



Township of O'Hara

Chicken Permit Check List

- Application fully completed
- Dimensioned Site Plan or existing survey of property showing the location of the chicken coop and run, if provided, as accurately as possible, as well as the designated area of mobility for a mobile chicken coop is attached
- Electrical Permit if structure will include electricity

Application

Address: _____

Lot and Block Number: _____

Name: _____

Phone Number(s): _____

Email Address: _____

Occupant if different from Property Owner: _____

Mailing Address: _____

Number of Chickens: _____



Township of O'Hara

Township of O'Hara Chicken Permit Guidelines

The Township of O'Hara has passed an Amendment to the Zoning Ordinance to permit responsible ownership of chickens on single family properties. Property Owners who wish to have chickens must obtain a chicken coop permit from the Township. The permit number must be displayed visibly on the exterior of the coop. The Township permit cannot override provisions of your Homeowner Association. Renters must have the property owner obtain a chicken coop permit from the Township.

Please ensure that all sections of this permit are filled out and any needed documentation is securely attached.

Attachment A to this permit includes a list of helpful reading materials on the proper raising of chickens.

1. Coop Location

A stationery or mobile coop must be in your backyard.

Only one (1) mobile chicken coop is permitted per property.

The entire chicken coop and any run structure, if provided, must be located at least 10 feet from any property line in the R-1, R-2, R-4, CD-1 and CD-2 zoning Districts, and 5 feet from any property line in the R-3 zoning district.

You will need a dimensioned site plan or existing survey of your property with the location of the chicken coop and run, if provided, noted as accurately as possible. A dimensioned site plan shall indicate the designated movement area in the rear yard for a mobile chicken coop.

The chicken coop is considered an accessory structure and must comply with this section and other applicable sections of the Zoning Ordinance.

2. Number of Chickens Permitted

As chickens are a flocking bird, a minimum of 3 chickens is recommended.

The number of chickens that you are permitted to keep depends on the size of your yard. Properties less than 10,000 s.f. may have a maximum of three chickens. Properties 10,000 s.f. or larger may have three chickens for the first 10,000 square feet of the yard. Each additional bird will require 2,000 additional square feet of yard.

Mobile chicken coops may have a maximum of four (4) birds.

You may not have more than 20 chickens at one time.

3. Coop Requirements

Space - Coops without a chicken run should permit three (3) square feet per chicken. Coops with a chicken run should permit two (2) square feet per chicken. Coops should be predator proof, well maintained and in good repair. Coops should be constructed from proper building materials. The coop should provide natural lighting, protection from weather and adequate ventilation.

This checklist will help you determine whether your coop design is compliant with the Township's Chicken Permit.

Function

- Provides natural lighting and ventilation
- Windows covered in hardware cloth, screen or other appropriate material of sufficient size to protect from predators is recommended
- It is recommended that the door be closed
- Construction is solid as to protect from predators

Appearance

- May not exceed eight (8) feet in height
- Maximum size is 100 s.f.

4. Chicken Run Requirements

Chicken runs are not required for the raising of chickens but are recommended.

If provided, the chicken run height may not exceed seven (7) feet. Run should be of sound construction and designed to keep predators out. A minimum 20-gauge chicken wire may be used. Other materials may be used subject to Township approval.

5. General Chicken Requirements

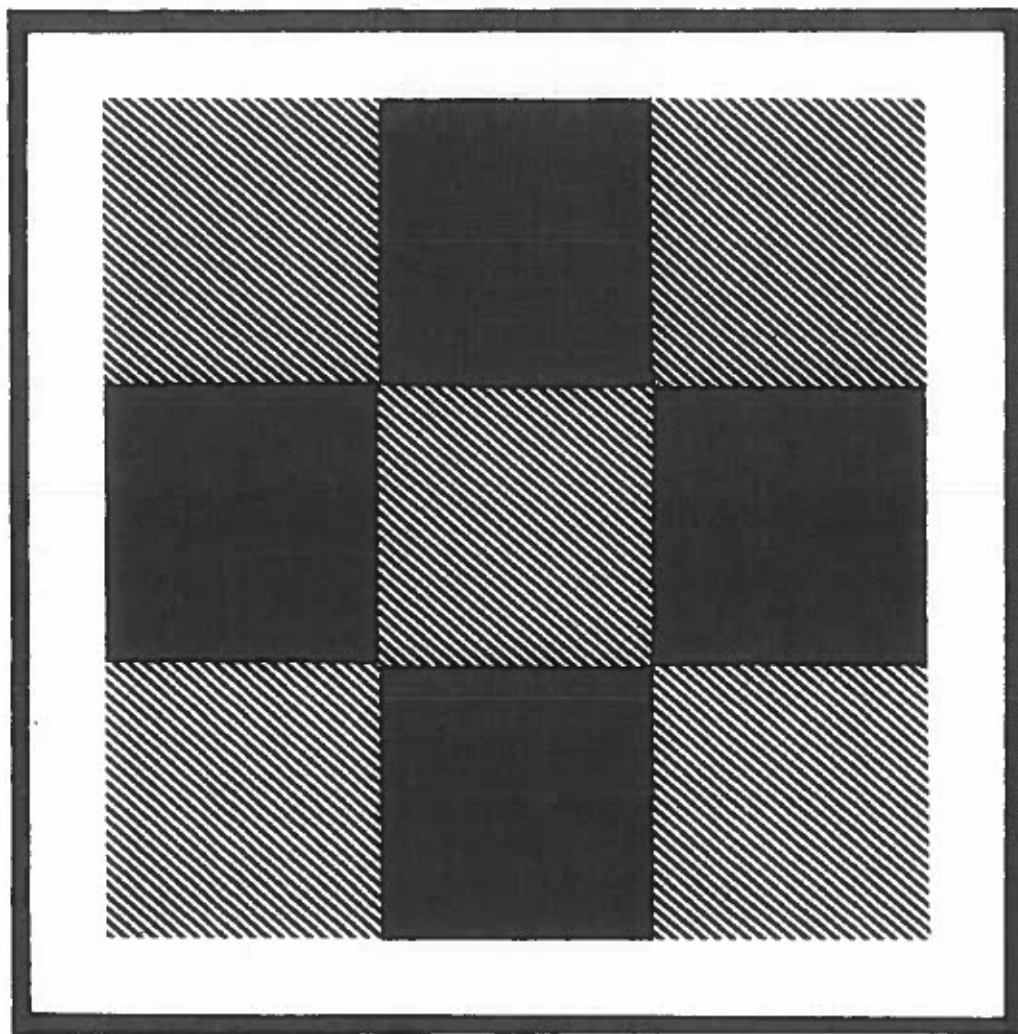
In order to ensure that chickens are maintained in a healthy and humane manner the following are required:

- Coops and runs must be regularly cleaned and animal byproducts properly disposed of in accordance with the management of manure and waste plan submitted with the application. Acceptable methods to dispose of animal byproducts include composting or placing in the waste stream in securely tied trash bags. Shopping bags **do not** qualify as trash bags.
- No animal byproducts or wastes may be transported off the lot by natural causes that may result in contaminated wells, watercourses, or potable water supplies.
- No odors from the chickens, coop or run may go beyond the property line.
- Chicken feed should be kept in a rodent-proof container. Follow manufacturer's recommendation for storage length.
- A constant supply of fresh water is recommended.

- Chickens may roam free in a secure, fenced-in rear yard. It is recommended that predators be considered if doing this.
- Chickens should not roam off your property, into a street or neighboring property.
- No butchering or cleaning of butchered chicken is permitted in plain sight.
- No Roosters are permitted.
- Chicken coop and run, if provided, shall be free of infestation of insects, rats, vermin, or other pests. Proper extermination precautions shall be taken by owner to eliminate infestation and prevent re-infestation.

6. Other Township Requirements

- No selling of eggs is permitted.
- No selling of butchered meat is permitted.
- No selling of chicks or chickens is permitted. If you decide not to maintain a flock, the coop and run must be converted to a permitted use or removed within one year.
- If running electricity to your chicken coop, an electrical permit will be required.
- If fencing-in your yard for your chickens and/or coop, a fence permit will be required.
- A dog or cat that kills a chicken shall not, for that reason alone, be considered a dangerous or aggressive animal if the chicken is off the owner's property.



BROODING and REARING BABY CHICKS

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BROODING AND REARING BABY CHICKS

BY DANIEL W. TALMADGE, *Extension Poultryman*
University of Connecticut

RAISING BABY CHICKS for layers, broilers or roasters is a popular 4-H Club project. In this venture you can gain much satisfaction and valuable learning experience. Moreover, you can contribute to the health of your family by raising these very nutritious foods—eggs and poultry meat. You will be able to sell some and provide yourself with pocket money.

As with any 4-H activity, you will want to do the best job possible. Promise yourself at the start that you will give the birds regular care. Keep the feed and water before them at all times. And make sure that the chicks are comfortable. Once started, you will need to spend only a small amount of time each day to care for your flock.

In this bulletin you will find information on the care and development of baby chicks. Read

this material carefully—it will help you increase your chances of success in this project. Remember to consult your club leader on problems that you can't handle adequately.

WHAT WILL IT COST?

It will cost you from 0.52 to 0.60 cents for each all pullet day-old chick. Other additional basic costs are \$1.64 to \$2.05 for 20.5 pounds of feed for each pullet chick up to 22 weeks and .13 to .15 cents for heat and litter. The total cost, therefore, ranges from \$2.29 to \$2.80 to raise a chick to ready-to-lay size (see Table 1).

Of course, if you lose birds along the way, the total cost to raise each bird will be more. All expenses considered, you may save money by

TABLE 1—Approximate Cost of Raising Replacement Pullets and Meat-Type Males

Replacement Pullets (to 22 weeks of age)		Meat birds (Broilers 3½ lbs.)	
Cost per chick	\$.52- .60		\$.38-.40
Cost of feed 20.5 lbs.	1.64-2.05	7.71 lbs.	.77-.85
Heat and litter	<u>.13 - .15</u>		<u>.13 - .15</u>
	\$2.29 - 2.80		\$1.28 - 1.40

This bulletin was originally written in cooperation with Richard Warren, Extension poultryman at the University of New Hampshire (since retired), and Thomas Higgins, retired Extension poultryman at the University of Rhode Island.

growing your own pullets, and you get the experience as well. Many poultrymen believe that home-grown pullets are healthier than purchased pullets.

BUYING YOUR CHICKS

When to Start

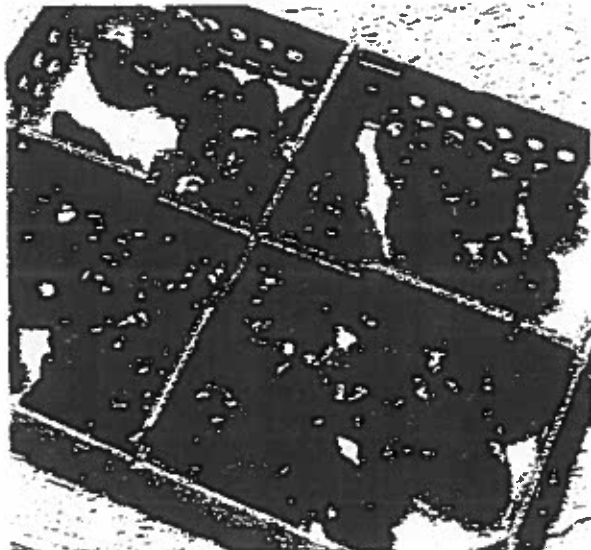
The exact time to start your chicks may depend on the type of housing you have and your brooding equipment. Winter-hatched birds start laying in the early summer, but may go into a neck molt and a "vacation" period the following winter. Pullets hatched in the late winter or early spring start to lay in the summer when egg prices are usually high. Those raised late in the spring will not start laying until late fall. At that time, egg size may be small and prices lower.

Probably the best time for 4-H members to buy their chicks is April and May. These chicks are much more satisfactory for those who do not have cold weather brooding facilities. Moreover, the pullets will start laying in early fall and continue laying for at least 12 months.

Breeds for Best Results

Production birds that lay brown eggs are the most popular with 4-H members in New England. This includes all of the sex-linked crosses; black and buff colored females, other production crosses popular in your area as well as purebreds such as Rhode Island Reds.

If you are planning to raise cockerels for meat, your best choice will be from among the white meat breeds, such as White Plymouth Rocks.



After deciding on what breed you want, be sure to buy healthy stock. Get chicks from flocks that are rated as U. S. Pullorum clean, (free from Pullorum disease) and have high production records.

Get the best chicks you can buy. Cheap chicks may cost you more in the end than those that cost more in the beginning. If possible, buy your chicks from hatcheries or breeders near your home or within the state. Consult your County Club Agent for more information on sources of good baby chicks.

WHAT SIZE FLOCK SHOULD YOU HAVE?

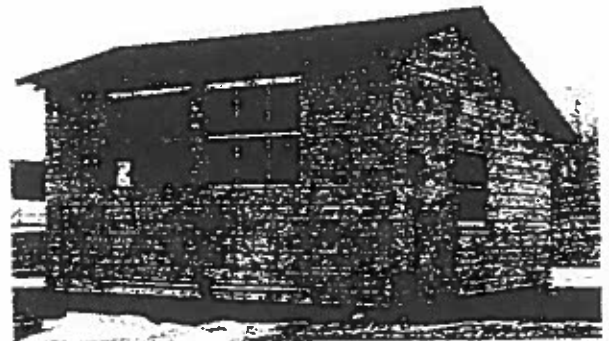
Before deciding on the size of your laying flock, consider first the time you have available and the space requirements.

Time for Care

A flock of 12 laying hens should keep a family of 6 adequately supplied with eggs. However, a flock of 25 hens doesn't take much more time and there will be eggs for sale.

Space Requirements

You need to provide a house or pen large enough to allow each layer 3 to 3½ square feet of floor space. Example: a 10' x 10' pen will take care of 25 hens adequately.



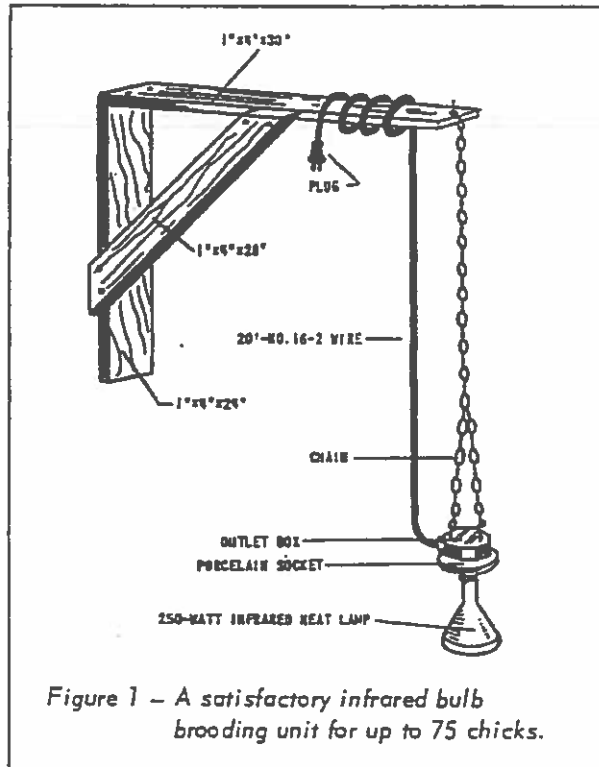
This 12' x 12' poultry house provides space for up to 50 birds.

This box of chicks just arrived from the hatchery.

ESSENTIALS FOR SUCCESSFUL BROODING

Housing Needs

Your brooding area should be draft and rain proof and protected against rats and mice. Baby chicks need about 1 square foot of floor space per chick for the first 8 weeks. The pen should have windows for ventilation and sunlight.



Types of Brooders

Infrared lamps are excellent for brooding small flocks of chicks (see Figure 1.). The equipment is inexpensive and the lamps are excellent for supplying heat to the chicks in the late spring, summer, or early fall months.

Many 4-H flocks are brooded with brooders heated by electric light bulbs. Contact your club agent for plans on electric light brooders.

Conventional brooders, usually oil, gas or electric, have a hover to keep the heat at the floor level. These brooders are excellent for

flocks of 100 chicks or more. The initial cost is greater than the infrared brooder unit.

