MISSISSIPPI STATE UNIVERSITY EXTENSION

COMMERCIAL CHICKENS AND COVID-19: RECOMMENDATIONS FOR DEPOPULATING POULTRY FLOCKS

The COVID-19 pandemic continues to create disruptions across the livestock industry, particularly in the area of meat processing. Many beef and pork plants have been shut down for periods of time, and many poultry plants are operating at less than maximum capacity.

Mississippi's poultry industry has not been spared at least some of these disruptions. In addition, in recent days, we have been contacted by individuals from several poultry- and swine-producing states asking the same hypothetical question, "If we should have to depopulate poultry or swine in the field, what are the approved methods of depopulation and disposal?"

We are hopeful that depopulation does not become necessary, but it is certainly wise to consider such a scenario in case the need should arise. Depopulation and disposal are processes that require a **well-thought-out plan**, and it's best to develop that plan of action well ahead of time. They are not the kind of processes that lend themselves well to making it up as you go along.

In-House Composting

In many situations across the country, burial or in-house composting will be the most likely disposal methods if animals must be depopulated.

Burial, where allowed, is pretty simple and straightforward. First, make sure you have a pre-approved mass mortality burial site location on your farm. Then, should disaster strike, notify the proper officials, obtain a burial permit, dig a hole, and cover them up. However, burial is intended only for disease or disaster events and when there are no other options. In addition, there are several parts of Mississippi where the soil type does not lend itself to burial.

In-house composting is a little more complicated and takes a little longer than mass burial. However, **in-house composting is likely the ideal method**. In fact, based on guidance from North Carolina Department of Agriculture experts, birds under 4 pounds can likely be composted with little to no extra carbon source added to the house.

The most common question associated with in-house poultry composting is, "**How much carbon source do I need?**" The USDA (2016) developed guidelines related to the 2014–15 avian influenza outbreak that contain methods for estimating carbon needs for mass mortality composting. Those guidelines could be used today if poultry/pork processing plants around the country are shut down because of the COVID-19 pandemic.

Should the need arise in Mississippi, depopulation in the field could be timed, unlike for a disaster or disease event where everything has to happen in a few days. Birds could be kept on maintenance diets until the Mississippi Board of Animal Health (MBAH) could get personnel and equipment to them. Using this method, the MBAH could **strategically work one area and then move to another** and not bounce around from site to site.

Estimating Carbon (Bulking Agent) Needs

The following three approaches to estimating the amount of additional carbonaceous materials needed to compost poultry carcasses are taken from the 2016 USDA guidelines (*https://www.aphis.usda.gov/animal_health/emergency_management/downloads/hpai/mortalitycompostingprotocol.pdf*).

All three require estimating the volume of litter in a building. To do this:

1. Determine the length and width of the building.
2. Estimate the average depth of existing litter.
3. Calculate cubic feet of existing litter: length (in feet) × width (in feet) × depth (in inches) / 12.
4. Convert to cubic yards: volume of litter in cubic feet / 27 = cubic yards of litter.
5. Modify the estimate based on the condition of litter (volume should be reduced if there is a large volume of "cake" or very wet litter).

Once you have an estimate of the existing litter, you can estimate the total amount of carbonaceous material needed. Below are three approaches for estimating the total.

Method 1. Weight-Based Estimate

1. Effective in-house composting must have a **minimum of 1.5 pounds of carbon material (based on bulk density of 30 pounds/cubic foot material) per pound of bird** (1 pound of carbon per pound of bird for the base and cover, and the remaining carbon for the mix).
2. Determine total pounds of birds.

   Pounds of birds = number of birds × average weight in pounds
3. Determine total pounds carbon needed.

   Total carbon = pounds of birds (from above) × 1.5
4. Determine pounds of litter in house.

   Cubic feet of litter in house (see above)

   Pounds of litter = cubic feet of litter × weight of a cubic foot of litter (average bulk density = 30 pounds; range = 25 to 35 pounds)
5. Determine amount of additional carbon needed.

