CONSISTENCY OF SHAPE/SIZE

The inconsistent size or shape of the product is based on the uniformity of a product line. There are many shapes and sizes of boneless chicken products. For example, nuggets are processed in a variety of shapes from stars to dinosaurs. Slight variation is expected, however, substantial differences or variations in shape and size of products can affect consumer preferences and cook times. Standard product size and shape should be determined in each group by using two or more pieces of similar size. If there are clear differences in the uniformity of product size or shape in the sample, or if the product is folded prior to breading or while processing and the product take on a shape not consistent with the other samples, record “Consistency of size/shape defect’.

Figure 5. The chicken patty that is on the right is not circular compared to the one on the left.
CONSISTENCE OF SHAPE/SIZE would be listed as the defect

3. CLUSTER/AGGREGATE OF PRODUCTS

Figure 6. Two chicken patties attached to each other. CLUSTER/ AGGREGATE OF PRODUCTS would be listed as the defect

When breading further processed products, it is possible for two or more pieces of product to become overlapped and breaded together. This is a defect since the products that are overlapped may not cook properly. When selecting a “Cluster” defect, the product must appear to be fused together with breading and not just touching each other or overlapping when displayed.

4. COMPLETENESS OF PRODUCT

Broken or incomplete products are visible in two ways. An incomplete break is when a product has a break or tear in the meat that is clearly visible. A complete break is when the product is broken apart and displayed in two pieces or as part of the piece. If the complete break is evident and the only part is displayed it should still be recorded as “Completeness of product.” **Do not record this type of defect as “Inconsistent Shape and Size” or “Coating Defect” when it is evident that it is part of a broken product and the break is what caused the product to take on these other defects.**

Figure 7. Chicken patty with an incomplete break. COMPLETENESS OF PRODUCT would be listed as the defect.

Figure 8. Chicken patty with a complete break. COMPLETENESS OF PRODUCT would be listed as the defect.

5. EVIDENCE OF FOREIGN MATERIAL

Foreign materials are any non-food objects, such as feathers, plastic, metal, rubber, glass, and wood.

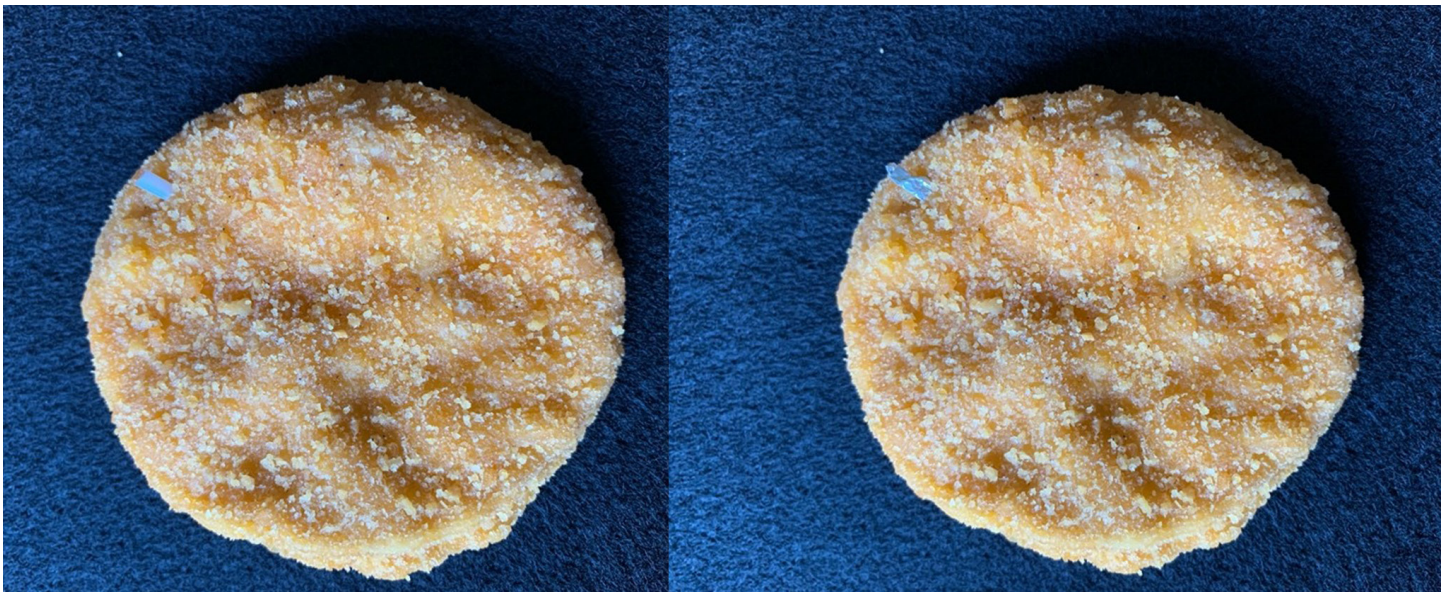


Figure 9. Chicken patties with a protruding piece of foreign material. FOREIGN MATERIAL would be listed as the defect

OVERALL

Since the contestants cannot handle the product, they should only evaluate the portions that are fully visible. Be careful not to create multiple defects when one defect causes the other factors by the nature of the main defect. For example, if a patty is broken in half and only one half is displayed, you should record “Broken/Incomplete” as the defect even though it is a different shape or may be missing some breading where the break occurred. You do not record the “Coating Defect” or “Shape/Size Defect” since they are a result of the broken patty.

Figure 10. Examples of patties with multiple defects.
The patty on the left would be marked ‘BROKEN/INCOMPLETE’ and ‘COATING DEFECT’. The patty on the right has three defects - ‘BROKEN/INCOMPLETE,’ ‘COATING DEFECT,’ and ‘EVIDENCE OF FOREIGN MATERIAL.’

Figure 11. Group of patties with multiple defects including: COATING DEFECT on the first and second patties due to burnt and missing coating, COMPLETENESS OF PRODUCT DEFECT for the break in the third patty, and CONSISTENCY OF SHAPE/SIZE DEFECT due to the difference in shape between the patties.