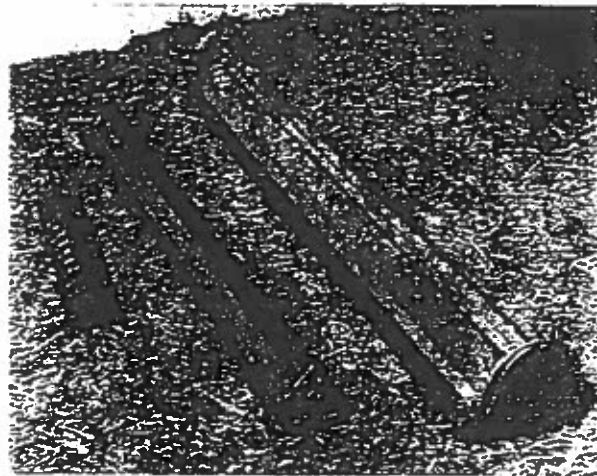
Brooder Guards and Litter

Brooder guards keep the chicks from wandering away from the heat and getting chilled. They are made from cardboard, tar paper, or wire. It should be about 1 foot high and long enough to go around the brooder. Allow about 3 feet between the brooder and the edge of the guard.

Cover the floor of your pen with litter. It should be dry, clean, and have good absorbing qualities. Recommended materials to use include dried sugar cane, wood shavings, and peanut shells. Chopped hay or straw and dry leaves have been used in an emergency. A thin layer of dry fine sand on the floor and about 1 or 2 inches of litter make a good floor for the chicks.

Types of feeders

for various age groups (see Table 2.).



Feeders

Feeders should be constructed so that the birds can get at the feed conveniently and still not waste any of it. At least two sizes of feed hoppers are needed with enough feeding space

Table 2. – Recommended Feeder Space for Chicks

<i>Age of Chicks</i>	<i>Length</i>	<i>Depth of Feeders</i>
1-4 weeks	at least 1 inch per chick	2-3 inches
4-8 weeks	at least 2 inches per chick	4 inches
8 weeks on	at least 4 inches per chick	5-6 inches

Table 3. – Amount and Kind of Feed Required for 25 Pullet Chicks by Age

<i>Age</i>	<i>Amount and Kind of Feed</i>
0-7 weeks	100 lbs. of Starter
7- 10½ weeks	100 lbs. of Starter or Grower
10½- 22 weeks	500 lbs. of Grower
22 weeks on	100 lbs. of Layer ration every 2 weeks

so that all the birds can eat at one time. It is easy to make wooden hoppers from spare pieces of lumber. Ask your club agent for plans.

Table 2 indicates the recommended feeder space per chick.

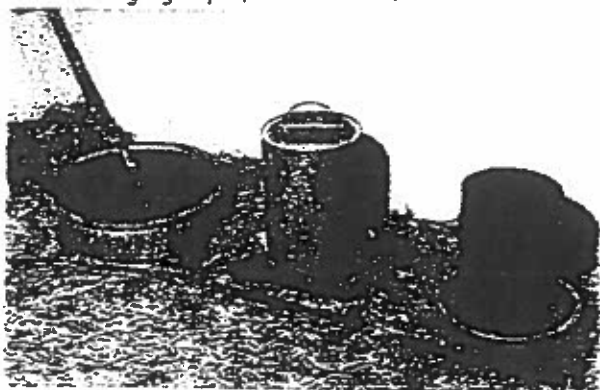
To figure feeding space, count the length of both sides of the feeder. A feeder 24 inches long has 48 lineal inches of feeding space and should feed 48, 3-week-old chicks. You also should have a clean place to store your feed where it will be protected. A metal barrel or a wooden box with a cover will serve the purpose.

Looking at Table 3 will tell you the amount of feed you will need to buy for your project.

Waterers

Water is the most important nutrition the chicks receive. About 65 per cent of the bird's body is water. Therefore, you need to keep water before the birds at all times.

Types of waterers for various age groups (see Table 4.).



You can make your own water fountains, using 5-quart oil cans or fruit-juice tins and tin plates. Make 2 holes on opposite sides of the can about ¾" from the lip. Fill with water, place the plate on top and flip over (see waterer at right in picture).

It also would be good to put a small wire platform underneath each fountain. It keeps the water cleaner and prevents damp litter.

Table 4 will help you figure the size and number of waterers.

PREPARING THE BROODER HOUSE

Cleaning and Checking

Start preparing for your chicks at least 3 weeks before the chicks arrive. Brush the cobwebs and dirt from the ceiling and walls. Clean, wash, and disinfect the floor. Use a good disinfectant for the floor area, such as coal-tar disinfectants like creosote or carbolinum. Be sure to air out the houses thoroughly before putting in chicks.

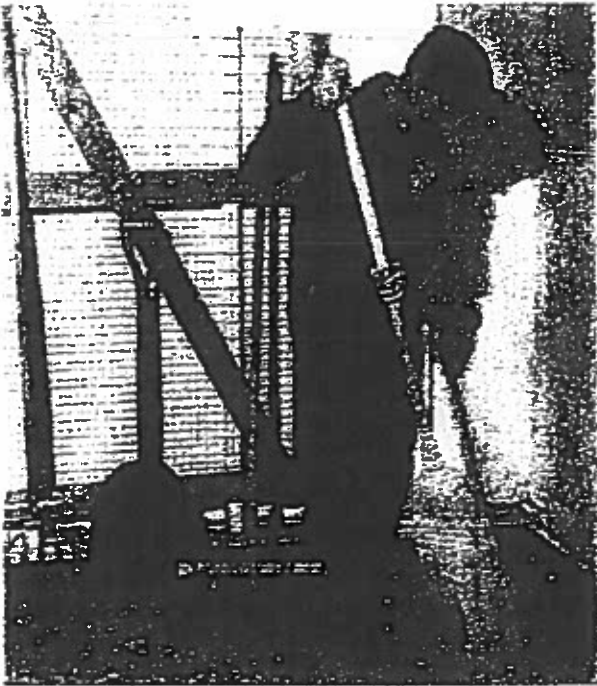
Patch up any leaks in the roof or cracks in the walls. Clean the water fountains and hoppers thoroughly and make any needed repairs.

Get rid of any rats or mice that might be in the brooder house. Put out poison baits; some

Table 4. - Size and Number of Waterers for 100 Chicks

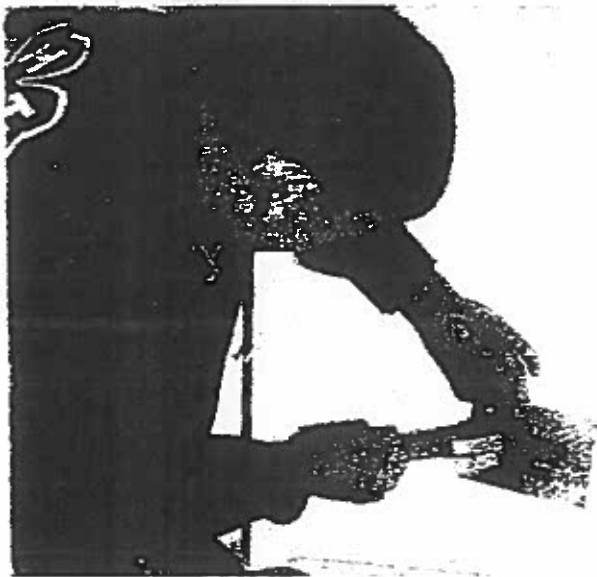
Age of Chicks	Number	Capacity
1-4 weeks	4	1 or 2 quarts
4-8 weeks	2	2 or 3 gallons
8-20 weeks	1	5 gallons

Never allow your chicks to be without water and feed.



Clean your brooder house thoroughly before the chicks arrive.

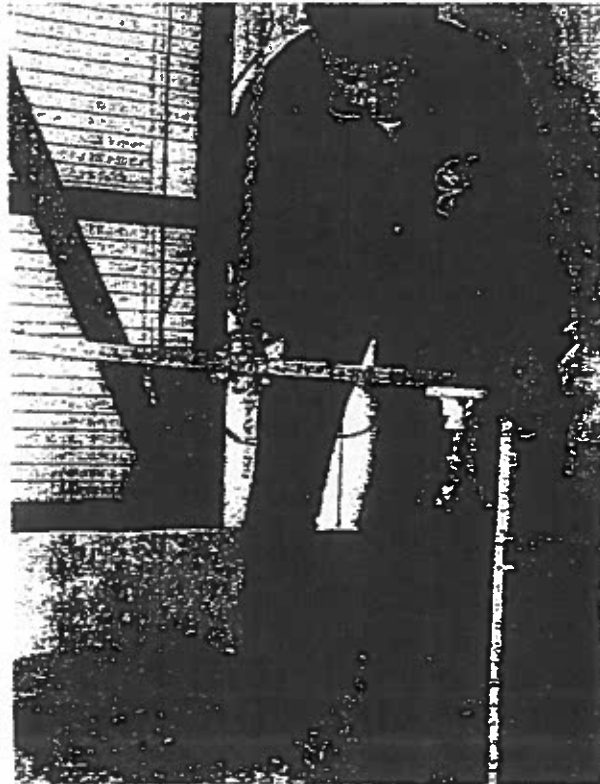
Patch up cracks in the walls to prevent drafts and mice from getting into the house.



form of anticoagulant should do the job. Block up any rat holes in the floor by nailing pieces of metal over them.

Next, set up your brooder and see that it is in good working order. For your electric brooders and your infrared heat lamps, be sure that the wiring is in good shape. Check for broken wires and replace them. If you use an infrared heat bulb, be sure that the chain, cord, and wire guard are fastened tightly. Never have the infrared lamp closer than 18" from the litter.

Hang the infrared lamp 18" from the litter.

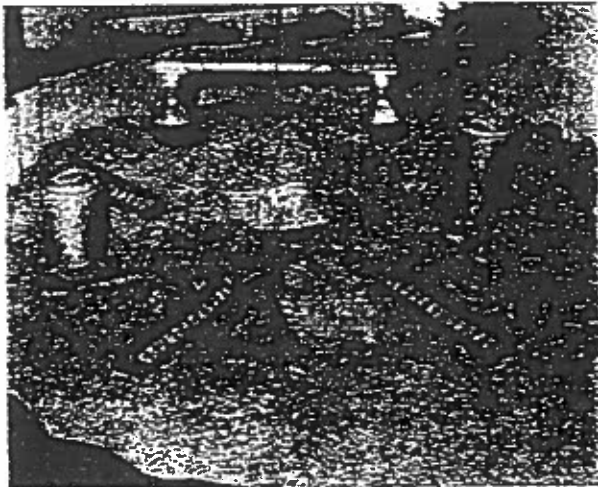


If you use the conventional brooder heated by oil or gas, check your brooder and see that it is cleaned out thoroughly. Make sure that your storage tanks and the lines from the tank to the brooder do not have any leaks. It is always best to check the safety features with an adult.

Be Safe, Not Sorry

Always follow good safety practices in your brooder house. Every year, some poultrymen lose baby chicks through carelessness or because they didn't take time to check their equipment.

Always start your chicks on fresh litter. If you should raise more than one brood of chicks during the year, it is best to clean all of the old litter out and put new litter for each brood of chicks.



This brooder pen is ready for the chicks.

Arrange the feeder and the fountains around the brooder. Some people put their feeders around the brooder evenly like the spokes coming out from the hub of a wheel. The fountains are set in between and near the edge of the hover.

Set up the chick guard around the hover at least 2 or 3 feet away. Block off the corners of the house to prevent the chicks from crowding in case they should become frightened after you take away the guard. Extra litter piled in the corners works very well.

If possible, leave the pilot light on in your brooder pen at night. This enables the chicks to

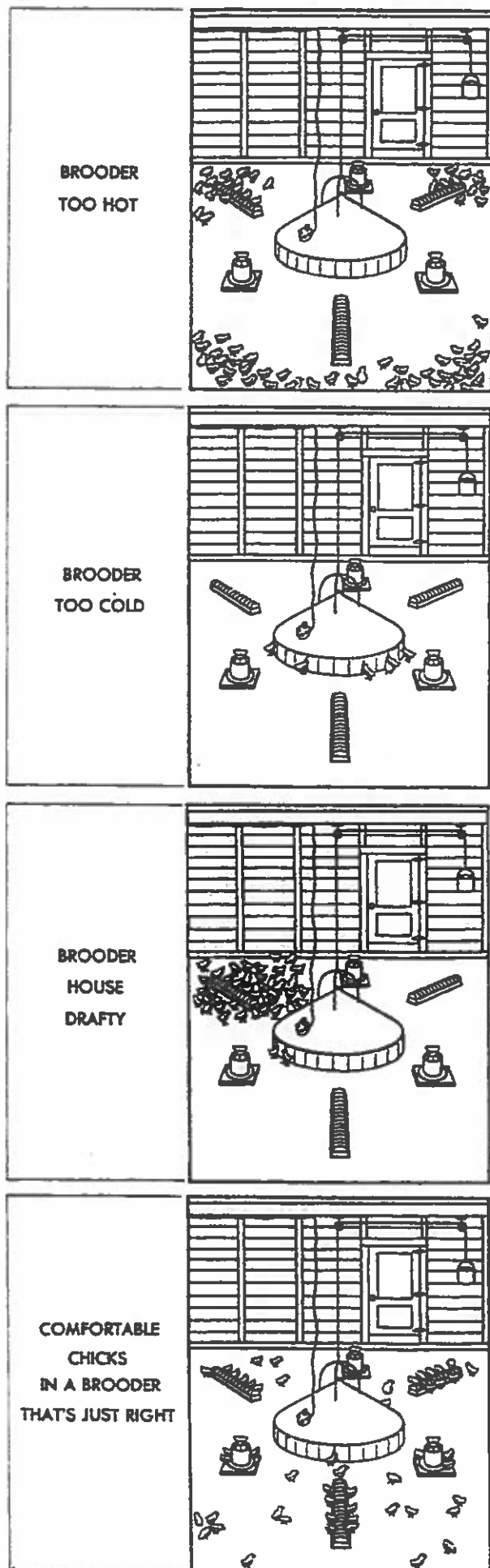
find their way to the source of heat in case they should wander away. A thermometer is also useful for checking the temperature. If you watch your chicks closely, they can tell you better than anything else whether they are comfortable. If they are spread evenly around or under the brooder, they are comfortable. If they huddle up close, they are too cold. If they push up against the guard, they are probably too warm (see Figure 2).

GIVE CHICKS A GOOD START

The day before your chicks arrive, check all the equipment in your brooder house to make sure that it is in good working order. Start the brooder so it will be warm. Some junior poultrymen cover



Put your chicks in the brooder pen right after they arrive from the hatchery.



the litter around the brooder with papers for the first few days, but this is not necessary. It is good practice to put some mash on paper plates, cut-down chick box covers, or on new egg-case flats. Set these on the litter where the chicks can find the feed easily for their first feedings. Be sure to take these out after the third day because continual use can result in wasted feed. Also, fill the chick hoppers with mash.

What To Do After Chicks Arrive

1st to 3rd Day - As soon as you get your baby chicks, put them under the hover. Check them often to see if they are eating and drinking. Keep mash on the paper plates and the hoppers about two-thirds full. It is not necessary to give chicks scratch feed the first day. Clean the water fountains and refill every day.

The temperature for the first week should be about 95 degrees F. at the edge of the hover, 2 inches above the floor. Use a good thermometer. The infrared bulb should be 18 inches from the litter.

At the 4th Day - Enlarge your chick guard to make a comfortable working area around the hover. At the end of the 1st week, remove the guard except to round out pen corners to prevent crowding.

Watch how the chicks bed down at night. Chicks should bed down side by side, not pile up. At night, the chicks should be under or at the edge of gas and electric hovers; at the edge of coal and oil hovers; or fanned out if under infrared units (see Figure 2).

Each type of brooder will give a different room temperature. But watch small houses against overheating from the sun's rays. If chicks crowd toward the corners or room temperature gets above 75 degrees F., open the windows.

Clean waterers each day inside and out. Don't spill water on the litter. As the chicks grow, place the waterers further away from the brooder. Fill the feeders only two-thirds full from now on to stop the chicks from wasting feed. It's

Figure 2 - Chick comfort.

a good idea to clean out the litter that has gotten into your feed – shake the feed to one end of the feeder before adding new mash.

