

Processing Chickens

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

Step 1. Feed withdrawal

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

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

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

Water removal is not as critical as feed removal. In hot weather

chickens should be on water as long as possible. Your birds will die if deprived of water for long periods of time.

Step 2. Collection

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

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

surfaces and spread from one flock to another.

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

Step 3. Holding

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

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



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



Figure 2. Removal from crates

Step 4. Killing

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

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

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

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

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



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

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

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

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

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



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



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

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

Step 4. Feather removal

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

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

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



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

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

Automatic feather pluckers use plastic “fingers” to pull the feathers off the carcass circulating in the equipment. The circulating carcasses will hit each other as well as the walls of the equipment. The pressure that the carcasses are exposed to may result in leakage of

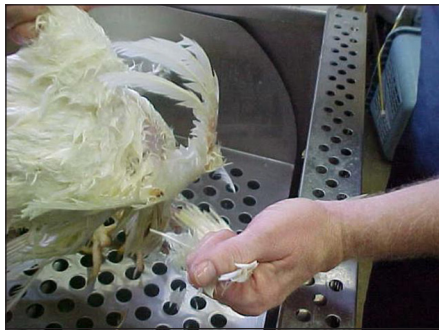


Figure 7. Testing the ease of feather removal post-scald



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

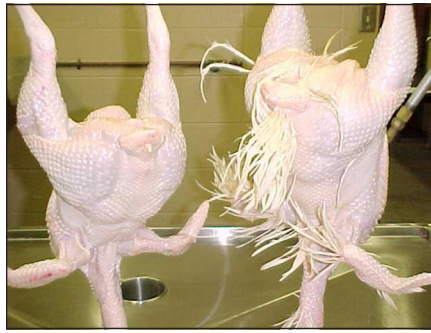


Figure 9. Comparing the effectiveness of feather removal post-plucker of a chicken that has been scalded at the correct temperature (left) with one that was scalded at too low a temperature

any fecal material remaining in the lower intestines, contaminating all the carcasses in the equipment at the time. This is one step, therefore, where the efficiency of the feed withdrawal program can be evaluated. A poor feed withdrawal program will result in increased feather contamination.

Step 5. Removal of preen gland

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



Figure 10. Removal of the preen gland



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

Step 6. Removal of the crop

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



Figure 12. Cutting along the back of the neck



Figure 13. Locating the trachea and esophagus



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



Figure 15. A processed chicken carcass with a full crop

Step 7. Removal of the internal organs

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

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

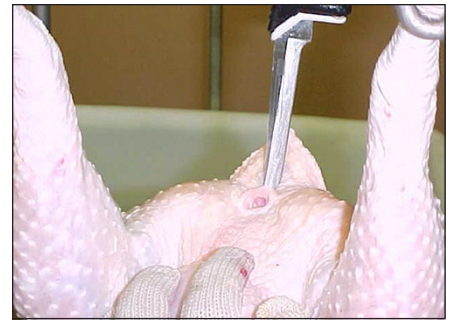


Figure 16. Cut a hole at the base of the tail above the vent.

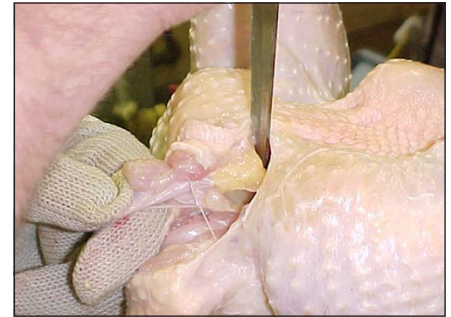


Figure 17. Hold the large intestines while continuing to cut around the vent.