   Cubic yards of additional carbon needed = ((total pounds of carbon needed – pounds of litter in house) / (weight per cubic feet of carbon material)) / (27)
   - wood chips, litter, or wet sawdust = 30 pounds/cubic foot
   - dry sawdust = 15 pounds/cubic foot

Method 2. Volume-Based Estimate

1. Assume bulk density of litter is 30 pounds/cubic foot or approximately 800 pounds/cubic yard. This means the following:

   Each 20-lb bird requires 30 pounds or 1 cubic foot of carbon material.

   Each 40-lb bird requires 60 pounds or 2 cubic feet of carbon material.
2. To calculate total carbon material needs, perform the following calculations:

   Multiply number of 20-lb birds by 1 to get cubic feet, then divide by 27 for cubic yards.

   Multiply number of 40-lb birds by 2 to get cubic feet, then divide by 27 for cubic yards.
3. To estimate additional volume needed, subtract the total volume of litter in the building (see above) from the total volume of carbon material required.

Method 3. Computerized Estimator

1. Visit *http://msue.anr.msu.edu/program/info/managing_animal_mortalities* and select Composting Tools.

2. First, use the Michigan State University Spartan Emergency Animal Tissue Composting Planner v1.04 to estimate the total amount of amendment needed.

3. Then use the Spartan Compost Recipe Optimizer v1.05 to estimate the amounts/proportions of amendments needed, given the availability of amendments (poultry manure, poultry litter, sawdust, bark, etc.).

Depopulation and Ethics

Fortunately, there are also guidelines from the American Association of Swine Veterinarians (AASV, 2020; *https://www.aasv.org/Resources/welfare/depopulation_recommendations.pdf*) and the American Association of Avian Pathologists (AAAP, 2020; *https://aaap.memberclicks.net/assets/Positions/AAAP_final%20faq%20for%20mass%20depopulation%2004_23_2020.pdf*) that provide recommendations for depopulating swine and poultry, respectively. Regarding poultry, the recommendations have been created for veterinarians, poultry companies, and growers to increase awareness about available emergency poultry depopulation methods, limitations of each method and how they can be applied under various circumstances, and considerations for depopulation during emergency situations.

Depopulation is considered to be a **last-ditch effort**. It refers to the rapid destruction of a population of animals in response to drastic circumstances, taking into consideration the welfare of the animals to the greatest extent possible. More information regarding depopulation is available from the American Veterinary Medical Association (AVMA) at *https://www.avma.org/resources-tools/avma-policies/avma-guidelines-depopulation-animals*.

These guidelines are intended to help veterinary professionals make good decisions in the best interest of animal welfare in difficult situations where the decision to depopulate has been made in response to an emergency. Emergency events, such as the current COVID-19 pandemic, represent extraordinary circumstances when rapid response and the need to prevent further devastation may impose severe constraints that limit other available options.

Depopulation is required when circumstances threaten animal populations, human beings, and/or the environment. Depopulation is **never used under ordinary circumstances** and should be considered an emergency method only. The guidelines reflect the AVMA's concern for the ethical treatment of animals at all stages of life and in all situations. In addition, the guidelines support advanced planning for possible emergency situations and provide guidance for making difficult decisions during an emergency.

The AVMA has developed guidelines for the euthanasia of animals, as well. These guidelines can be found at *https://www.avma.org/sites/default/files/2020-01/2020-Euthanasia-Final-1-17-20.pdf*. Depopulation requires making difficult ethical decisions regarding what is best for animals in an emergency situation. Tough decisions that must be made during emergency situations should be based on sound ethical footing and standards. **We cannot suspend or disregard ethical reasoning on account of an emergency declaration or, in the case of COVID-19, a global pandemic**.