Watch for toe and feather picking. Use a "stop pick" salve if this habit starts. Shade the windows if the sunlight is too bright on chicks.

At 2 Weeks – Continue to give your chicks all the feed they will eat, but fill the feeder only two-thirds full. As the chicks grow, add the intermediate-type feeder.



Keep feed in front of the chicks at all times, filling the hopper only two-thirds full.

Replace water containers with 3-gallon size, 2 per hundred. Place the waterers on a wire platform to keep out the litter and help keep the floor dry.

Stir litter regularly to prevent caking and remove any caked or wet litter. Add fresh litter so that it is 3" to 4" deep on all parts of the floor. Help to prevent wet litter by opening windows for proper ventilation.

Lower the brooder temperature to 80 to 85 degrees F. and then reduce the temperature by 5 degrees F. each week thereafter. Raise the infrared bulbs 1" per week as birds grow.

3rd to 4th Week – It is time to add larger feed hoppers and water fountains. Your chicks should be about half feathered and should be making rapid gains in size. Be sure they are not crowded. Allow at least 1 square foot of floor space for each chick for the next 4 weeks.

Continue to feed the replacement chicks a high efficiency chick starter mash. Allow at least 2" of feeding space per chick. It is a good idea to leave the small hoppers in the pens for a few days until the chicks get used to new ones.

Stir the litter every few days to keep it loosened and dry.

If the weather is mild, your chicks can go without heat during the day. The temperature should be about 70 to 75 degrees F. under the hover at night. Raise the legs of the brooder until the edge of the hover is above the backs of the chicks. Continue to raise the infrared heat bulbs 1" to 2" per week.



As the chicks get older, raise the brooder hover.

Table 5. – How to Distinguish Males from Females at 4 to 8 Weeks of Age

<i>Males</i>	<i>Females</i>
Larger and heavier	Smaller
Greater comb and wattle development	Less growth on comb and wattles
Larger shanks and feet	Smaller shanks and feet

Check your chicks carefully. If you see any runts or sickly chicks, it is best to get rid of them now. "Cull" chicks usually do not grow up to be good birds.

4th to 8th Week – Your chicks should be almost fully feathered by now. Separate the cockerels from the pullets if you have extra room to house them. Both sexes will grow better if separated (Table 5).

Plan your feed purchases carefully. Change over to growing mash at 6 weeks for your pullets and to broiler finisher at 5 to 6 weeks for your broilers. Opening the windows on sunny days helps to control moisture. Stir the litter regularly to prevent caking. Make sure waterers are of the 2- or 3-gallon size. Set them on wire platforms to help keep the litter dry.

Check hopper space to see if there are 3, 6-foot feeders per 100 birds. Water fountains should hold a full day's supply.

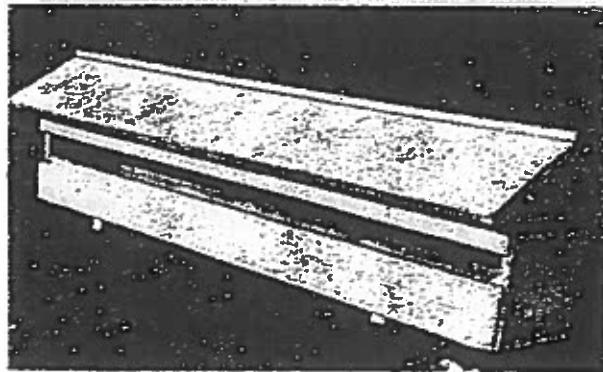
Remove and clean your brooder or infrared lamp and put them away in a safe place for use another year.

MANAGEMENT DURING THE GROWING PERIOD

Some poultrymen put their birds on range during the growing period from about 8 weeks until a week or so before the birds start to lay. However, range rearing of 4-H flocks is very hazardous, since members are not at home all day to watch their flocks for damage by predatory animals. These include dogs, coons, foxes, owls and hawks.

For Replacements

If you use a range, be sure to shut the chicks in the house or shelter at night. However, most young birds are raised in confinement. If



This hopper protects the feed from wind and rain.

birds are confinement-reared, make sure that they have plenty of feed and water space. Also allow at least 2 square feet of floor area per bird.

If the pullets are ranged, the best practice is to have a range shelter, a clean grass range with a tight fence around it, and special feed hoppers. The latter will protect the feed from wind and rain.

Confinement rearing is recommended for the meat birds.

For Meat Birds

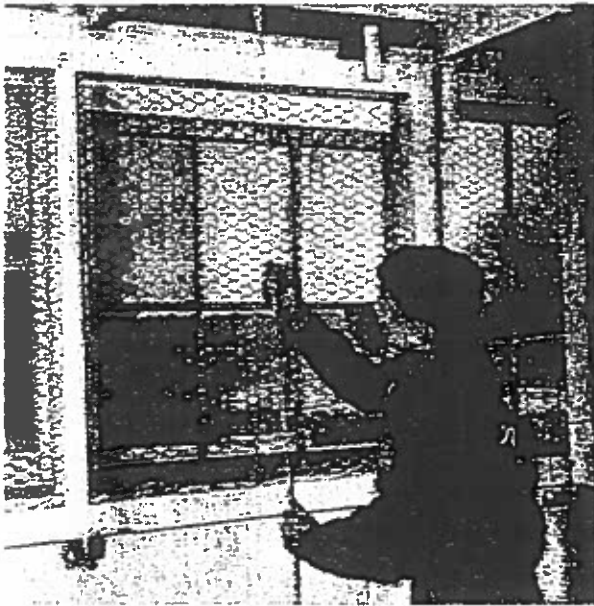
Meat birds should have been separated from the production pullets at about 6 weeks of age and fed a high efficiency broiler ration. Keep plenty of clean water and fresh feed before the birds at all times.

Some meat birds will weigh 4 lbs. or better at 8 weeks of age. These birds should be killed and dressed, and eaten as broilers. If you keep your meat birds longer than 8 or 9 weeks, they will develop into roasters. They also will cost more to raise per pound of gain than the broilers.

KEEP YOUR FLOCK HEALTHY

There are several troubles that might affect your chick flock. If you keep your litter dry, follow a good feeding program, and have fresh air in your brooder house, you will go a long way in keeping your flock healthy.

Provide fresh air in your brooder house by regulating the windows.



Diseases

Some diseases your flock might have include coccidiosis, newcastle disease, and bronchitis. There are vaccines available for newcastle and bronchitis. Check with your club agent for vaccination recommendations.

Parasites

Sometimes young stock become infested with red mites or body lice. Doing a good cleaning job in your house before the birds arrive should help control these parasites. Nevertheless, it is a good plan to look over your pullets often for parasites.

Poultry Lice - Several kinds of lice may appear on various parts of a chicken. They feed on dry skin and feather parts, causing a constant irritation to the birds. Their eggs, laid at the base of the feathers, hatch in two or three days.

If left uncontrolled, lice will multiply on the birds. To get rid of them, use 4 per cent malathion dust in the litter at the rate of 1 lb. per 50 square feet of floor space.

Poultry Mites - Two kinds of mites that affect poultry are red mites and northern fowl mites.

Red mites feed on the birds at night and hide during the daylight in the cracks and crevices of the poultry house. They are usually found near the bird's tail or abdomen. To control them, use 4 per cent malathion dust in the litter, 1 pound per 50 square feet of floor area. Use a duster or shaker jar and apply to dry areas only. For complete control, make 2 treatments 7 to 10 days apart.

Northern fowl mites spend their entire life on the body of the chicken. You can find them near the tail, vent, or on the shanks. Note: the shanks appear to have had pepper shaken on them. In the laying house you often see the small mites crawling on the chicken eggs. Treat the same as for red mites; also apply some dust to the nesting material.

Caution: Malathion dust should be kept out of the feed and waterers. **BE SURE TO READ THE LABEL ON THE PACKAGE AND USE ONLY AS RECOMMENDED.**

Bad Habits

Feather Picking - If chicks are too crowded or too warm, they start feather picking. You can stop this trouble by darkening the room, or by putting anti-pick paste or pine-tar product on the tails of the affected birds. Debeaking birds is the best way to prevent feather picking. Some specialists recommend debeaking all replacement pullets between 12 and 16 weeks. This will prevent cannibalism, egg eating, and feather pulling in the laying house. Ask your club agent to assist you in borrowing an electric debeaker. This machine takes off the upper end of the beak and sears the cut to prevent bleeding.

For a small number of birds use a dog nail clipper to remove the point of the upper beak.

Other troubles - Keep a close watch on the behavior of your chicks. If at any time you think something is wrong, ask your club leader for

help. Don't wait until you have lost several birds. Your State Land-Grant University provides a service in its Animal Diseases Department for detecting the different kinds of poultry diseases.

KEEP GOOD RECORDS

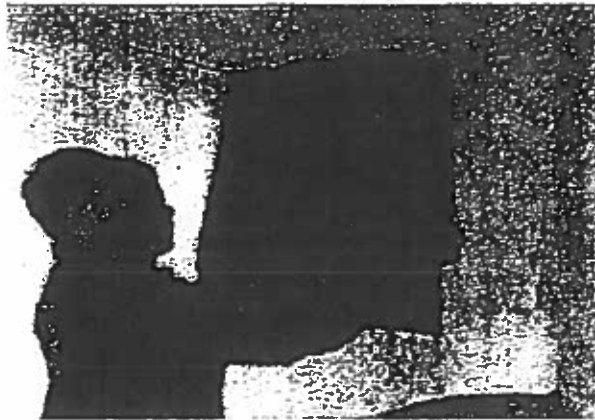
Records are an important part of every person's activity. The older you get the more records you will be required to keep. Develop a good system of record keeping now and it will help you throughout your life.

Secure a chick record sheet from your club agent and follow the directions carefully. It will include spaces to record expenses for the birds, equipment, and feed. It also will include space for receipts. You should record the number of birds sold, price per pound, total received, and the number of birds that died or were culled. There will be an item for an exhibit record and also a summary of your total costs and total returns for your projects. This information will prove valuable if you decide to raise a flock of birds another year.

*Keep accurate records!
They can help you do a better job of flock management.*



Records also help you to manage your birds better. If you are keeping careful track of the amount of feed that your chicks eat, you will be able to spot quite quickly any trouble that might occur. If you notice that your birds are eating less feed for a day or two, inspect the flock carefully to find out the reasons. A sudden drop in feed and water consumption means the birds may be sick.



Hang your feed bags on a rack to keep them in good condition.

SAVE FEED AND FEED BAGS

Poultry feed is the largest single cost in raising chickens. Prevent wastage of feed by following the suggestions listed below:

1. Keep rats and mice out of your pens.
2. Don't let the birds get in the feed hoppers.
3. Make sure your feed hoppers have a good lip on the edge to prevent the birds from billing-out the feed.
4. Do not fill your hoppers more than two-thirds full.
5. If you allow your birds to range, make sure you use a range-type hopper.
6. Take careful care of your empty feed bags. They are worth money if you keep them in good condition. Make a rack to hang them on.

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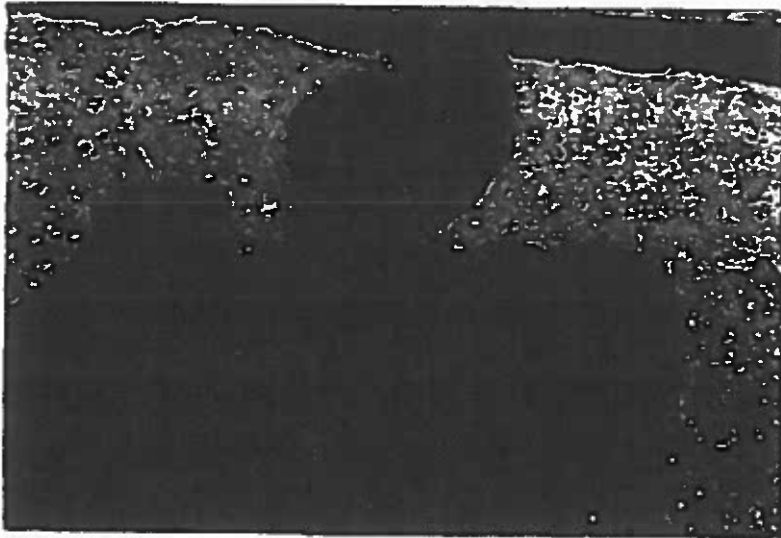
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Brooding of Domestic Fowl

It is very important to realize that baby fowl are totally dependent upon you to meet their needs. Baby fowl need proper environment, nutrition and protection.

Updated: February 26, 2016



Preparing the Brooder Environment and Equipment

It is important that you properly clean and disinfect your brooder equipment and set-up your equipment at least 48 hours before your chicks arrive.

Heat Source

The first decision you must make is what heat source you will use. Artificial heat sources include incandescent light bulbs, heat lamps, electric hovers, gas hovers, and hot water radiators. Each works satisfactory as long as it is set-up in a safe manner and maintains a constant temperature comfortable for the chicks.

For small flocks, the wooden chick brooder using incandescent light bulbs for heat is the most economical. Heat lamps are more expensive to use but are the most popular.

Specific Heating Recommendations

- Always measure the temperature at the chick's level, directly under the heat source. Do not overheat the brooding areas. Excessive heat causes dehydration, poor growth and increased mortality.
- Secure all heat sources so they cannot be moved or slip too close to flammable materials. As a rule, heat lamps should be at least 20 inches from any flammable material.

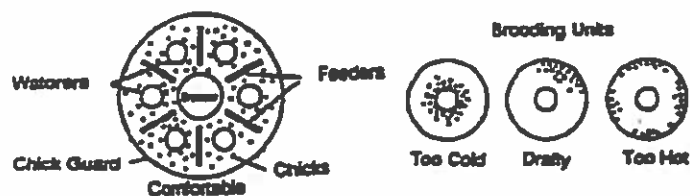
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- Supply 95°F. at chick level under the heat source for the first week. Decrease the heat by 5°F. per week until the normal daily temperature is reached (62-65 degrees F.).
- Be sure that chicks don't get chilled during extremely cold nights or experience large temperature swings for the first 6 weeks of age. High/low thermometers are helpful to insure the temperature in the brooder does not get too hot or too cold when you are not able to observe the brooding area.
- The brooding area should be draft free.
- Whatever your heat source, make sure it is adjusted properly and works effectively through the day and night temperature changes.

Two methods of observing the chicks can help you understand the chicks comfort level:

1. Comfortable chicks are spread evenly through the brooding areas. Cold chicks will huddle under the heat source. Chicks which are too warm will be seen as far from the heat that is possible. Chicks in a drafty brooding area will huddle away from the source of the draft.
2. You can also tell if the temperatures are too extreme by looking at the young fowls legs. If the chicks are chilled, their legs will be cold to the touch and appear puffy and swollen. If the brooding area is extremely hot, the legs will look dry, thin and dehydrated.

Ideal Brooding Temperature and Equipment Arrangement



Good Management and Set-Up of the Brooder

If the brooding area has been used to raise fowl before, thoroughly clean and disinfect the brooding facilities and equipment at least two weeks before you plan to brood your new chicks. This will allow the area to dry thoroughly.

Completely prepare the brooding area for the young fowl 48 hours before their planned arrival. This will allow the floor and other materials to warm properly prior to the chicks arrival. Preparation should include:

Space Requirements

Summary Of Brooding Requirements

Age of Chicks	Temperature ° Fahrenheit	Floor Space sq. ft./bird	Feeder Space inches/chick	Water Space inches/chick
1st Week	92 - 95°F	1/4	1	1/2
2 - 3 Weeks	85 - 90°F	1/2	1-1/2	1/2

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3 - 5 Weeks	80 - 85°F	3/4	2	1/2
5 - 8 Weeks	70 - 80°F	1	2	3/4
8 Weeks and Up	room temperature	1-1/2*	3*	1*

* Increase appropriately as birds grow and for larger breeds and types of birds.

Litter

If you brood the chicks on the floor, put down a base layer of 2-3 inches of clean, dry litter. Avoid sawdust or other fine litter for the first few weeks to limit excessive litter consumption. It is a good practice to put a burlap cloth, cheese cloth or paper towels over the litter for the first week so the young fowl can learn to distinguish the food from the litter.