MARKET EGGS - INTRODUCTION

Chicken egg production is a major agricultural industry in the United States. In a commercial layer operation, eggs are evaluated for quality before being packed by weight (size). Egg quality is independent of egg weight (size) and eggshell color. All shell colors are graded with the same standards. During a poultry judging contest, exterior quality and interior quality are evaluated separately since handling eggs during a contest can influence both the interior and exterior quality.

The parts of an egg are shown in Figure 1.

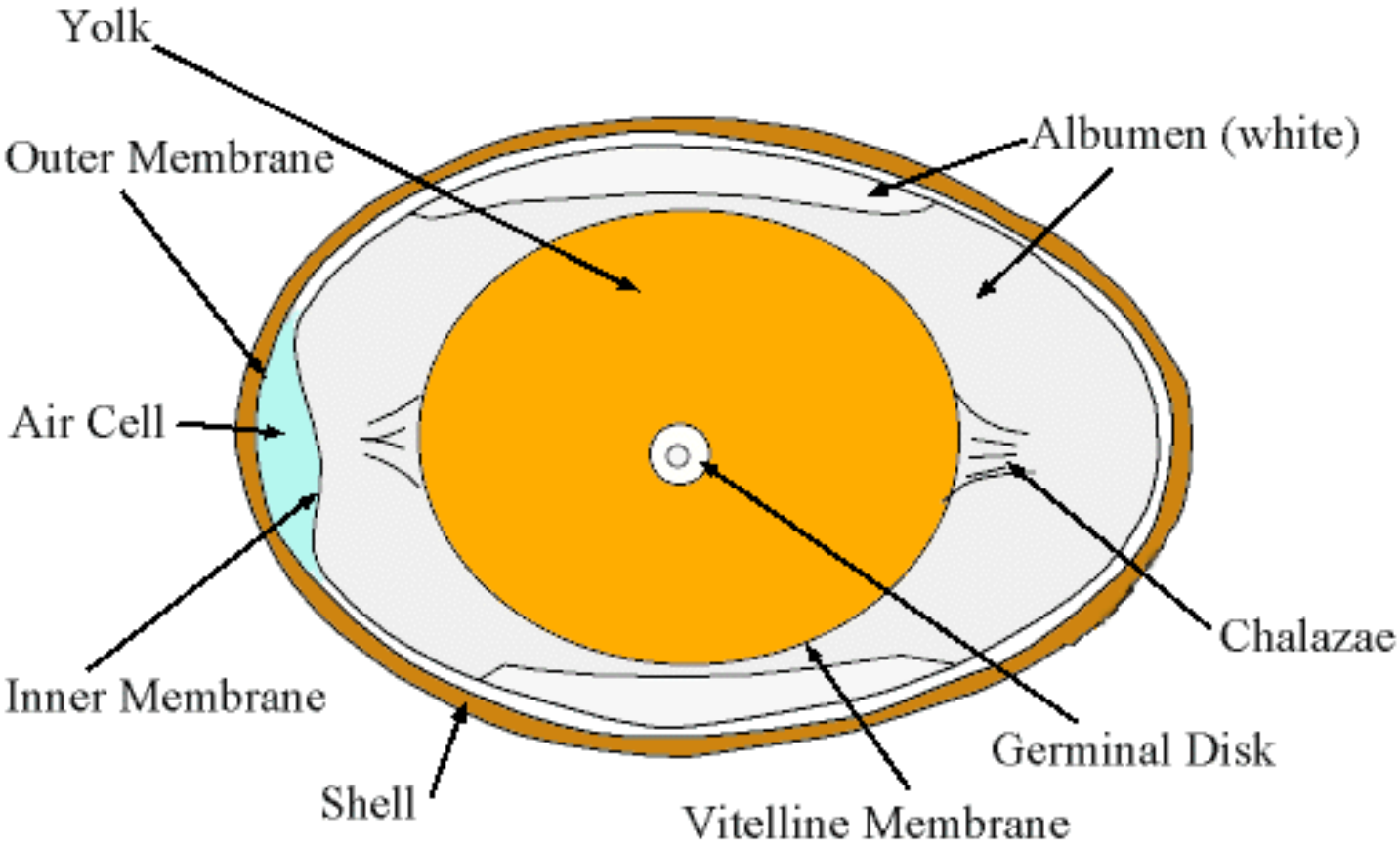


Figure 1. Parts of the egg identified.
Photo credit: Shutterstock.com

MARKET EGGS - INTERIOR QUALITY BY CANDLING

The interior grades of eggs are set by the United States Department of Agriculture and include Grades AA, A, B, and Loss. Dirty and cracked eggs are removed as loss eggs. The specific standards for the USDA egg grades are shown in Table 1.

Table 1. Summary of USDA standards for interior egg quality by candling for 4-H poultry judging.

QUALITY FACTOR	GRADES			
	AA	A	B	LOSS
AIR CELL	⅛ inch or less in depth	3/16 inch or less but more than ⅛ inch in depth	More than 3/16 inch in depth	N/A
ALBUMEN/WHITE	Clear Firm	Clear May be reasonably firm	Clear May be weak and watery	N/A
YOLK	Outline slightly defined	Outline may be fairly well defined	Outline clearly visible	N/A
BLOOD OR MEAT SPOT	None	None	Blood or meat spots totalling no more than ⅛ inch in diameter	Blood or meat spots totalling more than ⅛ inch in diameter

To evaluate the interior quality of eggs without breaking them open, the eggs are candled. Candling takes place in a darkened room and involves shining a light through the egg. To candle an egg, hold the small end of the egg between your thumb and first two fingers. Place the large end up to the candling light in a slanting position (see Figure 1). You can see the air cell and the yolk shadow within the albumen. For any 4-H poultry judging contest, the air cell will always be at the large end of the egg. While holding the egg between your thumb and first two fingers, turn your wrist quickly (Figure 1). This will cause the contents of the egg to twirl. The movement of the contents can tell you a great deal about the yolk and albumen.