Emergency Situations

Unfortunately, there are times, such as the recent tornado outbreak in South Mississippi, when emergency events may require depopulating animals to prevent unavoidable pain and suffering. These emergency events may include natural and non-natural disasters, zoonotic or pandemic disease that threatens public health or the food supply, disease outbreaks such as the 2014–15 and 2016–17 U.S. avian influenza outbreaks, or severe market disruptions such as those currently being faced by the meat processing industry resulting from the COVD-19 pandemic.

The AAAP (2020) has listed circumstances that may require the rapid and efficient destruction of a population of poultry that include, but are not limited to, the following:

- **Natural disasters.** Depopulation may be required when poultry cannot be removed from harm's way to prevent or relieve animal suffering. Following a natural disaster, farms and/or poultry housing may be damaged to an extent that is hazardous for personnel to safely enter buildings. Additionally, if farms remain intact but basic services, including animal care and feeding, are unable to be restored in time to prevent animal suffering, depopulation may be required to prevent or relieve that suffering.
- **Non-natural disasters.** Depopulation may be required during non-natural disasters, such as terrorism, bioterrorism, nuclear power plant incident, accident, loss of structural integrity to poultry housing, etc., to prevent or relieve animal suffering and to protect worker and public health.
- **Contamination of food/water supplies.** If animals are exposed to toxic substances, to contaminants of food and water supplies, or to other adulterants, depopulation may be required to prevent real or perceived threats to food safety or immediate or impending danger to poultry welfare.
- **Zoonotic or pandemic diseases.** Depopulation may be required because of real or perceived public health threats, such that poultry can no longer be moved or marketed. Zoonotic or pandemic diseases may complicate or increase the burden of depopulation because of the level of personal protection required to prevent human exposure.
- **Reportable diseases.** Depopulation may be used by state and federal animal health officials as the first line of defense to quickly control and eradicate a reportable poultry disease by preventing further disease replication in infected, exposed, or at-risk flocks. Stop movements may be implemented in disease control areas and result in the need for depopulation of poultry on non-infected farms.
- **Highly infectious avian diseases.** Within a geographic area, depopulation of infected and susceptible poultry flocks may be required to prevent the rapid spread and further pathogen replication for a highly infectious disease to mitigate additional flock infections and further losses.
- **Severe market disruption.** Depopulation may be required for any event that reduces or eliminates the marketability of poultry. However, depopulation for severe market disruption should be considered only when the disruption has created extraordinary circumstances and when no other solutions exist. This circumstance should be considered to prevent animal suffering and negative poultry welfare outcomes.

Choosing a Depopulation Method

Every situation where depopulation may be necessary is unique for a variety of reasons. These include limitations and constraints imposed by the type of emergency (we saw this recently in Mississippi when tornadoes damaged or destroyed over 100 poultry houses at the same time that the state was under shelter-in-place orders resulting from the COVID-19 pandemic), resource availability, local regulations, site variation, geography, etc. The AASV (2020) recommends that, when choosing a depopulation method, the following factors be considered:

- Legal requirements
- Animal disease characteristics
- Time constraints
- Ownership and indemnity
- Personnel and equipment availability
- Worker health and safety
- Operator and observer impact
- Public perception
- Animal housing and environment
- Number of animals and phase of production
- Confirming insensibility and death
- Carcass removal and disposal

There are currently three methods of depopulation recognized by the AVMA. The AVMA Guidelines for the Depopulation of Animals defines the methods as follows:

1. **Preferred methods** are given the highest priority and are preferred when circumstances allow reasonable implementation during emergencies.

2. **Permitted in constrained circumstances methods** are permitted only when the circumstances of the emergency are deemed to constrain the ability to reasonably implement a preferred method. Potential constraints include, but are not limited to, zoonotic disease response time, human safety, depopulation efficiency, deployable resources, equipment, animal access, disruption of infrastructure, and disease transmission risk.