In small brood boxes or coops, it may be easier to line the bottom of the brooding area with 6 to 10 pages of newspaper as a base. Then put a layer of paper towel on the top of the newspaper for traction. When the brooder gets dirty, just roll up the top 3 sheets of newspaper and put another layer of paper towel on top of the fresh newspaper.

Remember.. never brood young fowl on slippery surfaces like newspaper or wood floors. If the young lack good traction they may develop permanent leg damage.

Three-eighths inch mesh wire floored brooders work well for most fowl. However, don't raise bantam chickens, game birds, or miniature waterfowl on wire as their hocks often will drop through the mesh and become trapped. This can be prevented by covering the mesh wire with burlap or rags for the first few weeks.

Waterers

Supply one quart of water for every 25 chicks. Use drinkers the young can reach but not fall into. For Bantams, game birds and other miniature fowl, it is advisable to place marbles or pebbles in the water tray so that they can drink but not fall into the tray and drown. Don't let young waterfowl swim unsupervised in water until they are totally feathered. Their fluffy down can become saturated and birds can drown. For larger numbers, automatic nipple watering systems work excellent.

Feeders

Place feeders near the heat but not directly under the heat source. To encourage eating for the first week, put feed in an egg carton top or shoe box cover. Only feed non-medicated starter foods to waterfowl to avoid possible adverse reactions to some types of poultry medications. For all other fowl feed an 18-24% medicated starter for the first eight weeks. Keep fresh feed in front of young fowl at all times.

Chicks should be fed 18-20% protein chick starter. Meat chicks can be fed 18-24% protein meat bird diet if available. Turkeys and gamebirds usually are fed 20-24% protein starter diet. Waterfowl should never be fed medicated starter diets. Feed them a waterfowl 20-22% protein starter if available. If not available, a non-medicated chicken starter will work.

Feed

Only feed a starter diet to young fowl. It is properly balanced for young growing fowl. NEVER feed laying ration to young fowl. Layer feed contains too much Calcium and will damage the bird's kidneys, create high mortality and stunt the growth in the birds that do survive.

Chick guard

If brooding young on the floor, use a chick guard during the first few weeks to prevent drafts, keep the chicks near the heat source and keep chicks from piling in corners. A chick guard is usually made of cardboard and encircles the brooding area. A chick guard 18 to 24 inches high and 6 to 10 feet cross is sufficient for 100 chicks. This is especially good in large floor pens where the chicks can get separated from the heat source & pile up in corners.

Placing the chicks

Newly hatched chicks can live on the unabsorbed yolk in their bodies for about 72 hours if necessary. If possible it is best to get them into a brooder with feed and water within 24 hours after they hatch. If you plan to ship or transport the young fowl for a long distance after incubation do not feed or water the chicks until they arrive at their final destination. Once the young fowl start eating and drinking their yolk sac will not be useful to them. Driving them home over an hour or less is ok for the chick as long as they do not get chilled.

With small numbers of young it is helpful to show each bird where the water is by quickly dipping its beak into the water tray.

Check on chicks often to ensure they are comfortable. Chicks need enough room to regulate their body temperature by moving toward or away from the heat source.

As the birds get older, replace the feeders and waterers with larger equipment and adjust them to the birds back height to limit wastage.

Other Management Tips To Consider

- Clean and refill waterers daily with water that is cool but not too cold.
- Add a vitamin/mineral supplement to the water of young fowl (except waterfowl) for the first week to help them get off to a better start.
- Consider the possibility of predators attacking your flock and provide adequate protection. Rats, cats and snakes will prey on young fowl.
- Watch your flock daily for signs of unusual behavior. Failure to eat, drink or move about normally is indications of a problem. A quick diagnosis and treatment can save your flock from unnecessary mortality.
- If mortality does occur, get a diagnosis from a diagnostic lab as soon as possible. Give medicines and treatments only after you know the diagnosis.

Recommended Protective Health And Vaccination Practices

1. Egg-type or breeding chickens should be vaccinated for Marek's disease at the hatchery or as they are removed from the incubator.
2. All land fowl should have a coccidiostat in their diet for the first four weeks.
3. Waterfowl should not be given any medicated feed since they may have some reactions to antibiotics.

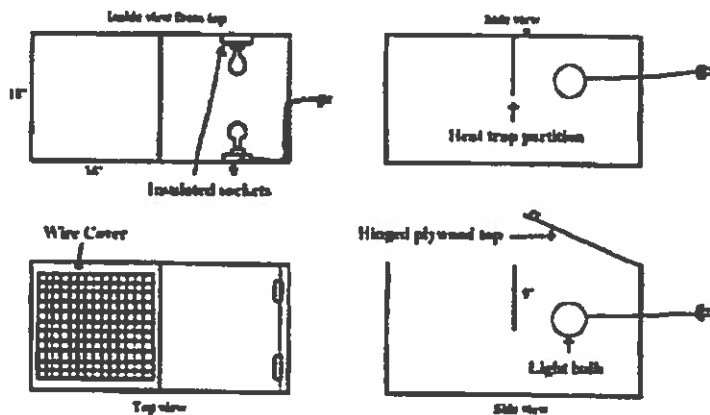
4. Vaccinate chickens for Newcastle/bronchitis via the drinking water at four weeks and eight weeks of age or as recommended by manufacturers.
5. At eight weeks of age most chickens should be vaccinated for pox if there is a history of fowl pox on the farm or in your part of the state.
6. If drugs are used in the feed, recommended withdrawal times before slaughter or marketing must be observed.

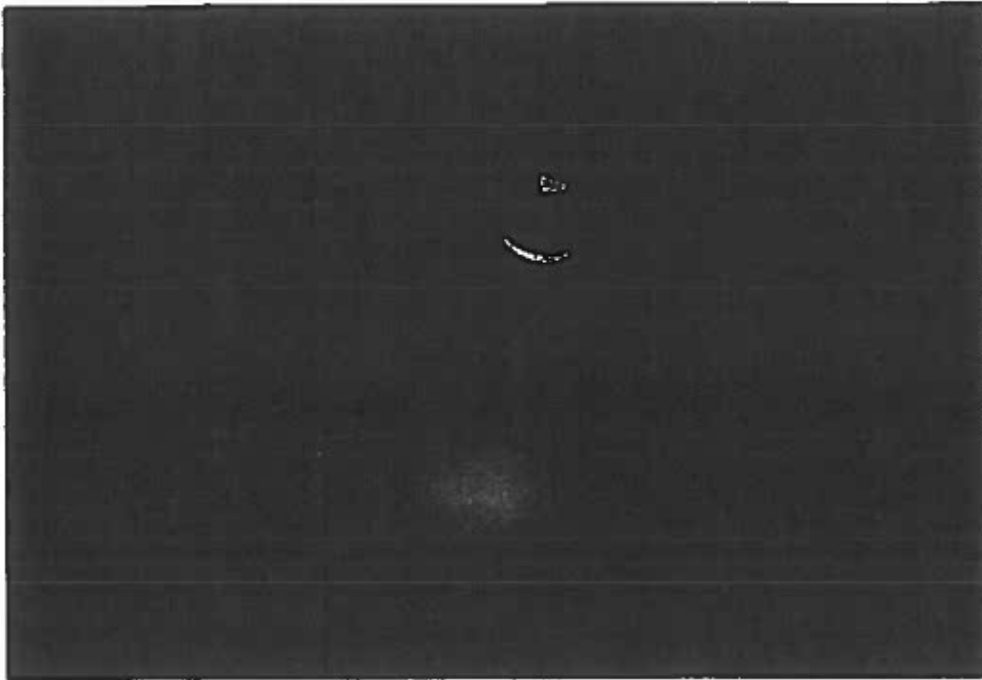
Build your own The Wooden Box Brooder

The plywood brooder is intended for brooding for the first four weeks of age and is easy and inexpensive to build. The proportions can be changed to accommodate different numbers of baby fowl. The brooder is designed to trap heat in half of the unit to keep the chicks warm. The other half allows the chicks to eat and move about. The top above the light bulbs should be hinged to allow you to open the top to clean the brooder and catch the chicks.

Use 2 incandescent light bulbs on the heated end of the brooder. If one burns out, the other will help maintain heat in the brooder. Two 40-watt bulbs will usually produce enough heat. However, adjust the size of the light bulbs to regulate the temperature. It should be 95°F in the heated side for the first week, and then decrease the temperature by 5°F. each week by decreasing the light bulb size. Some people build in a thermostat on the second bulb to help control the heat more accurately.

Place a layer of newspaper about 5 pages thick in the bottom of the brooder and cover with two layers of paper towel. This will keep the chicks from slipping and hurting themselves.





Reviewed by Dr. Michael Hulet.

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Expertise

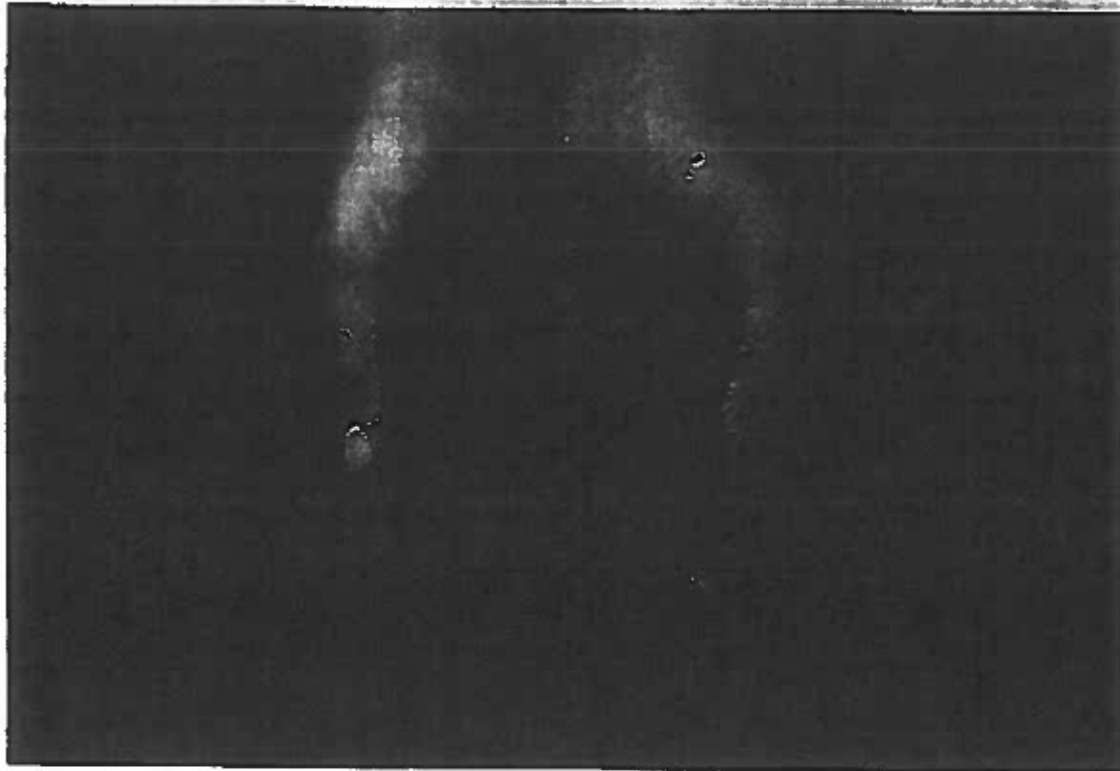
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Composting Chicken Manure Fertilizer

by Janet Garman | Aug 8, 2021 | Gardening, Guest Articles, Janet Garman, Raising Chickens



After raising chickens for a short while, you will understand the importance of composting chicken manure fertilizer. Even a small flock will produce an admirable amount of chicken manure. Some gardeners refer to this as garden gold. Once composted, chicken manure fertilizer can be used to nourish garden soil and feed vegetable plants.

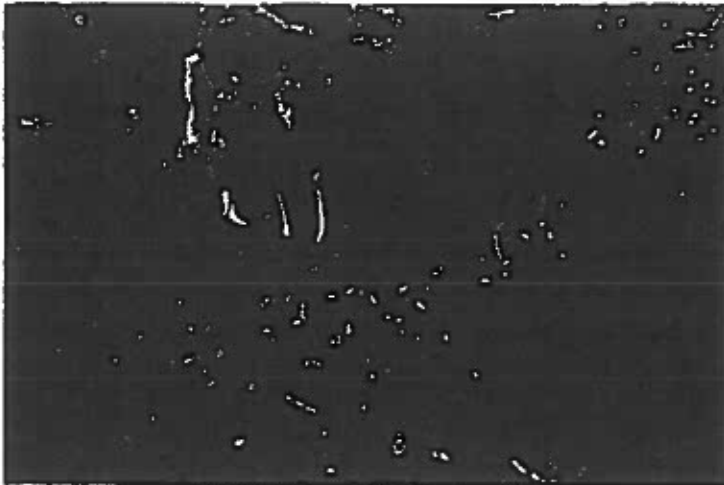
Raising chickens in a backyard or suburban setting usually consists of a smaller flock. Even a small flock's coop clean-



Janet Garman of Timber Creek Farm is an author,

<https://blog.mcmurrayhatchery.com/2021/08/08/composting-chicken-manure-fertilizer/>

out will need somewhere to go. In some cases, homeowners choose to bag the dirty bedding and litter and put it out for trash pickup. While that is one method, consider setting up a compost system in a corner of your yard and making your own rich chicken manure fertilizer using the material.



It may be a surprise to learn just how much manure one chicken can produce. Estimate that each chicken produces two cubic feet of manure every year. A typical backyard flock of six chickens, can easily produce twelve cubic feet of manure in a year's time. Cost wise, purchasing 12 cubic feet of manure-based fertilizer at the local big box store would run you approximately \$5 for 1 cubic foot of cow manure. (2021 pricing).

That's easily \$60 worth of chicken manure fertilizer you can produce from the chicken waste. Once small flock can provide not only fresh delicious natural eggs, but also help you grow healthy vegetables! First, you must get started and the entire process for creating composted manure fertilizer takes months.

Before beginning, review the following safety notes about handling manure:

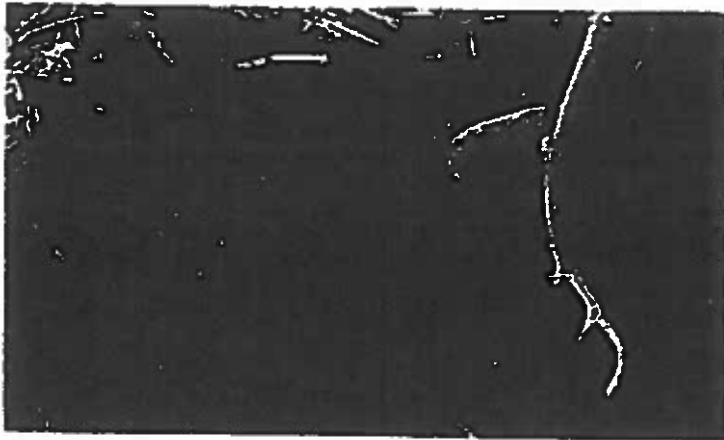
- Manure can contain bacteria, most commonly Salmonella and E. coli.

fiber artist and farmers with a love for animals and sustainable living. Janet has a degree in large animal farm management and animal science from the University of Maryland, and helps others learn to raise livestock, chickens, ducks, rabbits, and manage a small farm. Her articles on keeping animals, small farms and homesteading can be found in many popular websites. Janet has is the author *50 Do-it-Yourself Projects for Keeping Chickens, Chickens from Scratch* and many books about fiber arts and farming with animals.



- Fresh manure also contains high amounts of ammonia. Wearing gloves and a mask are recommended when handling fresh chicken manure.
- Never add dog, cat, pig or human feces to your compost pile.
- Vegetables grown in a compost improved soil, still require a good wash before eating, as with any fresh from the garden food.

The waste from the coop will contain straw, pine shavings, and wasted feed. It can all go straight to the compost bin or pile. Components of a healthy compost pile include browns and greens. The brown additions are the bedding, yard debris, leaves, and paper. Manure and kitchen scraps are referred to as the green portion. The ratio for a chicken compost is two to one, brown parts to green. This will result in a better nitrogen percentage for your garden.