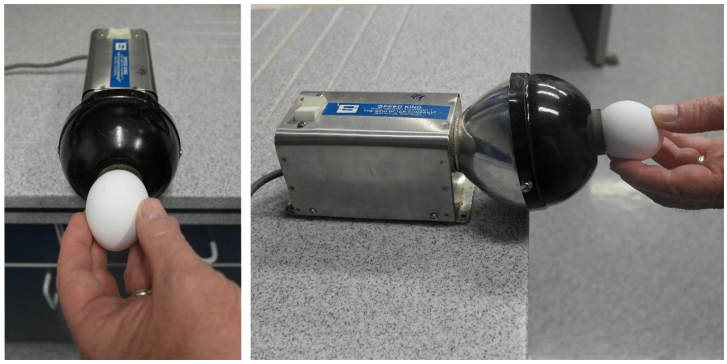


Figure 1. Holding an egg for candling as shown from the front (left photo) and the side (right photo)

When rotating the egg held up to the light, you may see the shadow of the yolk. The yolk of a fresh, high-quality egg will be surrounded by a rather dense layer of albumen. As a result, the yolk moves only slightly away from the center of the egg when it is twirled while being candled. Because of this, the yolk outline is indistinct or partially visible. As the egg ages or deteriorates in quality, the albumen becomes thinner and the yolk tends to move more freely and approaches the shell more closely. The yolk then becomes more visible when candled. The condition of the albumen, therefore, is determined largely by the movement of the egg yolk when the egg is candled. When twirling the egg, if the yolk retains its position in the center, the white is usually firm and thick.

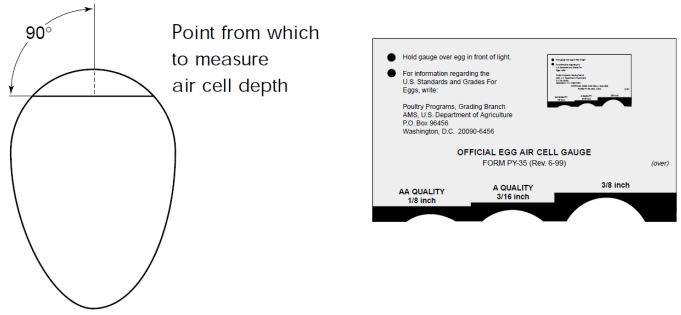


Figure 2. Use of the USDA air cell gauge to determine egg grade.

While observing the movement of the egg contents while twirling the egg, any blood or meat spots present will be visible. If there are small blood or meat spots that together total less an ⅛ inch in diameter, the egg is a grade B. If there are large blood or meat spots (greater than ⅛ inch in diameter) present, the egg is considered a loss egg. Contestants should not confuse meat spots with chalaza. The chalazae are strands of mucin fibers that help hold the yolk in the egg's center and may be prominent in some eggs. The chalaza is distinguished from a blood or meat spot by a bright area of refracted light that accompanies the chalaza's darker shadow.

If there are no blood or meat spots, the grade of the egg is based primarily on the air cell depth. The depth of the air cell is the distance from its top to its bottom when the egg is held with the air cell up to the light. In a fresh egg, the air cell is very small. As the egg ages, evaporation takes place and the air cell increases in size.

There is an official USDA egg air cell gauge card that is used to grade egg (sees Figures 2 and 3). If the air cell depth is ⅛ inch deep or less, it is a Grade AA egg. If the air cell depth is greater than ⅛ inch deep but less than 3/16 inch deep, it is a Grade A. If the air cell is more than 3/16 inch deep, it is a Grade B egg. **During a contest air cell gauges may not be used**, so contestants must learn to determine air cell depth without the use of a gauge.

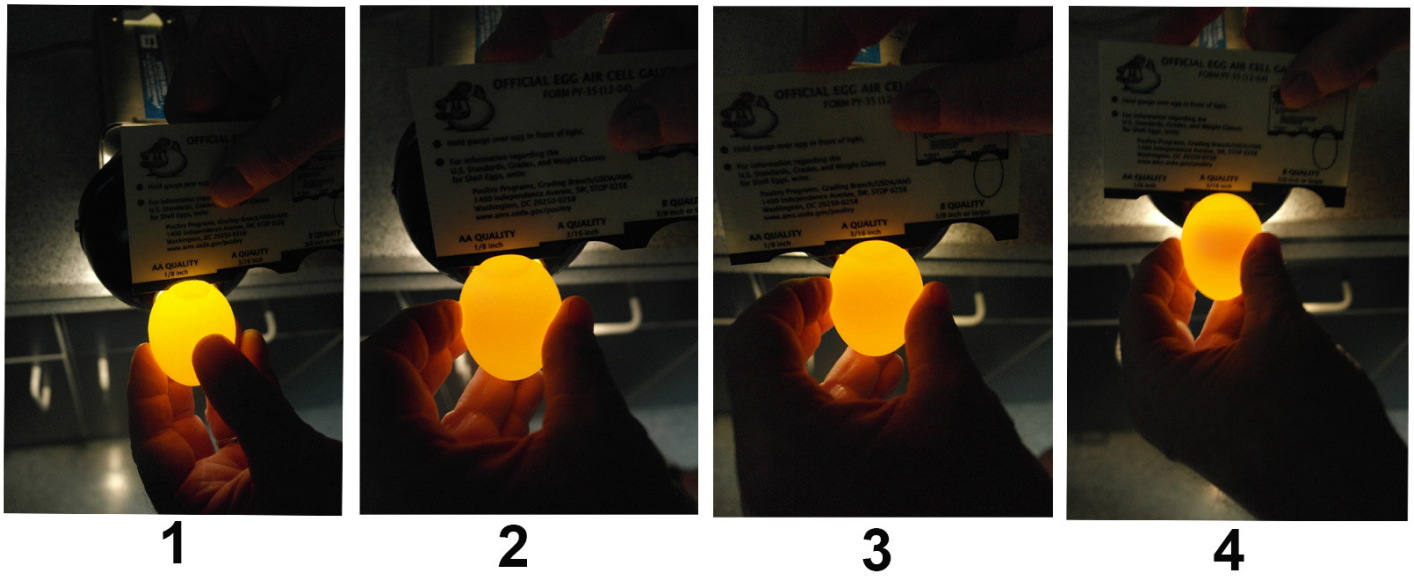


Figure 3. The use of the USDA air cell gauge to determine air cell depth in eggs. 1) Grade AA egg with an air cell depth less than ⅛ inch allowed; 2) Grade A egg with air cell depth more than the ⅛ inch allowed for Grade AA; 3) The same Grade A egg with an air cell gauge showing less than 3/16 inch allowed for Grade A; and 4) Grade B egg with an air cell depth of more than 3/16 inch allowed for a Grade A egg.