3. **Not recommended methods** should be considered only when the circumstances preclude the reasonable implementation of any of the preferred or permitted in constrained circumstances methods and when the risk of doing nothing is deemed likely to have a reasonable chance of resulting in significantly more animal suffering than that associated with the proposed depopulation technique. Examples include, but are not limited to, structural collapse or compromise of buildings that house animals, complete inability to safely access animals for a prolonged period of time, or any circumstance that poses a severe threat to human life.

Table 1 lists depopulation methods for poultry as developed by the AAAP (2020).

Table 1. Depopulation methods for poultry.[1]

	Preferred Methods	Permitted in Constrained Circumstances	Not Recommended
Floor reared/ confined poultry	Water-based foam generators/ nozzles Whole-house gassing, partial house gassing, containerized gassing Cervical dislocation, mechanically assisted cervical dislocation, and captive bolt gun	Gunshot VSD plus Controlled demolition Exsanguination, decapitation	VSD[2] alone
Cage-housed poultry	Whole-house gassing, partial-house gassing, and containerized gassing	Compressed air foam Cervical dislocation, mechanically assisted cervical dislocation, captive bolt gun, and decapitation VSD plus	Water-based foam generators/nozzles Gunshot VSD alone
Outdoor-access poultry	Containerized gassing Captive bolt gun, cervical dislocation, and mechanically assisted cervical dislocation	Water-based foam generators/ nozzles Partial house gassing Gunshot via firearm or pellet gun, exsanguination, decapitation, and cervical dislocation Controlled demolition	Whole house gassing VSD alone

[1]Adapted from AAAP (2020).

[2]**Note:** Ventilation shutdown (VSD) plus (includes: VSD plus heat, VSD plus CO_2, and VSD plus heat and CO_2) applied in a manner that will produce a 100% mortality rate meets the classification category permitted in constrained circumstances. Ventilation shutdown (VSD) alone is not recommended.

The AAAP (2020) indicates that the methods listed above have been shown to be appropriate for poultry depopulation based on the available scientific literature and experience. However, this list may not be all-inclusive. The appropriateness of alternative options should be assessed using the following criteria:

- Ability to induce loss of consciousness followed by death in a timely manner with a minimum of pain or distress.
- Reliability and irreversibility of the method to result in death of the animal.
- Compatibility with the safety of humans, other animals, and the environment.
- Potential psychological or emotional impacts on personnel and sensitivity to public sentiment regarding the destruction of large numbers of animals.
- Availability of agents and carcass-processing and disposal venues to handle the volume.
- Ability to maintain equipment needed for depopulation in proper working order.
- Compliance with legal requirements.

Summary

Mississippi is not immune to the ongoing disruptions in the meat processing industry caused by the COVID-19 pandemic. Many poultry processing plants are currently operating at less than full capacity. However, broilers continue to be processed and depopulation of birds in the field has not proven necessary.

The Mississippi Board of Animal Health is currently monitoring the COVID-19 situation and is working closely with broiler integrators across the state in case there should be a change in the current situation. State Veterinarian Dr. Jim Watson indicates that, should depopulation become necessary in Mississippi during the COVID-19 pandemic, federal assistance may be available. However, with limited federal resources available, there will likely be multiple states competing for the same resources.

Regardless, to the best extent possible, the Mississippi Board of Animal Health is supporting the needs of the Mississippi poultry industry and will continue to do so. Mississippi State University Extension Service personnel are also monitoring the situation and continue to provide assistance to the state's number-one agricultural industry during these challenging times.

References

AAAP (American Association of Avian Pathologists). 2020. Recommendations for the depopulation of poultry flocks. Updated April 23, 2020.

AASV (American Association of Swine Veterinarians). 2020. Recommendations for the depopulation of swine. Updated April 30, 2020.

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USDA. 2016. FY2016 HPAI Response: Mortality composting protocol for avian influenza infected flocks. February 5, 2016.

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Publication 3458 (POD-6-20)

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Produced by Agricultural Communications.

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. GARY B. JACKSON, Director