What are you planning to use for the actual compost system? Some folks choose to build a two or three bin system. The multiple bins can make it easy to “turn” the pile regularly, from one bin to the next. The same can be accomplished with a simple pile in the corner of your yard. Good bacteria are present in the pile, breaking things down. Turning the pile adds air to the deeper levels of the pile and keeps the good bacteria alive and working. The heat produced in a healthy compost pile, the turning and

aging, breaks down the raw manure and turns it into something safe and nutrient rich for the garden. The compost chicken manure fertilizer pile will be around 130 to 140 degrees Fahrenheit, in the middle.

Types of Compost Systems

Quite a few plastic bin style composters are available on the market. These look like a drum, turned on its side with a handle that makes the bin turn. The composting happens inside the bin and out of sight. This might be a good option for a neighborhood where a neighbor might object to an open-air compost pile.

Used pallets can be used to make as many compost bins as you want. Three pallets put together in a three-sided open bin work well. This is a cost-efficient solution as the pallets are often found free from businesses. (always ask before taking!) Some people will build two or three of these adjacent to each other. The compost is turned by moving the material from one bin to the next in rotation.

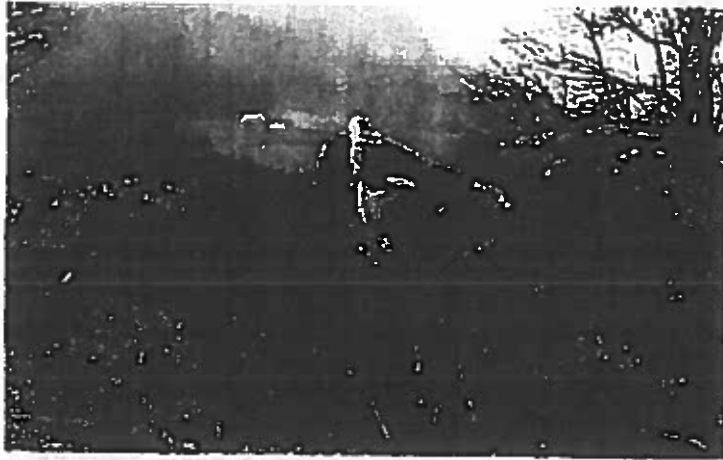
Chicken wire bins are also a popular method of storing and creating compost. To make, use a section of chicken wire that will make a tube about three feet in diameter. Fasten the chicken wire into a tube. Secure to the ground with bent wire or stakes.

One other method for creating compost involves your chickens! Yes, not only will these feathered friends provide you with eggs, valuable garden gold manure, they will also help you turn the compost to keep it healthy!

The flock will happily eat what they find, such as tasty bugs, and food tidbits. What they don't like, they scratch up, helping to break down leaves and just about anything! In winter, the compost pile will be warmer due to the heat being created. The warmer ground will help the chickens warm up their feet while they scratch the pile. Allowing the chickens to help manage your compost keeps them entertained and delighted with the tasty treats they

uncover.

If you choose not to have the chickens help you then you must turn the compost pile every three to four weeks. By the time nine months to a year has passed, you should have rich fertilizer that contains safe levels of Nitrogen, Phosphorus and Potassium for your garden plants.



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POULTRY LITTER COMPOSTING FOR BACKYARD FLOCKS

Heather N. Kolich, Agriculture & Natural Resources Agent, UGA Extension, Wayne County
Casey W. Ritz, Ph.D., Professor & Extension Poultry Specialist, UGA Poultry Science



UNIVERSITY OF GEORGIA
EXTENSION

Your coop is ready. You've built a covered run or exercise yard to keep your chickens safe from predators and wild birds that carry diseases. Your chicks are old enough to move outside, and you're eagerly awaiting your first fresh eggs.

In the meantime, your chickens are producing something else on a daily basis: manure. How do you handle all of that poultry poop so that your neighbors don't complain about the smell and the flies?

One good answer is composting. Properly composted poultry litter—manure mixed with bedding material, such as pine shavings—is a valuable soil amendment. However, just as it takes care and management to get your chickens into laying condition, it takes care and management to compost the litter from poultry housing environments.

Compared to other manures, poultry manure is high in nitrogen and phosphorous, and these nutrients are quickly available to plants. Excess nitrogen can easily interfere with seed germination and “burn” plant roots and young plants, but composting helps to stabilize the manure nitrogen so that it's beneficial to garden plants.

How Composting Works

Composting is an aerobic process that's accomplished by billions of beneficial soil organisms. Some of them, like earthworms and millipedes, are big enough to see. There are many more, however, that can only be seen with a microscope.

When the compost pile contains the right quantity and balance of materials, soil organisms digest manure and other compostable organic materials in an odorless process. Proper composting also reduces pathogens or disease organisms that may be in manure.

Equipment for Composting Poultry Litter

Using a series of three bins has proven to be a successful composting design. Important considerations for timely composting include the size and location of compost bins. Compost requires a certain volume of materials to create the heat needed for active processing, so it is important to size the bins large enough to contain several days of material.

The composting process typically takes several weeks, during which time your flock will continue producing feedstock for the pile, so you'll need more than one bin. To facilitate ease of handling and working with materials, bins should be 4-5 feet long, 4-5 feet wide, and 4-5 feet high. Comparable round bins should be 4-5 feet in diameter and 4-5 feet high.

Construct or place bins in a shady to semi-shady area. Shade helps compost retain the moisture necessary to keep microbes alive. Check local ordinances for any potential setback requirements from property lines before placing your bins.

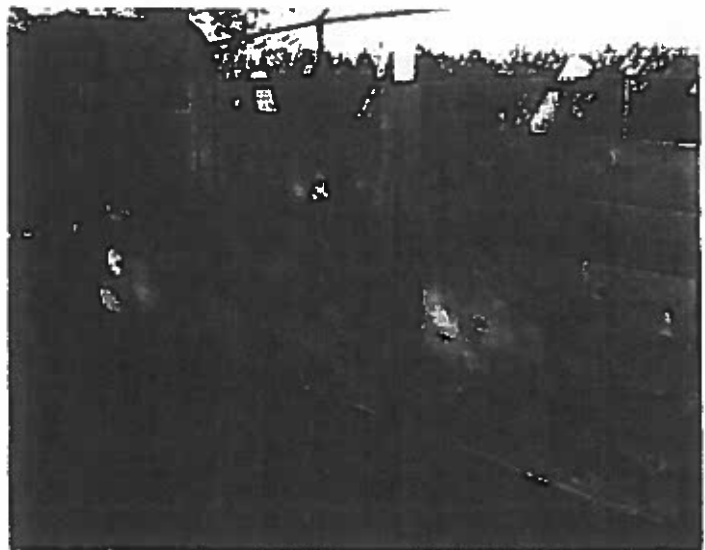


Figure 1. A series of three compost bins works well to process poultry litter while controlling odor and pests (Photo by H.N. Kolich).

In Georgia, stored manure must be covered at all times, so be sure to have a cover or roof over your compost bins. A cover is also necessary to maintain uniform moisture throughout the pile and minimize leaching. Build a solid roof or place a plastic tarp over the compost pile to keep out storm water that would soak the pile and drown the process.

You will also need a pitchfork or similar tool for “stirring” the materials in the pile and for turning the pile into the next bin.

A compost thermometer is handy, too. Monitoring your pile temperatures gives you a good idea of how well the compost process is developing. Temperatures that exceed 130 degrees Fahrenheit indicate that the composting organisms are working properly to break down the organic matter within the pile.

Poultry Litter Compost Recipe

A 3-to-1 ratio of “brown to green” material is ideal for a proper compost ingredient combination. Components of a successful compost pile include:

- **70-75% carbon:**
Carbon should be supplied by the pine shavings or bark used as poultry bedding, plus other coarse “brown” material, such as dead leaves, straw, or yard and garden waste. Sweetgum balls, pinecones, and other coarse material can be used, but will take longer to break down.
- **25-30% nitrogen:**
Nitrogen should be supplied by manure and “green” material such as grass clippings or fruit and vegetable scraps.
- **Moisture:**
Moisten compost materials in layers as you build the pile. Compost materials should be uniformly moist throughout the pile—about half of the total weight—but the pile should not be dripping wet.
- **Oxygen:**
Including coarse materials in the pile allows air to move into and through the pile. Periodically turning the pile fluffs materials and introduces oxygen.
- **Microorganisms:**
Microorganisms should be supplied by the soil and already present in materials added to the pile for composting.
- **Heat:**
Microorganisms create heat as they digest organic materials in the pile.

Directions:

1. Rake litter from poultry housing areas on a weekly basis if you have six or more chickens. If you have five or fewer chickens, you can probably get by with cleaning out litter every two weeks or so. More frequent cleaning minimizes insect, odor, and pest problems.
2. Add poultry litter to the first bin. Because poultry manure by itself is wetter and higher in nitrogen than poultry litter, you may need to mix in materials such as leaves, straw, wood shavings or wood chips to balance nitrogen with carbon, add bulk for air circulation, and absorb excess moisture.
3. Cover compost ingredients with a solid roof or secured tarp.

4. Over the next few weeks, continue adding litter and other compostable brown and green materials until the bin is full. Mix ingredients well and spray with water as necessary to achieve even moistness throughout the pile. Keep the pile covered between additions.
5. When the first bin is full, cover it and allow it to compost undisturbed for two weeks. Monitor temperature with a compost thermometer. Aim for an internal temperature between 130 and 150 degrees Fahrenheit. See troubleshooting tips if the pile doesn't heat up enough.
6. After the pile has composted for two weeks, turn it into the second bin. Cover and let it compost for several more weeks.
7. Repeat steps two through five, piling fresh litter into the (now empty) first bin.
8. When the pile in the second bin has composted for several weeks, turn it from the second bin into third bin to allow it to mature for several more weeks.
9. Turn the material from first bin into the second bin for a second heating cycle.
10. Repeat steps two through nine.

Uses for Compost

Fully composted poultry litter is valuable for improving soil structure. It also adds a bit of fertility to the soil. Compost can be tested for nutrient content to properly add fertility to soils. Here are some suggested uses for compost:

- Apply a quarter-inch of compost to lawns as topdressing.
- Mix compost into the soil of flowerbeds before planting.
- Blend compost with peat moss and perlite to create potting soil for outdoor container plants.
- Mulch garden plants, such as tomatoes and peppers.
- Share compost with your neighbors.

Compost Troubleshooting Tips

Problem	Possible cause(s)	Suggested remedy
Compost pile smells bad.	Pile is too wet. Excess moisture drives oxygen out of the pile. Under these conditions, aerobic microbes die and anaerobic (stinky) microbes colonize the pile. Excessive nitrogen source or too little carbon	Turn the pile to help it dry out. Add dry leaves or pine shavings to help absorb excess moisture. Add leaves, mulch or other carbon material to increase the carbon to nitrogen ratio.
Pile does not heat up.	Pile is too dry. Pile is too small. Pile needs more nitrogen.	Turn pile and moisten layers. Continue adding and mixing materials. Add more "green" matter or chicken manure.

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Circular 1097

Reviewed July 2022

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Local Sources for Chickens and Supplies
Last updated October 2022

Feed and Supplies - chicks often available in the spring by preorder

Glenshaw Feed and Garden Center (Ask for Mike Bogacz)
1645 Old Butler Plank Road
Glenshaw, PA 15116
(412) 487-5559

Saxonburg Feed
145 Butler Road
Saxonburg, PA 16056
(724) 352-1650

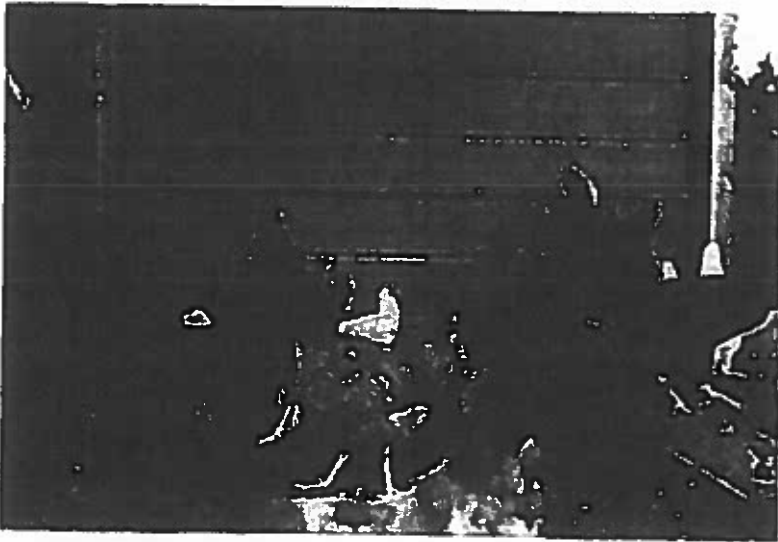
Tractor Supply
100 Tractor Lane
Gibsonia, PA 15044
(724) 449-5700
www.TractorSupply.com



Small Scale Poultry Housing

Small scale poultry coops seem to be built in almost every possible shape and size. Many existing buildings can easily be adapted to accommodate poultry.

Updated: February 26, 2016



Poultry housing can be as crude or elaborate as you wish to build as long as you provide the following:

Protection

A good poultry house protects the birds from the elements (weather), predators, injury and theft.

Poultry require a dry, draft-free house. This can be accomplished by building a relatively draft free house with windows and/or doors which can be opened for ventilation when necessary. Build the coop on high, well-drained areas. This prevents prolonged dampness and water saturation of the floor of the coop and outside runs. Face the front of the coop, the windows and outside run to the south which allows the sun to warm and dry the coop and soil. Allowing adequate space per bird also helps keep the humidity level in the coop to a minimum.

Keeping poultry totally confined with fence and covered runs are your best protection from predators. If you are building a new facility, consider laying a concrete floor, and start the wall with one or two concrete blocks. This prevents rodents, snakes, and predators from digging under the walls and the floors. Windows and doors must be securely covered with heavy-gauge mesh wire or screening when opened.

With outside runs, bury the wire along the pen border at least 12" deep, and toe the fence outward about 6 inches. This stops most predators from digging under the fence. Animals always dig at the base of a fence. By toeing the fence outward and burying it, the predator will dig down into more fencing and will be unable to dig under the fence. If you bury the fence with medium sized course gravel most animals are less likely to try and dig at the base of the fence. Some people run electric fencing around the outside of their pens 4" off the ground about one foot from the main fence to discourage predators. If your outside runs are not predator-proof, you need to lock up your poultry before dark.

To prevent problems with hawks and owls, cover your outside runs with mesh wire or netting. A good ground cover of millet, broomcorn, sorghum or other tall leafy vegetation also provides cover for the birds to hide under. Planting a few shrubs that are low to the ground and provides good leaf cover also allows the birds cover and shade. Many times weaving a 3-4 ft. grid over the pen constructed of wire or twine will give excellent protection from flying predators.

Build your poultry house to prevent possible injury to your birds.

- Remove any loose or ragged wire, nails, or other sharp-edged objects from the coop.
- Eliminate all areas other than perches where the birds could perch more than 4 feet above the floor. Remove perching areas such as window sills, nest box tops, or electric cords whenever possible.
- Be sure doorways are large enough for the birds to move through easily.
- Make sure ramps have good traction for the bird. Use slats spaced three inches apart or a textured surface like a roofing shingle on the surface of the ramps to provide traction. Use ramps and walkways so the birds do not crowd over a high sill or jump onto hard ground from elevated doorways.
- Do not use wire that is large enough or allow gaps in fencing or equipment that a bird can push its head through. Birds will often catch their comb in fencing or gaps and rip their combs. These type of gaps are also a cause for pattern feather damage on the birds neck or breast.

These extra measures could eliminate any injury to you or your birds and may prevent damage to the coop, as well.

To protect the birds from theft, lock your building and pens securely whenever you are not home. Have your neighbors watch for visitors while you are away. Some people actually have burglar alarms in their bird coops.

Adequate Space

Birds need adequate space for movement and exercise as well as areas to nest and roost. Space requirements vary with the type of bird you raise.

Table 1. Minimum Space Requirements

Type of Bird	Sq ft/bird inside	Sq ft/bird outside runs
Bantam Chickens	1	4
Laying Hens	1.5	8
Large Chickens	2	10

Quail	1	4
Pheasant	5	25
Ducks	3	15
Geese	6	18

Pigeons require a minimum of 4 square feet per breeding pair. One-eighth inch perch and two 9 inch x 9 inch nests per breeding pair are recommended.