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



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

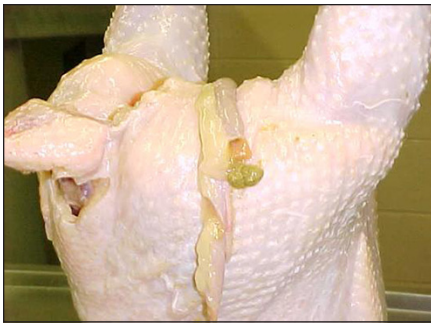


Figure 20. Carcass with fecal contamination from broken intestine



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



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

Step 8. Inspection of the internal organs

Inspect the internal organs for any sign of disease or abnormality (Figure 23). Similarly, once the entire intestinal tract has been removed it should be evaluated for disease or abnormality. In order to be able to identify disease or abnormality in the internal organs it is important to be familiar with the normal appearance of these organs in a healthy chicken. Figures 24, 25 and 26 show organs and intestines

from a healthy broiler chicken. The liver is mahogany to light tan in color. The membranes are clear, and there are no hemorrhages. The gall bladder is intact. It is enlarged because the chicken was not eating prior to slaughter and thus did not have a need for bile, which is stored in the gall bladder. The color of the spleen is similar to that of the liver. The membrane around it is clear, and there are no hemorrhages. The intestines are intact. The connective membranes are clear, and there are no hemorrhages.

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

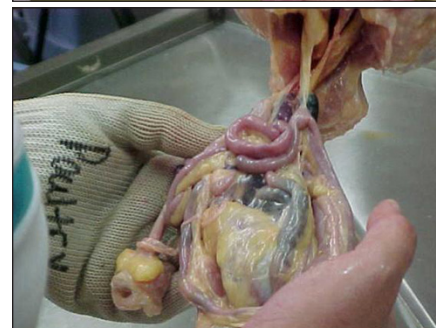


Figure 23. Inspect the intestines and organs for any sign of disease or abnormality.

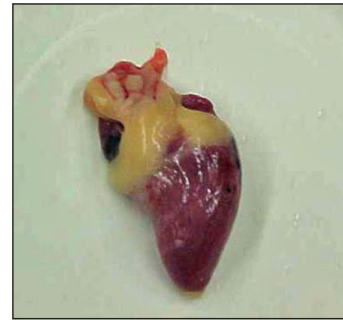


Figure 24. Normal heart (top) and gizzard from a healthy chicken

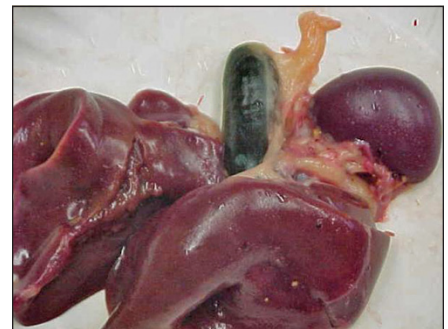


Figure 25. Normal liver, gall bladder and spleen of a healthy chicken



Figure 26. Normal intestines of a healthy chicken

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



Figure 27. Removing the lungs from the body cavity



Figure 28. Lung from a healthy chicken

Step 10. Removal of the neck and legs

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



Figure 29. Removing the neck



Figure 30. Removing the feet

Step 11. Finish

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



Figure 31. Bruised wing



Figure 32. Bruised breast muscle

Step 12. Reduction of the temperature of the carcass

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



Figure 33. Processed chicken carcass in chill tank

Trouble-shooting

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

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

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



Figure 34. Carcass contaminated by torn intestines



Figure 35. Torn carcass with no damage to the intestines

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

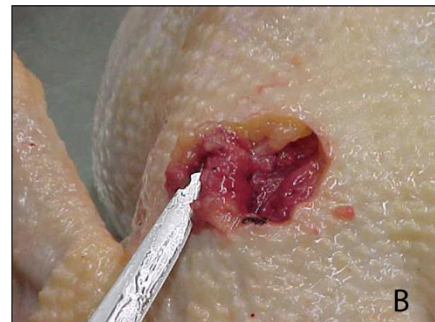


Figure 36. Impact of a small scratch on the quality of the underlying meat