MARKET EGGS - EXTERIOR QUALITY

Evaluating eggs for exterior quality reduces the number of eggs with defects that detract from the eggs' appearance or that would have a low probability of surviving the rigors of handling in normal market channels. In other words, we want the consumer to have clean, unbroken eggs with practically normal shape and texture. Contestants should not be too harsh in assigning a grade to eggs that may have minor defects. This is especially important when judges have gained experience in evaluating eggs with various degrees of abnormalities. Shell color does not affect the quality of the egg and is not a factor in the U.S. standards and grades. Eggs are usually sorted for color and sold as either "whites" or "browns." For the 4-H poultry judging contest exterior egg classes, all chicken eggshell colors can be used. In a contest, excessively speckled brown eggs should not be used.

Table 1 summarizes the descriptive terminology used in the USDA Egg Grading Manual to help determine an egg's grade by exterior quality. Grades AA and A have identical standards for exterior quality. For 4-H poultry judging contests, therefore, eggs will be assigned the grades of A, B, Dirty, or Loss. The factors that affect exterior quality are discussed below. Eggs graded for exterior quality cannot be handled during the contest. Since contestants are not able to handle the eggs, the eggs are placed sideways on egg cartons and contestants must assume the unseen side is free of any stains, adhering material, cracks, or defects.

Table 1. USDA standards for grading grading exterior quality of market eggs

FACTOR	GRADE			
	AA/A	B	DIRTY	LOSS
STAIN	Clean - may show small specks, stains, or cage marks that do not detract from general clean appearance of the egg; may show traces of processing oil	Slight to moderate localized stain covering less than 1/32 of shell or scattered stains covering less than 1/16 of shell	Prominent stains or Slight to moderate localized stain covering more than 1/32 of shell or scattered stains cover more than 1/16 of shell surface	N/A
ADHERING DIRT OR FOREIGN MATERIAL	N/A	N/A	Any adhering dirt or foreign material	N/A
EGG SHAPE	Approximately the usual egg shape	Unusual or decidely misshapened (long, round, or distorted)	N/A	N/A
SHELL TEXTURE	May have rough areas and small calcium deposits that do not materially affect shape or strength	Extremely rough area that may be faulty in soundness or strength May have large calcium deposits	N/A	Checked: Broken or cracked shell, but membranes intact, no leaking Leaker: Has broken or cracked shell with membranes broken and contents leaking or free to leak
RIDGES	Free of ridges	May have pronounced ridges	N/A	N/A
SHELL THICKNESS	Free of thin spots	May have pronounced thin spots	N/A	N/A
BODY CHECKS	Absence of body checks	May have pronounced body checks	N/A	N/A

CLEANLINESS

Grade A eggs must be clean (see Figure 1). Grade A eggs may show small specks, stains, or cage marks that do not detract from the general clean appearance of the egg. Grade A eggs can also show traces of processing oil (used to preserve freshness). The processing oil may create a shiny or opaque appearance.

'Cage marks' is the term used to refer to dirty marks, dirty lines, or translucent lines on the shell when eggs are collected (see Figure 2). Dirty marks or lines are due to rusty or dirty wires in the cage floor or egg roll-out trays. Translucent lines result when the shell fails to dry out quickly after laying. Grade A eggs may show small cage marks that do not detract from the general appearance of the egg. Darker cage marks that do detract from the appearance of the egg would be Grade B. Eggs with large cage marks having a 3-dimensional appearance would be considered dirty eggs.

Figure 1. Clean, normal shaped white and brown shelled eggs.

Figure 2. Examples of eggs with cage marks

Any eggs with slight to moderate stains can be Grade B or dirty depending on the number and size of the stains. If there is a single stain, it is referred to as a localized stain. A Grade B egg can have a slight to moderate stain that covers less than 1/32 of the entire shell (see Figure 2 for relative sizes). If there are two or more stains, these are referred to as scattered stains. The amount of stain is added up, and if the total covers less than 1/16 of the entire shell, it is a Grade B egg. Any eggs with slight to moderate stains covering an area larger than these allowed amounts are classified as dirty eggs. All prominent stains are considered dirty eggs. See Figure 3 for eggs with various levels of stain(s) on the eggshells.

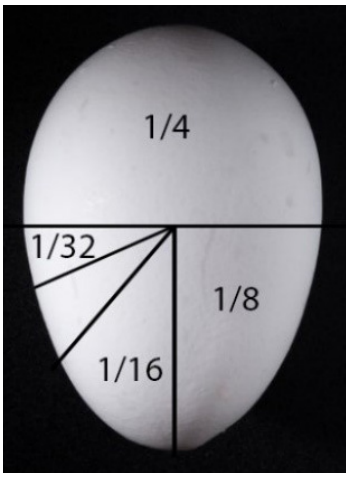


Figure 3. Marked egg showing the amount of shell for 1/16 and 1/32

Moderate, single (localized) stain covering less than 1/32 of the shell:
Grade B

Moderate, single (localized) stain covering more than 1/32 of the shell:
Grade Dirty

Two (scattered) stains covering less than 1/16 of the shell:
Grade B

Multiple (scattered) stains covering more than 1/16 of the shell:
Grade Dirty

Figure 4. Examples of eggs with various numbers (localized and scattered) and sizes of stains resutling in different egg grades.

Eggs with adhering material (3-dimensional) larger than a speck will be classified as dirty. Small specks of dust, eyelashes, pencil marks, or lint that may have settled out of the air should not be considered. An attached feather, however, would be considered adhering material. See Figure 5 for examples of eggs with adhering material.