Perches

Perches should not be used with large structured or meaty breeds of chickens to prevent leg joint damage and injuries when to jump off the perch.

With standard size chickens provide six inches per bird. Space roosts one foot apart, 18" to 24" above the floor.

Bantams (miniature chickens) only need four inches of roost space per bird and should only be place 12" to 18" above the floor.

Never allow chickens and turkeys to perch more than 4 feet off the floor to prevent leg, wing and other structural injuries from the birds trying to get up to the perch and when jumping down for the perches.

Place roosts away from nesting areas to prevent the birds from nesting in the nesting boxes. This will quickly contaminate your nesting boxes and increase egg breakage and dirty eggs.

Nests

For chickens nest should be at least 12" x 12". Increase the nesting area space for larger birds. The nest should be large enough for the bird to enter and sit comfortably. Never make the box too large or multiple birds will try to enter and increase egg breakage.

- Provide two nests for the first four hens. Then add a nest for every four additional hens.
- Always locate the nests at least 2 feet off the ground and at least four feet away from the roosts.
- Have a three to four inch lip in the front of the nests to keep nesting material in the box and try to keep two inches of clean dry nesting material in the nests at all times. Pine shavings are preferred. Many eggs are cracked due to a lack of protective padding in nesting boxes. Some small producers will cut carpet pads and place in the bottom of their nests to prevent breakage. However, these can easily become contaminated with bacteria and harbor mites if not removed and cleaned or replaced frequently.
- Place nests in darker, secluded area off floor and away from roosts. Never place across from bright sunny windows or near high traffic areas. Birds prefer a dim secluded area to lay eggs.

Easy Access to Feed and Water

Feeders and waters should be placed conveniently throughout the pen for birds' access. Place the top lip of the waterers and feeders at the birds' back height. This will keep the feed and water clean and prevent wastage.

If you choose to use nipple watering systems place the tip of the water nipple at a level just above the bird's eye level. The bird should need to reach up for the water nipple to prevent water and wet spots in the pen. Plan to have 1 water nipple for every 6-8 birds in the pen.

Be sure that birds have free access to water and feed at all times. The pecking order determines which birds get to eat and drink in the flock. When you have inadequate feeder space birds at the lower end of the pecking order may never be allowed to eat. Provide at least 3 inches of feeder space per bird and if you have more than 25 birds place feeders in separate areas so all birds can reach feed.

Small birds like pigeons, bantams and quail, only require 1 linear inch/bird of feeder and water space and large birds require 3-4 linear inches/bird.

When possible, place the waterer in the outside runs, especially for waterfowl. This helps to keep the humidity level lower inside the coop.

Source of Light

If you wish to produce eggs from your flock year-round, you must have a source for electric light. One, low intensity electric light (40 watt or less) every 40 feet at ceiling height is appropriate. Most small poultry houses do very well with one light above the feeding and watering area. A bird only needs one foot candle of light to sustain year round egg production.

Windows placed on the south side of the coop will also be a good source of light and warmth in winter and a good source of ventilation in summer.

Ventilation

Ample air movement without a draft is essential. Fresh air brings in oxygen while excess moisture, ammonia or carbon dioxide are removed the stale air moves out of the house. Dampness and ammonia build-up is a sign that there is not enough ventilation for the number of birds in the coop. For small coops windows or vents on one side of the house usually provide plenty of ventilation. However, do not allow the vents or windows to open directly over the birds perching area to prevent drafts. Well-ventilated houses must also have plenty of insulation and a good vapor barrier. Failure to insulate or ventilate properly causes moisture to accumulate on the walls and ceiling in cool weather. Poultry can handle cold very well if they are dry. However, cool and humid conditions can create many health problems. Locate openings on the side away from prevailing winds. Angle any air inlets upward to help the air to mix with the warmest (drier) air as it enters the coop. The south or east side is usually best.

Appearance

The appearance of any poultry house and outside run that is visible to the neighborhood should never detract from the over-all appearance of the surroundings. Structures should be kept painted and well-maintained. Weeds and trash should be removed from around all facilities. Proper landscaping can provide screening and also help muffle sounds from the birds. Unsightly structures are not good for the image of bird producers and may lead to new laws restricting the raising of birds in your area.

Storage

Allow space to store your feed and extra equipment. Planning a place to store a couple metal cans to store feed and extra clean shavings will prevent contamination and keep things dry and away from rodents. Poultry feed can be stored for up to a month if it stored in dry, cool non-sunny location. Direct sun light and heat will damage the vitamins in the feed and moisture can cause feed to mold. Also have a location to hang your cleaning tools so they are easy to access when they are needed.

Use Common Sense

When building a poultry house, use common sense in designing the structure. It is extremely important that the coop be built for easy access for cleaning and daily care of the birds. Build the roof high enough and situate permanent structures like nests, roosts, and feeders for easy access and to make it easier to clean all areas of the house. Use sliding windows rather than windows which swing in or out so that the birds cannot roost on them. Use building materials which will be easy to clean and disinfect. Make sure that the birds cannot pick at or eat insulation (spray foam, board or loose insulation). Slightly slope the floor toward the door to prevent puddling in the building and make the building easier to spray out and dry between uses.

Reviewed by Dr. Gregory Martin

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Associate Teaching Professor and 4-H Youth Poultry Coordinator

Expertise

- 4-H Poultry Programming
- Embryology in the Classroom
- Poultry Judging and Training
- Incubation
- Small Scale Poultry Production and Management
- Exhibition Poultry

Suggested Poultry Reading
Last updated October 2022

Books

A.B.C. of Poultry Raising, by J.H. Florea

Chickens In Your Backyard: A Beginner's Guide, by Rick & Gail Luttmann

City Chicks, By Patricia Foreman

The Small-Scale Poultry Flock: An All-Natural Approach to Raising Chickens and Other Fowl for Home and Market Growers by Harvey Ussery

Storey's Guide to Raising Chickens, by Gail Damerow

Reference Books

American Poultry Association Standard Of Perfection

Describes poultry show requirements in the U.S. It has requirements for poultry exhibits, exhibitors, and judges. Contains information on all the show poultry breeds- chickens, ducks, geese, turkeys, & bantams.

Note: Revised Regularly, Look for Most Current edition

Bantam Standard

Descriptions of bantam breeds, plumage patterns, judging of chickens as well as the breeds and varieties of bantam ducks.

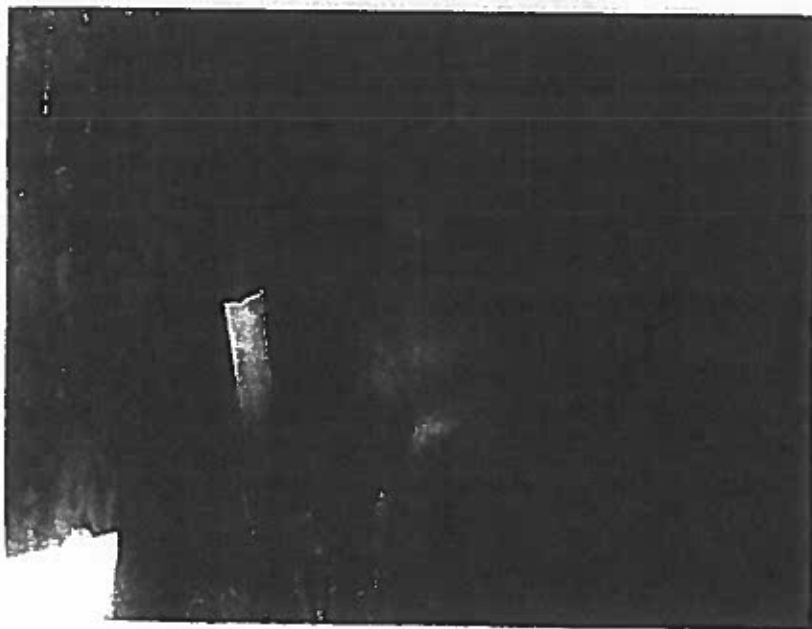
Edited by: American Bantam Association Standard Committee

Note: Revised Regularly, Look for Most Current edition

Using Chicken Manure Safely in Home Gardens and Landscapes

Introduction

Raising chickens at home is making a comeback. While a chicken can produce an egg every 24 hours, the average hen produces something else in abundance, one cubic foot of manure every six months (Anderson, 2010). With more than one hen, this rapidly adds up to a significant amount of manure that has to be managed. It can't continue to collect in the coop, or it will harm the chickens.



Raising chickens at home has increased in popularity. (photo: W. Hanson-Mazet)

What does a homeowner, particularly one who lives in an urban environment, do with all that manure? The answer is to use it as a soil amendment or fertilizer.

However, raw chicken manure can burn and damage plants. It should be composted or aged prior to use. In addition, raw manure can contain pathogens that can harm people and animals. If composting is done properly, the process destroys disease-causing organisms, making chicken manure safe to use around plants, people and pets.

Composition

What comes out of a chicken coop isn't simply fecal matter. It also consists of urine, feathers, undigested food and coop bedding material. Composting decomposes these materials into a form that is good for plants.

Benefits

Composted chicken manure provides a slow-release source of macro- and micronutrients and acts as a soil amendment. Compared to other manures, chicken manure and the associated litter are higher in nitrogen, potassium, phosphorus and calcium, and are also rich in organic matter (Zublena, 1993). Addition of organic matter to soils increases a soil's water-holding capacity, improves aeration and drainage, reduces erosion, reduces fertilizer leaching and improves a soil's structure.

Additionally, organic matter provides a food source for soil microbes, which increases soil biological diversity, accelerating the breakdown of organic nutrients into forms more readily available to plants. All of these factors can improve plant health (Rosen, 2005).

The use of composted manure and litter can also reduce the need to apply additional fertilizers.

Safety

Like other animal wastes, chicken manure and litter may harbor pathogens, such as *E. coli*, *Salmonella*, *Cryptosporidium* and others. To reduce risk to humans and pets, proper handling and precautions are necessary. Stockpiled manure should be kept in a protected area where children, pets and livestock do not have access.

Before applying manure or litter to the garden, it should be composted or aged.

Proper composting will generate temperatures of 140 F to 160 F, which is enough to kill most human and animal pathogens, such as *E. coli* and *Salmonella* (Griffiths, 2011).

Aging the manure and litter only reduces populations of disease-causing microbes by providing unfavorable growing conditions that cause them to die off gradually due to changes in moisture content, temperature and nutrient availability. Pathogens are not actively killed by aging, but instead are inhibited from reproducing, which results in a slow decline of the population.

Whether composted or aged, manure should be applied no later than 90 days prior to harvest of non-ground-contact crops such as trellised tomatoes, cucumbers and peppers; and no later than 120 days prior to harvest of ground-contact crops such as lettuce, strawberries and carrots (Rosen, 2005).

Storage

When planning how to handle chicken manure and litter, one must consider the storage requirements needed. The size of the storage area will depend on the amount of litter produced, but should always be isolated from children, animals and rain. Liquid runoff should not be allowed to stand or pool and the pile should drain well to prevent unpleasant odors and the buildup of disease-causing organisms (Griffiths, 2005). Additionally, the storage area should not be located where runoff could contaminate vegetable gardens, edible plants or children's' play areas.

A laying hen will produce about a cubic foot (about 7.5 gallons) of litter every six months, which means a flock of 10 hens, will produce about three-quarters of a cubic yard per year. If stored, this would create a pile that is about 3 feet long, 3 feet wide and 2 feet high. However, composting or aging will reduce this volume by about half over time.

Composting and Aging

Chicken litter is high in nitrogen, and can be composted in about five to six weeks. Composting "cools" the manure and litter material, meaning it reduces the ammonia content so it will no longer burn plants. It also reduces the total volume, weight and odor of the pile. Additionally, composting stabilizes nutrients enabling a slow, long-term release over a few years. Finally, the temperatures generated in the composting process will kill most pathogens and weed seeds.

In residential areas, odors caused by manure piles can quickly become a nuisance to both the chicken owner and surrounding neighbors, if not properly managed. Foul odors usually occur when the interior of a pile has an inadequate supply of oxygen, allowing the proliferation of microbes responsible for unpleasant, sewage-like smells. When composting, adequate pile drainage must be maintained and the pile turned weekly to introduce oxygen. A well-managed compost pile should have an "earthy" smell, like good potting soil.

If a compost pile cannot be turned each week, a better approach may be to dry out and age the manure before adding it to a pile.

Removing the moisture from the manure inhibits microbial growth and decomposition, preventing the associated smells. Each time a coop is cleaned, the manure can be thinly spread on a tarp or other impermeable surface to dry in the sun, before adding it to the pile. The drying pile should be protected from precipitation or other water sources, or decomposition (and odors) may occur.

Safety Tips

- Only apply composted or aged manure to soil, unless it is applied the fall before planting.
- Always wear gloves when handling manure.
- Wash raw vegetables thoroughly before eating.
- People who are susceptible to foodborne illnesses should avoid eating uncooked vegetables from manure-

amended gardens. Those who face risks from foodborne illness include pregnant women, young children and persons with cancer, kidney failure, liver disease, diabetes or AIDS (Anderson, 2010).

Conclusion

"Poultry manure, properly handled, is the most valuable of all manures produced by livestock" (Mitchell and Donald, 1995). When a family raises chickens, they have a ready supply of brown gold from composted or aged manure to benefit their garden and landscape plants.

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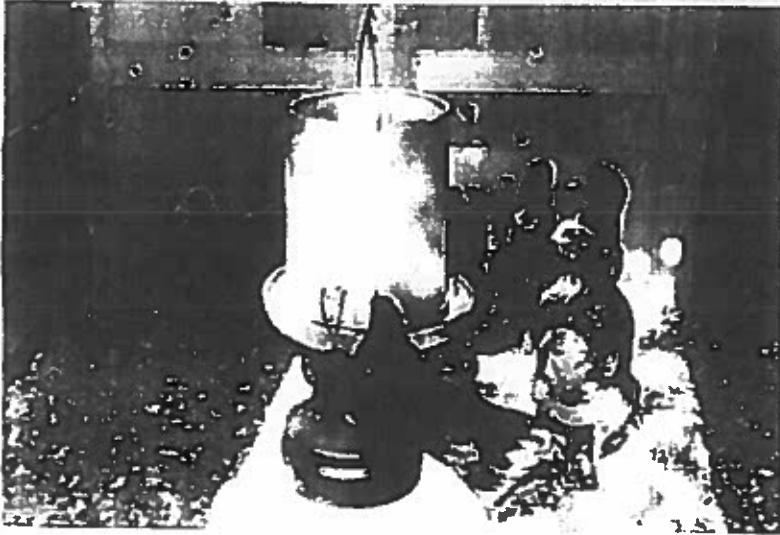
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Successfully Raising a Small Flock of Laying Chickens

Raising a small chicken flock for egg production in the backyard has increased in popularity.

Updated: April 22, 2016



General Considerations

- Check all local ordinances, zoning laws, and property association rules to see if you can raise chickens in your area.
- Follow laws and apply for permits if required.
- Roosters are not necessary in a flock for hens to lay eggs.
- Producing eggs in small flocks will always cost more.
- Chickens require daily care and monitoring. Develop a plan for who will care for the birds when you are away.
- Chickens must be fenced in for their own security.
- Manure/litter is a great soil amendment if composted properly.

Type of Birds

- All chickens will lay eggs.
- Chickens in most small flocks live 8 years, but they can live up to 12 to 15 years.
 - Common heritage type breeds will lay 50 to 100 eggs a year. There is also great variability between strains.
 - Commercial sex-linked hybrids will lay 240 to 280 eggs a year. They are a hardy yet docile bird, great for a small-flock setting.
- Egg shell color is determined by the breed and makes no difference in nutritional value or taste of the egg.

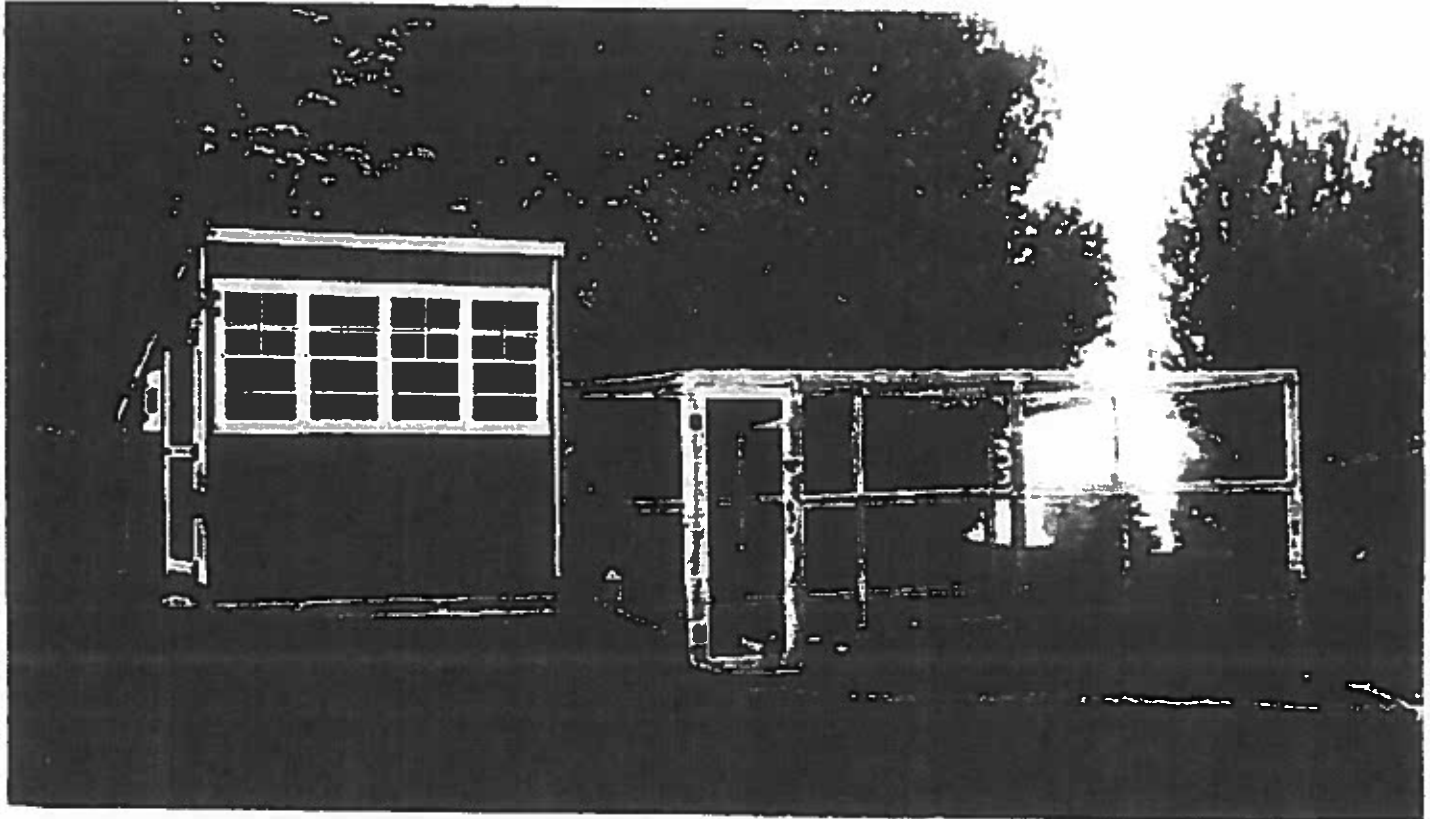
Feed and Water

- Provide a constant supply of fresh water. Clean out water daily.
- Feed free choice (feed available at all times).

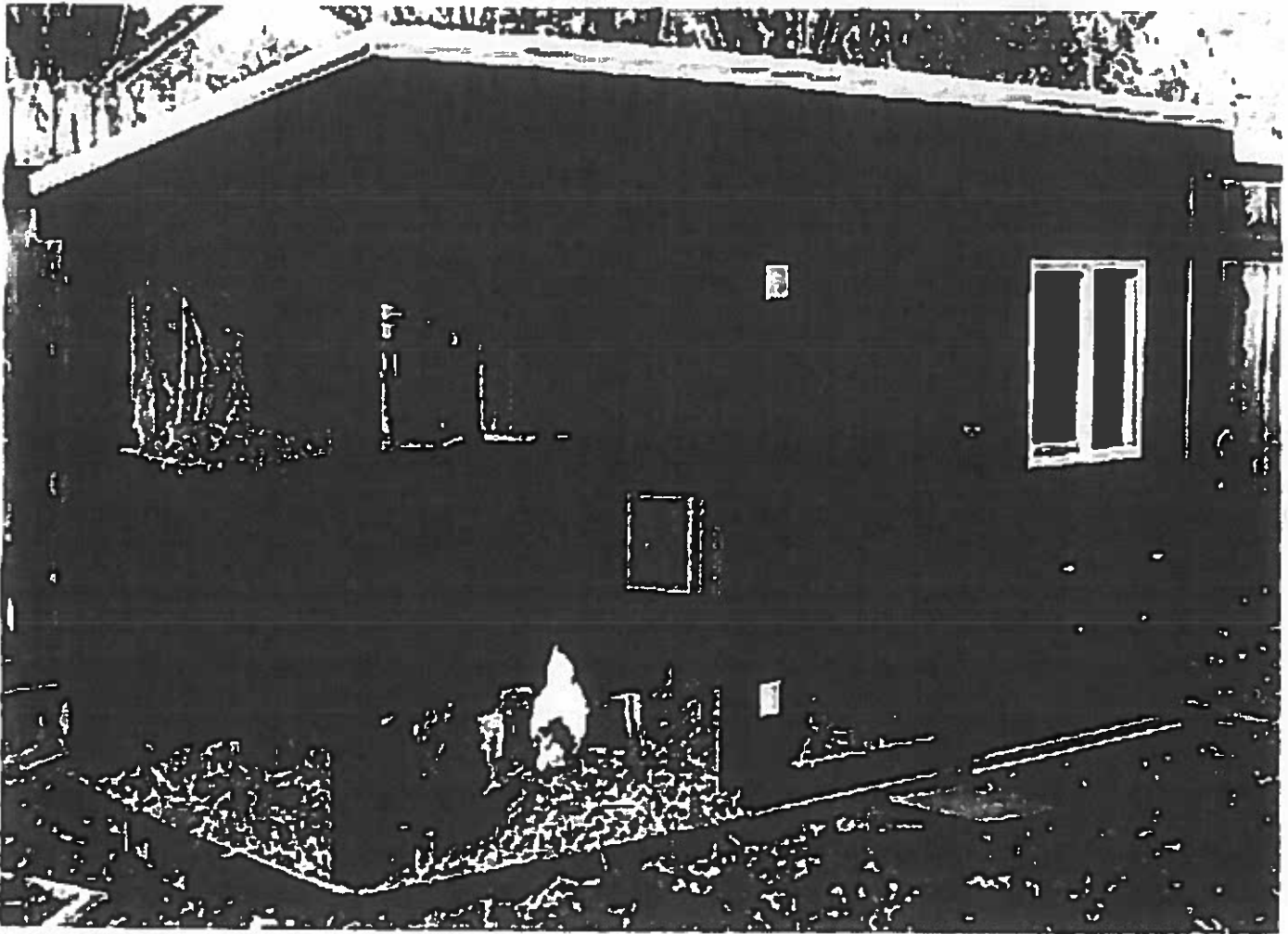
- Store feed in a dry, dark metal container for up to 4 weeks.
- Proper feeder size, settings, and height saves feed.
 - Keep feeder lip at back height.
 - Provide a 3-inch feed space per bird.
 - Only fill feed tray 2/3 full.
- Feed a complete ration specific to the bird's age, body type, and state of production.
 - Feed a chick starter diet for the first 0 to 6 weeks.
 - Feed a chicken grower diet from 6 to 18 weeks.
 - Feed a layer ration from 18 weeks on.
 - Supplement oyster shells to older birds.
 - Crack corn and scratch grain should not be fed to chickens. Avoid feeding high levels of human food or scraps.
 - Only chicks under 4 weeks of age should be fed medicated feeds to prevent coccidiosis.

Proper Cooping

- Build a coop that provides 2 square feet per bird of indoor space.
- Limit drafts and moisture in the coop.
- Make sure predators cannot access the coop. Close birds in securely at night.
- Coop should be easy to access, clean, and maintain; designed to prevent injury to the birds; and provide natural lighting.
- Slippery surfaces will cause leg injuries.
- Use pine shavings or straw for bedding.
- Clean out any wet or compacted litter.
- Maintain the coop.



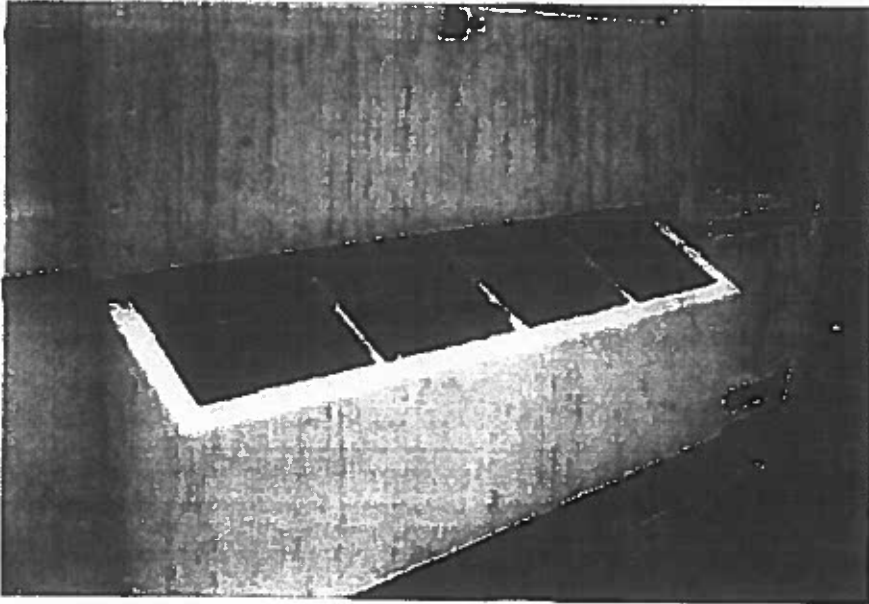
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Lighting

- Layers require 14 to 16 hours of light daily.
- Add artificial light in the morning, and allow the birds to roost with sunset.
- One foot candle is full light for birds. Use a 25- to 40-watt bulb.
- Do not light adult birds for more than 16 hours daily.



(https://extension.psu.edu/media/wysiwyg/extensions/catalog_product/0a9938135ddc4137bd14dae0ef26dc30/r/e/nesting-boxes.jpg)

Nesting Boxes

- Nests should be at least 12 by 12 inches.
- Provide two nests for the first four hens. Then add a nest for every four additional hens.
- Have a 3- to 4-inch lip in the front of the nests to keep nesting material in the box.
- Keep 3 inches of clean pine shavings in the nests.
- Place nests in a darker, secluded area off the floor and away from roosts.

Roosts

- Provide 6 inches per bird.
- Place roosts 18 to 24 inches above the floor, spaced 1 foot apart, and away from nests.

Egg Sale Laws

- Sell within 5 days of lay.
- Keep refrigerated at 45°F or lower.
- Do not use cartons from another business.
- Each carton must be labeled: name and address, date of packaging, statement of identity (eggs), net contents (in 3/16-inch letters), "Keep Refrigerated," and "Unclassified" (unless you weigh the eggs).

Best Health Care Practices

- Never introduce adult birds into an established flock.
- Never mix different species in the same flock.
- Limit visitors from accessing your pens.
- Practice good sanitation of equipment.
- Practice "all in, all out" when changing flocks.
- Confine birds to a fenced area and limit contact with wild birds and predators.
- Keep rodents, flies & other animals out of the chicken coop and feed.
- Check for parasites monthly and treat if necessary. A dusting area can help prevent external parasites.

Additional Resources

- [Disease questions](https://vbs.psu.edu/adj)(<https://vbs.psu.edu/adj>)

Prepared by Phillip J. Clauer, Penn State Extension and Department of Animal Science. Photos provided by the Penn State Department of Animal Science.

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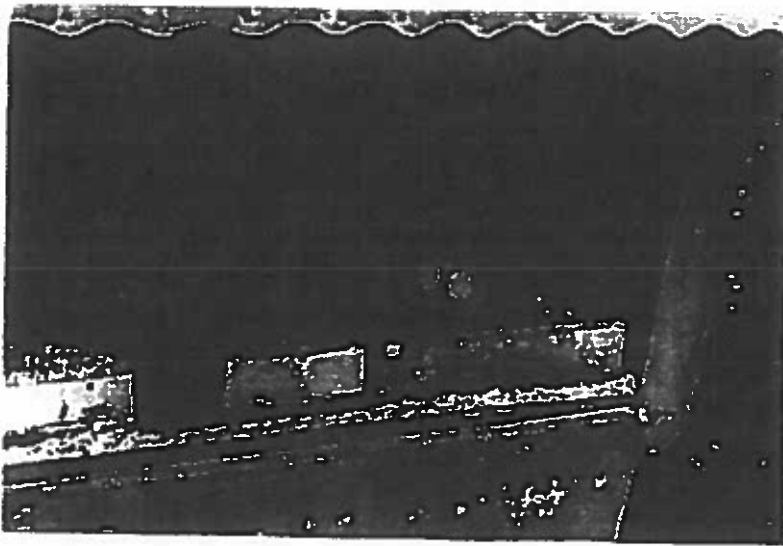
Expertise

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Egg Drop Syndrome

Egg drop syndrome, also known as EDS '76, is characterized by the softening of eggshells and shell-less eggs produced by otherwise healthy chickens.

Updated: July 19, 2022



Etiology

EDS is caused by a double-stranded DNA virus called the egg drop syndrome virus (EDSV) or duck adenovirus 1. Only one serotype has been recognized.

Susceptibility of the agent

The EDSV is resistant to pH range 3–10 and to heating for 3 hours at 56°C (approx. 132.8°F). Infection rate is lost after treatment with 0.5% formaldehyde or 0.5% glutaraldehyde.

Occurrence

EDS '76 has been recently reported in the US and in many other countries such as Ireland, England, and Brazil. All ages and breeds of chickens are susceptible to infection.

Pathogenesis

There are three patterns of viral transmission recognized in chickens. The first pattern with EDS '76 occurs when primary breeding stock are infected, and the virus is transmitted vertically through the egg. The chicks that hatch are contaminated with the virus which remains latent until the birds reach sexual maturity. Then, the virus multiplies and are excreted in the eggs and fecal matter. The second pattern is seen through endemic EDS, which is the result of horizontal infection of the flock during lay. It is usually seen in commercial egg layers. The third pattern is sporadic and due to spread of EDS virus due to contact with domestic or wild ducks or geese or the use of a water supply contaminated with wildfowl droppings.

Clinical manifestations

The first sign of the disease is the production of pale-shelled eggs, followed by the production of soft-shelled and shell-less eggs. Birds tend to eat the thin-shelled and shell-less eggs. In flocks in which there has been some spread of virus and antibodies are present, the condition is seen as a failure to achieve predicted production targets. Birds with antibodies slow the spread of the virus throughout the flock.

Diagnosis

Production of pale thin-shelled and shell-less eggs by a flock that appears otherwise healthy suggests that EDS '76 is present. Transient mild depression and/or mild watery droppings may be seen. Ridged eggs and poor internal quality are not features of EDS '76. Poor eggshell quality at peak production in healthy hens should also raise strong concerns for EDS '76. With endemic or sporadic EDS '76, the disease can develop in laying hens of any age.

Confirmatory laboratory testing is needed for definitive diagnosis. Searching for evidence of seroconversion is the easiest diagnostic approach for nonvaccinated flocks. In addition, a hemagglutination-inhibition test using fowl RBCs, and ELISA, are the primary serologic tests of choice.

PCR-based tests and antigen capture ELISA tests have been used to detect EDSV DNA and antigens. It is important to select recently infected birds for testing, but these can be difficult to identify. One of the easiest alternative methods is to feed affected eggs to antibody-free hens.

Relevant differential diagnosis

Similar diagnosis diseases of the EDS virus include failure to achieve adequate egg production levels or if there is a decrease in egg production in seemingly healthy birds. Shell-less, soft-shelled, and thin-shelled eggs are all characteristics that point to EDS; ridged and misshapen eggs are not.