Figure 5. Examples of eggs with adhering material (left to right: manure, feather, and egg yolk)

SHAPE

A considerable range of egg shapes may be considered “approximately the usual shape” or Grade A (see Figure 1). Eggs that are spherical (round) or too long to fit in the egg carton should be graded B quality (see Figure 6). B quality grades include eggs that are clearly misshapen or that have definite flat areas.

Figure 6. Examples of Grade B eggs for being too round or too long.

TEXTURE

Eggs with faulty texture are much weaker in shell strength and may be broken during distribution. Occasionally, calcium deposits will appear on eggshells. Unlike stains, the calcium deposits are not added together. If the calcium deposits on an egg are less than 1/8 inch in diameter, the egg is Grade A. There is no standard for the number of calcium deposits allowed on an egg, which means that an egg with small calcium deposits over the entire shall be classified as Grade A, as long as all the calcium deposits are each less than 1/8 inch in diameter (see Figure 7).

If any of the calcium deposits are larger than 1/8th inch in diameter, the egg is classified as Grade B. A good rule of thumb is that if you were to run your fingernail across a calcium deposit and a good size hole would be created if it came off, then the egg would be classified as Grade B.

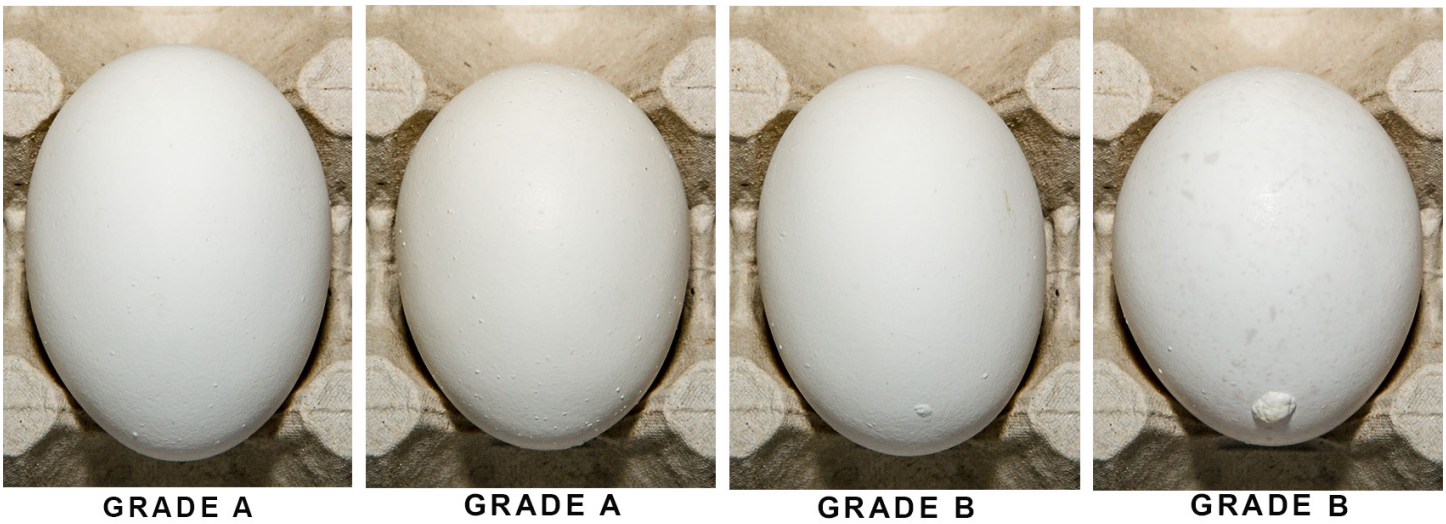


Figure 7. Examples of eggs with various numbers and sizes of calcium deposits

Grade A eggs may have slight rough areas to the shell that do not materially affect egg shape or the strength of the shell. Eggs with extremely rough areas that may be faulty in soundness or strength are Grade B (see Figure 8).

Figure 8. Grade B eggs because of extreme roughness of shell

RIDGES

Ridges can result in weakened shells. Eggs with large ridges are Grade B (see Figure 9).

Figure 9. Examples of Grade B eggs because of shell ridges.

SHELL THICKNESS

The shell should appear thick enough to withstand reasonable handling without breaking. Grade A eggs must have thick shells with no thin spots. Thin shells or thin spots would place an egg in Grade B. In all cases, the shell must not be broken. The thin spots can be large or small as in Figure 10. Small thin spots are referred to as 'windows.' To be considered a window, the thin spot must be three-dimensional. It is important that cage marks (see Figure 2) not be confused for windows.

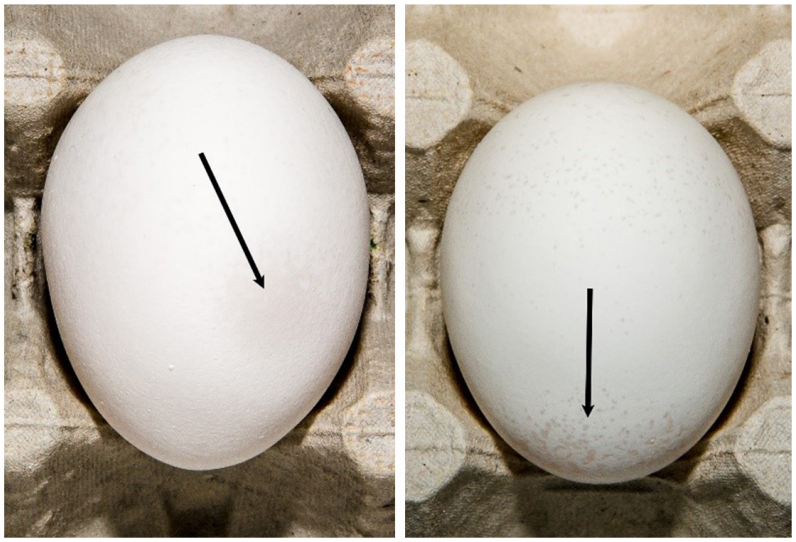


Figure 10. Examples of Grade B eggs for shell thickness.

BODY CHECKS

Body checks can cause weakened shells. This is a condition in which the eggshell looks like it is cracked but the shell is intact. Body check occurs during shell formation when the shell is cracked and then partially calcified before being laid. An egg with body check is classified as Grade B. When candled (see Figure 11), the shell can be seen to be intact, but weak. This should not be confused with a 'Check egg' which is graded as a Loss egg.

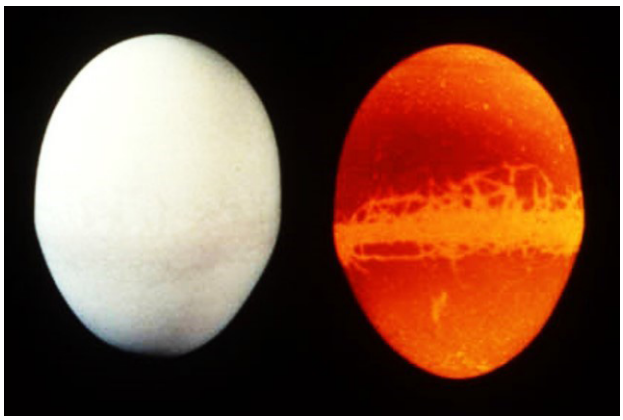


Figure 11. A Grade B egg with a body check and what it looks like when candled

LOSS EGGS

An egg that has a broken shell or a crack in the shell, but its shell membranes are intact, and egg contents do not leak, is considered checked and should be classified as a Loss. An egg that has a crack or breaks in the shell and the egg contents are exuding or free to exude through the shell, are considered as leakers and should be classified as a Loss. The national 4-H poultry judging contest does not use leakers.

Figure12. Loss egg due to crack in that is not leaking egg contents.

MARKET EGGS - INTERIOR QUALITY BY BROKEN OUTS

In the broken-out egg class, the eggs to be graded are broken out on glass dishes. The grades will be Grades AA, A, B, or Loss. Eggs with meat or blood spots less than ⅛ inch in diameter total will be classified as Grade B. Any eggs with blood or meat spots totaling more than ⅛ inch in diameter are classified as Loss (see Figures 1 and 2). It is important to not confuse bits of the chalaza as meat spots. Pieces of the chalazae may break off and be visible in the albumen (see Figure 3).

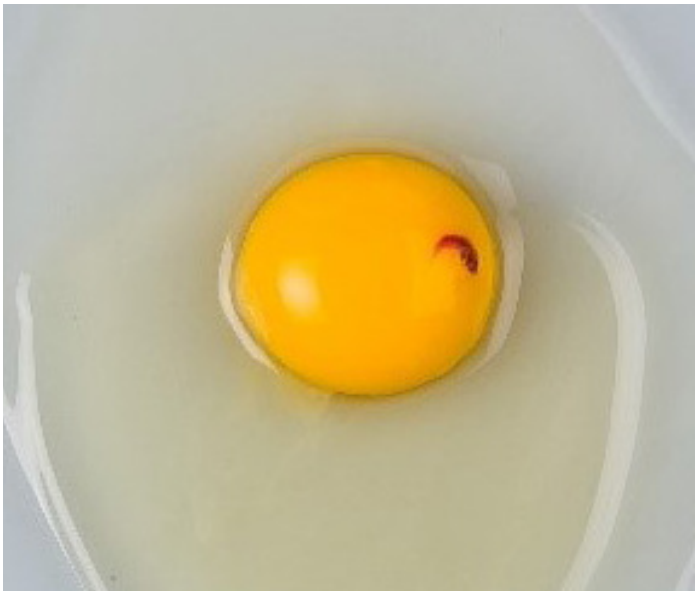


Figure 2. Broken-out egg with a blood spot on the yolk.

Figure 2. Broken-out egg with a meat spot in the albumen.

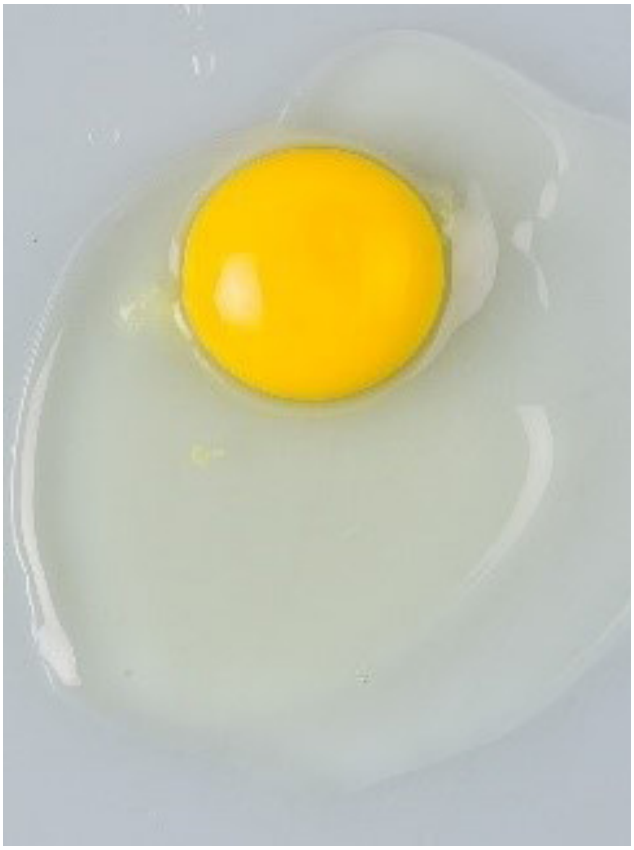


Figure 3. Broken out egg with a piece of chalaza, and not a meat spot, in the albumen.

The criteria used to grade broken-out eggs include the height of the thick albumen as well as the yolk's size and flatness. For a Grade AA egg, the thick albumen is in the shape of an egg and the yolk sits off the plate, as shown in Figure 4. For a Grade A egg, the albumen is losing its egg shape and sits lower on the plate. The edges of the thick albumen having a rounding of the edges. You cannot see under the yolk (see Figure 5). For a Grade B egg, the yolk is flattened, and the thick albumen is almost all gone (see Figure 6).

Contestants should evaluate each egg on its own merit and not compare it with other eggs in the class. If you set an incorrect standard, your grade scale could be off, causing you to incorrectly grade several eggs. The diameter of the outline of the thick albumen (top view) may give an indication of grade; however, the height of the thick albumen (side view) is the most important factor in determining grade.

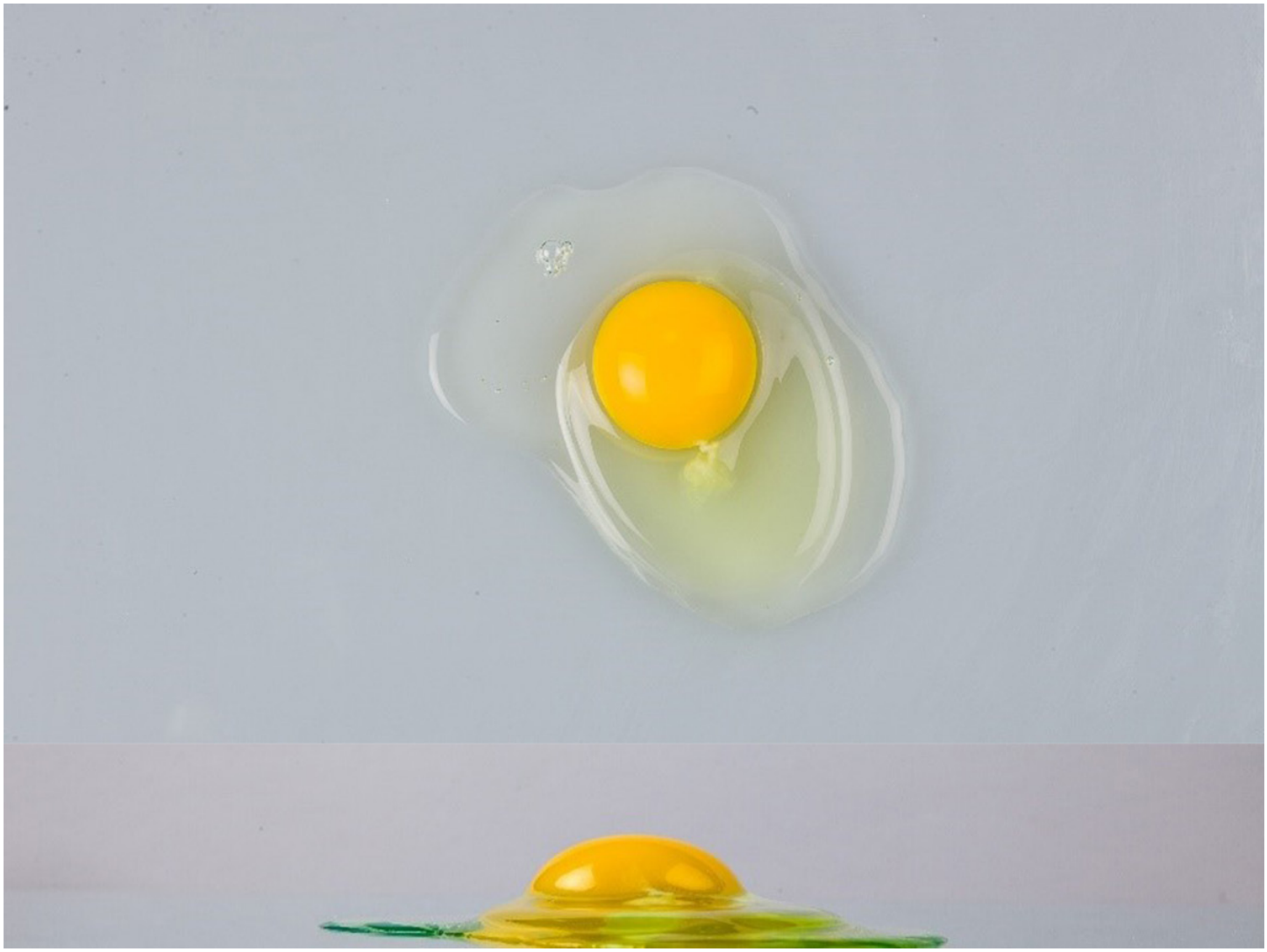


Figure 4. Grade AA broken-out egg.

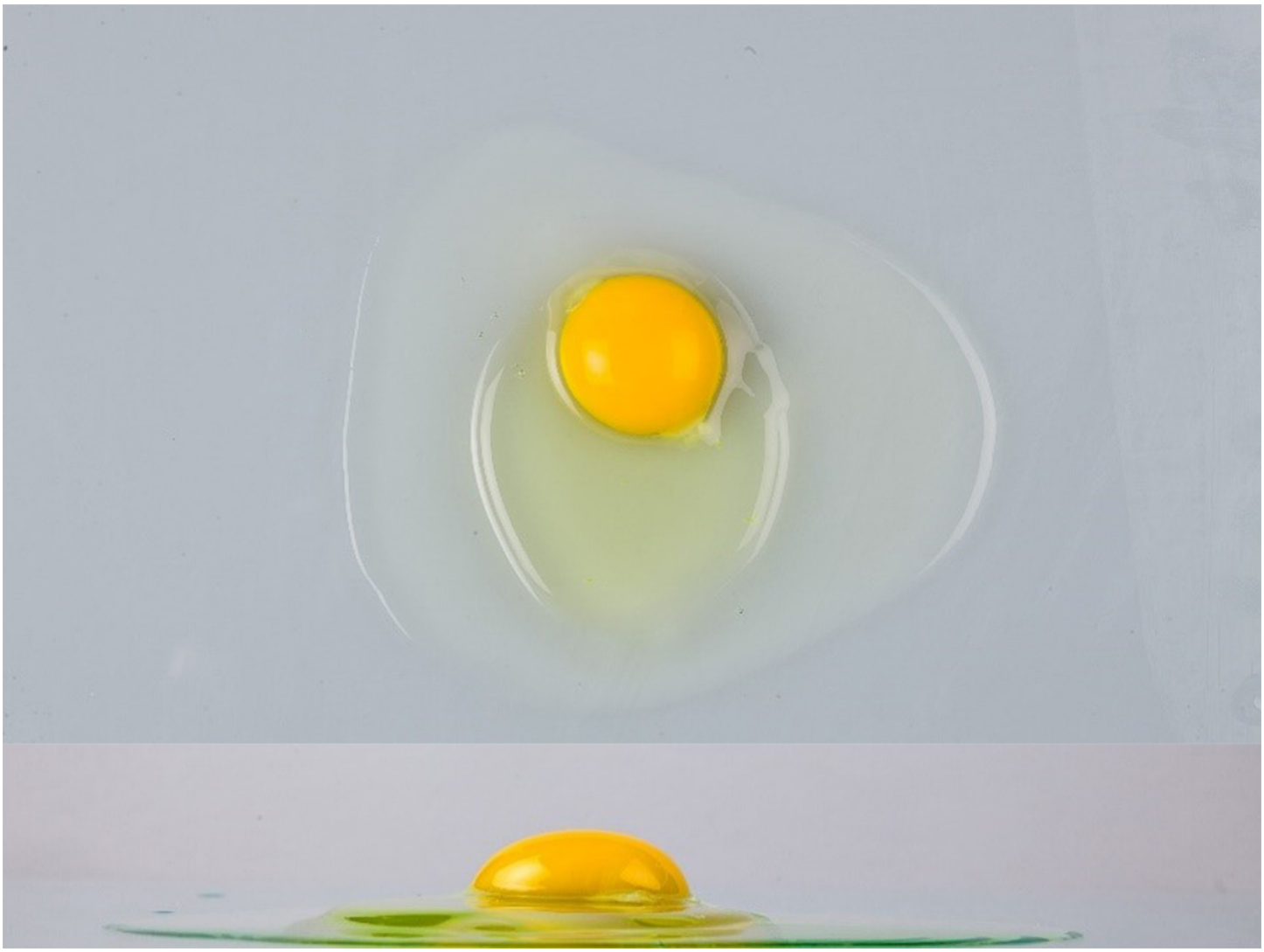
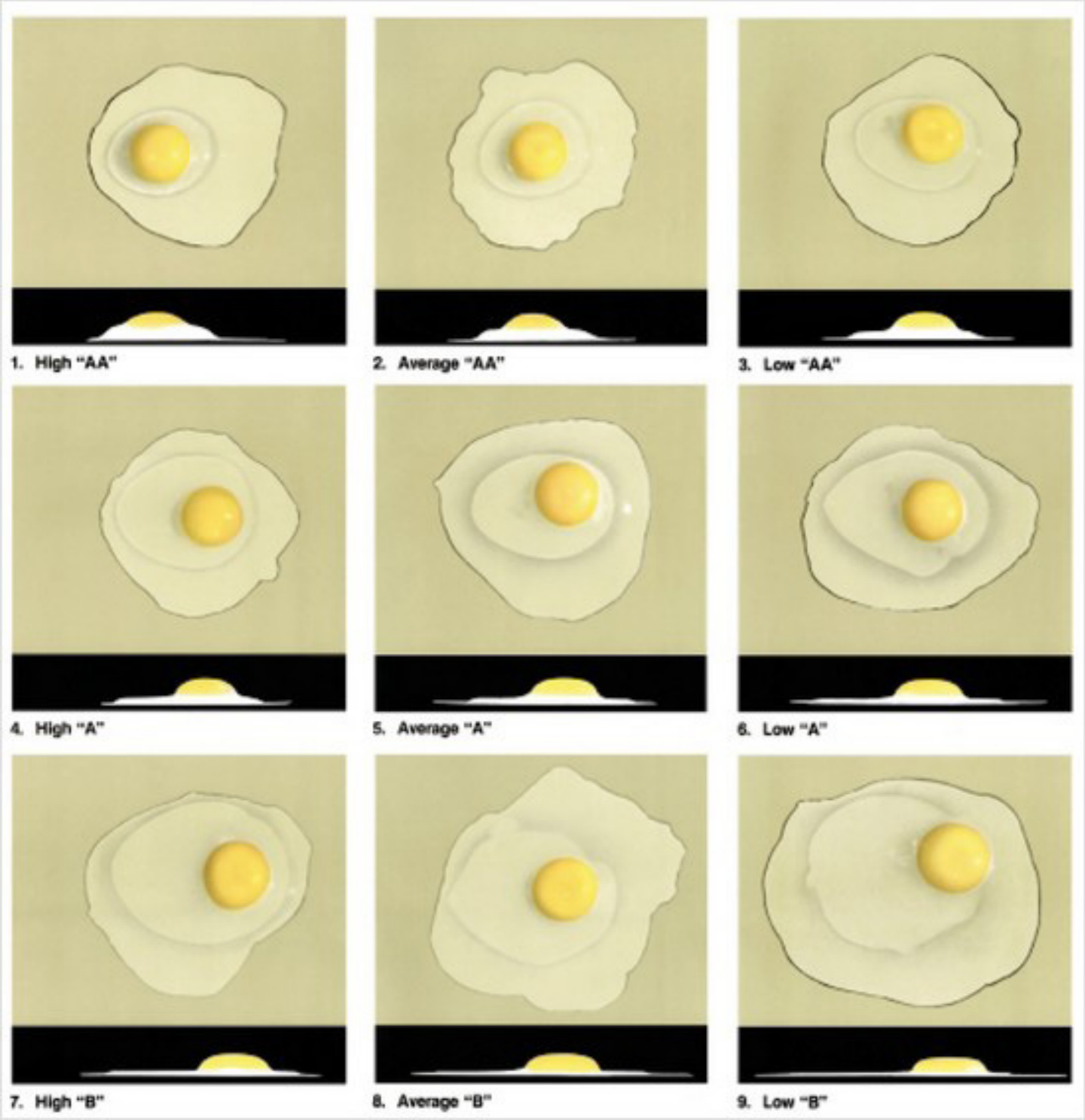


Figure 5. Grade A broken-out egg.

Figure 6. Grade B broken-out egg.



USDA standards for broken out eggs.