Prevention and Treatment

There is no treatment for EDS '76, but preventative measures can be set in place to limit the chance of spreading the virus. Some preventative measures include washing and disinfecting plastic egg trays before use and separating chickens from other birds. A vaccine is available in some regions.

This article was created by L. Loughlin and G. Lorenzoni

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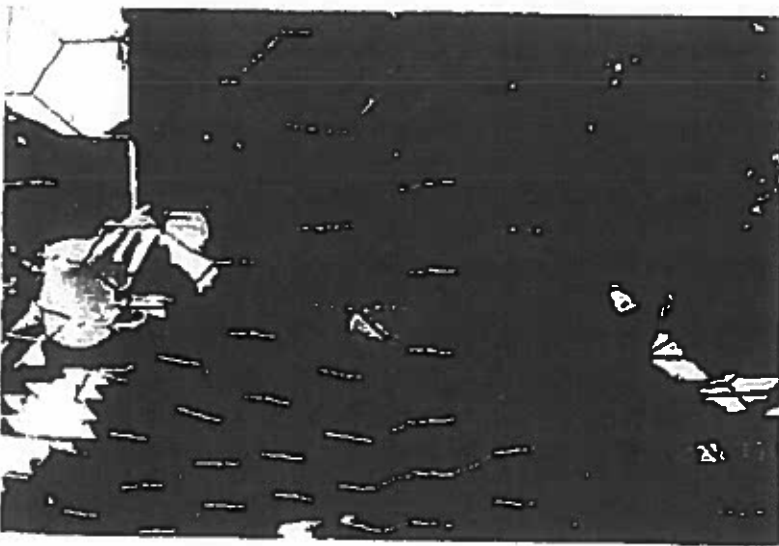
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Salmonellosis

Description of clinical signs and prevention strategies for Salmonellosis in poultry

Updated: October 29, 2020



Introduction

Salmonellosis is a condition caused by infection with bacteria in the genus *Salmonella* (over 2,500 serotypes). There are two highly pathogenic serotypes of *Salmonella* which affect poultry and are common in some countries of South and Central America. However, since these serotypes are not prevalent in the U.S., we will focus on other strains of *Salmonella* which are present worldwide (including Pennsylvania). These serotypes, although not highly pathogenic for poultry, have broad host specificity and thus have a tremendous relevance for public health. Therefore, this chapter will include advice for preventing the dissemination of poultry-derived *Salmonella* into the human population.

Etiology

Bacteria from the genus *Salmonella* are gram negative, non-spore-forming rods that can grow in a wide range of environments (variable oxygen concentration, high and low pH [4.0-9.0], variable temperature [from 36°F to 129°F], variable water activity [0.95-1.0]). Two strains, *Salmonella Pullorum* (pullorum disease) and *Salmonella Gallinarum* (fowl typhoid), are non-motile and highly pathogenic for poultry, causing high mortality in both breeders and their progeny. In addition, these strains can affect many other species of birds and, rarely, some mammals. Fortunately, they are not present in PA. However, there are many other strains of *Salmonella* that are present in PA. Possibly the most relevant serotypes for public health are currently *Salmonella* Enteritidis and *Salmonella* Typhimurium. These motile forms of *Salmonella*, known as paratyphoid *Salmonella*, have very broad host specificity and can infect humans. In general, paratyphoid *Salmonella* are not highly pathogenic for most poultry. However, they survive and multiply well in poultry, which poses a great risk for

human health. Unlike poultry, humans are susceptible to developing clinical disease in response to a *Salmonella* infection. Severe illness can occur in infants, elderly, and immunocompromised individuals.

Susceptibility of the agent

Several disinfectants can inactivate *Salmonella* when used as directed in their label. For example, phenolic and quaternary ammonium can inactivate *Salmonella* from various surfaces. *Salmonella* elimination can be more challenging when the bacteria are surrounded by organic matter. For example, *Salmonella* can be found in the fecal material of rodents, wild birds, and insects, where it has considerable protection from disinfectants. In this case, removal of organic material prior to disinfecting greatly increases the efficacy of the disinfection process. *Salmonella* can persist for a very long time in poultry litter (over one year). High environmental humidity increases the survivability of *Salmonella*. Composting the litter can eliminate all *Salmonella* from the litter; this requires temperatures of at least 55°C (131°F).

Salmonella is commonly found on raw feed materials (as well as complete poultry feed). In this case, aggressive thermal treatment (conditioning time) during pelleting normally destroys *Salmonella*. However, feed can (and does) get re-contaminated on its way from the feed mill to the farm. *Salmonella*-positive pellet coolers, conveyors, and feed trucks are common sources of feed re-contamination. In addition, when feed is left unprotected, wild birds, rodents, and insects can access the feed and introduce *Salmonella*. To protect the feed from re-contamination after thermal treatment, formaldehyde (1-2 kg/ton of feed), and to some extent organic acids (5-10 kg/ton of feed) have been used. In general, organic acids do not kill *Salmonella* in feed but can keep their numbers low. It is important to note that *Salmonella* can grow in a wide pH range (4.0 to 9.0).

Occurrence

Worldwide. Since *Salmonella* has broad host specificity, there are plenty of potential reservoirs which can be sources of infection. For example, humans, pets, rodents, wild birds, and insects (like flies and darkling beetles) can serve as vectors for introducing *Salmonella* into a flock. Breeders and hatcheries can be additional sources of contamination.

Pathogenesis

Most motile serotypes are not pathogenic for poultry under common circumstances. However, immunocompromised animals or very young animals may be susceptible to salmonellosis when challenged with very large doses of the bacteria. After a few days of life (perhaps due to the presence of competitive microflora in the intestine), the susceptibility of chickens to *Salmonella* infection is greatly reduced. Even very large doses of *Salmonella* (sufficient to kill 50% of day-old chicks) will not produce mortality in one-week-old birds.

Oral contamination may be the most common route for infection. However, it is also known that vertical transmission from mother to offspring occurs with some serotypes of *Salmonella*. The frequency of *in-ovo* contamination is fairly low; a more common infection route is the presence of *Salmonella* on the eggshell. Other routes of transmission, such as intracloacal and navel routes, are experimentally possible and may also be relevant in the field.

Once *Salmonella* reaches the intestine of young animals, it colonizes (with especial affinity for the epithelial cells in the ceca and ileocecal junction) and initiates persistent fecal shedding (for up to 6 months). Some serotypes (notably *S. Enteritidis*) can attach to and penetrate intestinal cells to gain access to the circulation, where they multiply. Bacteremia follows, and many soft and hard tissues can be infected by the bacteria (typically spleen, liver, and bones). Several strains of *Salmonella* are capable of multiplying in internal organs evading the immune system of the animals. After the initial bacteremia, it is possible to recover *Salmonella* from the birds for up to a year. The outcome of bacteremia depends largely on the initial dose and age at infection. If birds are infected with a moderate dose after one or two weeks of age, intestinal colonization and bacteremia can occur, but clinical signs are absent. Circulating antibodies are seen as early as 9 days post infection. It appears that humoral and cellular immune responses are needed to eliminate the bacteria from the host's tissues.

Clinical manifestations

For paratyphoid infections occurring after the first week of life, usually there are no clinical manifestations in poultry. However, if birds are

infected during the first days of life with a very high dose of bacteria, clinical signs can be severe and are compatible with those of bacteremia: somnolence, ruffled feathers, anorexia, emaciation, dehydration, and diarrhea. The infection may result in stunting, blindness, lameness, and death. In addition to these clinical signs, *S. arizonae* can induce neurological signs in turkeys.

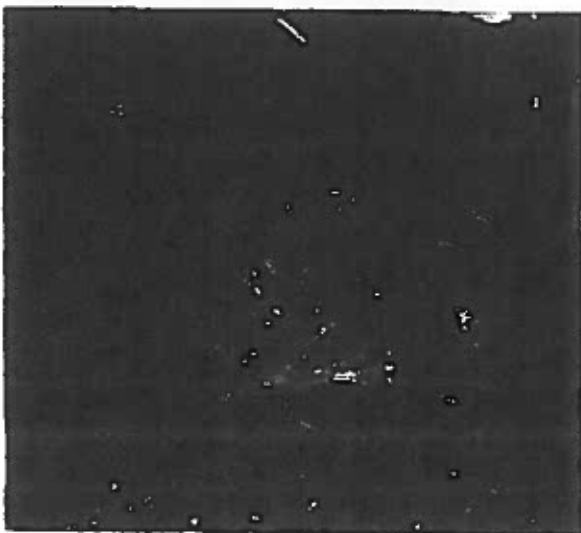
Necropsy findings

Lesions may appear in several organs due to bacteremia, which broadly distributes the organism in the tissues. Common findings are inflammation of the spleen (enlargement or splenomegaly) and liver (hepatomegaly, picture 1) along with peritonitis and/or pneumonia with airsacculitis (picture 2). In young birds, the yolk sac may remain unabsorbed and filled with caseous material. Necrotic lesions of the intestine are possible. Sometimes cecal cores (hard cores of fibrinous caseous material and cellular debris) are present. Arthritis and chondronecrosis are also found, but less frequently.



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Picture 1. Hepatomegaly. Picture credit. Dr. I. Rojas.



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Picture 2. Airsacculitis. Picture credit. Dr. G. Lorenzoni.

Diagnosis

DIAGNOSIS

The clinical signs and necropsy findings are not only produced by *Salmonella*. Many bacteria produce similar lesions. For this reason, direct culture of the organism from fecal material, intestinal tract, or internal organs is important. When the numbers of *Salmonella* are low, a pre-enrichment step is used to increase the number of viable cells before culturing them in differential media (such as tetrathionate broth).

Oftentimes, it must be known whether a particular flock is positive for *Salmonella*. For evaluating the flock as a whole, fecal material can be collected directly from the litter by dragging a moistened gauze across the floor. This gauze is later incubated in enrichment media, followed by culture in *Salmonella*-specific media. Dust samples are a good material for detecting the presence of *Salmonella* in the environment. Oftentimes, eggs are screened for the presence of *Salmonella*: the outside of the egg is washed, and the liquid derived from this process can be tested for the presence of *Salmonella*. The contents of eggs can also be tested for *Salmonella*. Even though *Salmonella* can be found inside eggs, the occurrence is very low, and sample size must be adjusted accordingly.

Relevant differential diagnosis

Bacteremia caused by other bacteria will show similar signs. Bacterial isolation is needed to confirm salmonellosis. Blindness can be caused by aspergillosis.

Prevention and treatment

Stringent biosecurity practices, covering all aspects of the operation, are needed to keep flocks *Salmonella*-negative. *Salmonella* cannot be eradicated from a flock with the use of antibiotics. Efforts must focus on preventing the entrance of *Salmonella* into a flock.

Effective prevention and treatment against *Salmonella* must start by obtaining eggs or birds from certified *Salmonella*-free flocks. If eggs will be incubated, the equipment and the eggs should be thoroughly disinfected. Before the arrival of new birds, the poultry house and equipment must be disinfected, and pests such as rodents and insects must be under control. Bait stations and traps must be operational for as long as poultry are present at the farm. Bait should be changed periodically as per the manufacturer recommendations.

Restrict the movement of equipment, personnel, and poultry between flocks. Water must be from a *Salmonella*-free source and treated (e.g., with chlorine). All feed should be given in pellet form and stored away from wild birds and rodents.

Water and feed acidifiers, probiotics, prebiotics, and yeast extract have been used as tools to decrease the ability of *Salmonella* to colonize the intestinal tract of poultry, with limited success. In general, these strategies have shown some efficacy reducing the intestinal colonization and organ invasion after a challenge. However, the contamination is never eliminated.

Vaccines against *S. Enteritidis* has been used in layers to reduce the susceptibility of the animals to a *Salmonella* challenge. This approach, coupled with stringent biosecurity standards, has worked in European markets to reduce the incidence of *S. Enteritidis*.

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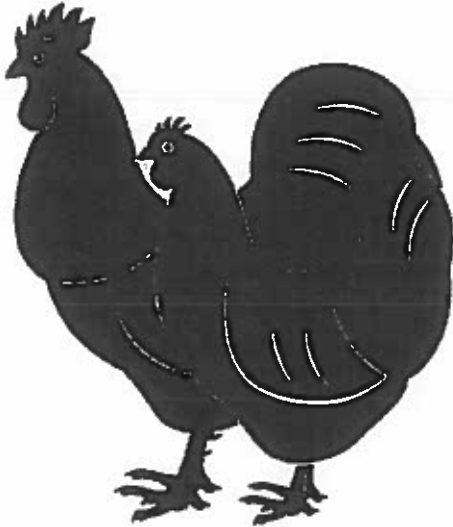
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Gino Lorenzoni

Poultry Diseases: Where to Get Help

Where do I get help when I suspect a health problem in my poultry flock?

Updated: March 2, 2021



University Diagnostic Laboratories

The Pennsylvania Animal Diagnostic Laboratory System (PADLS) has several university-based veterinarians with advanced training and expertise in poultry diseases. They have experience diagnosing all types of avian health problems, from the common to the unusual, and can help sort out individual bird problems from those that may cause sickness in the entire flock. Diseases that may spread to other animals and people can also be identified. Conditions that may impact food safety of poultry meat and eggs can be detected or ruled out. The PADLS laboratories are primarily focused on diagnostic pathology, disease surveillance, and regulatory disease testing; these diagnostic lab veterinarians can answer general questions about poultry diseases, but they do not examine or treat live birds.

Please contact either of the labs below for consultation and information on sample submission, preferably the closer to your location:

Penn State Animal Diagnostic Laboratory

University Park, PA (Centre County)

Phone: 814-863-0837

Website(<https://vbs.psu.edu/adl>)

University of Pennsylvania New Bolton Center PADLS

Kennett Square, PA (Chester County)

Phone: 610-444-4282

Website(<https://www.vet.upenn.edu/veterinary-hospitals/NBC-hospital/diagnostic-laboratories/new-bolton-center-padls>)

Private Practice Veterinarians

Private practice veterinarians who are known to work with poultry patients should be contacted for examination and treatment of sick birds, especially with reference to a single bird with specific problems. Note that not all veterinarians or clinics are comfortable working with poultry patients. Bird owners should identify veterinarians/clinics in their area who are willing to see poultry patients before they have a problem so that they know who to contact if their bird(s) get sick. If you don't already have an established relationship with a veterinarian who is willing to work with poultry patients, try contacting either local small animal clinics or large/mixed animal practices in your area. The university-based veterinarians listed above are available as a resource to help guide private practice veterinarians in sample selection and diagnostic testing.

PDA Veterinarians

The Pennsylvania Department of Agriculture (PDA) [Bureau of Animal Health and Diagnostic Services](http://www.agriculture.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_24476_10297_0_43/AgWebsite/OrganizationDetail.aspx?name=Bureau-of-Animal-Health-&Diagnostic-Services&navid=34&parentnavid=0&orgid=8)

(http://www.agriculture.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_24476_10297_0_43/AgWebsite/OrganizationDetail.aspx?name=Bureau-of-Animal-Health-&Diagnostic-Services&navid=34&parentnavid=0&orgid=8)

also has veterinarians on staff involved in efforts to keep birds healthy and prevent disease spread. Their mission is mainly focused on diseases of regulatory importance such as Avian Influenza and Newcastle Disease, and they will be involved in directing the sampling for these if appropriate. At the owner's discretion, they may be able to facilitate contacting the university-based veterinarians for consultations and investigations into a variety of more common disease problems that may be occurring in the flock in question. Some PDA veterinarians are based at the main offices in Harrisburg, and there are staff in each of seven regions in the state. You may know the PDA veterinarian in your region from fairs or certified poultry technician training courses. Contact phone numbers for these offices are as follows:

State Veterinarian

- Harrisburg: 717-772-2852

Regional Veterinarians (7 offices)

- Northwest (Meadville): 814-332-6890
- North Central (Montoursville): 570-433-2640
- Northeast (Tunkhannock): 570-836-2181
- Southwest (Greensburg): 724-832-1073
- Central (Altoona): 717-705-5500
- South Central (Harrisburg): 717-346-3223
- Southeast (Collegeville): 610-489-1003

USDA Healthy Birds Hotline

The United State Department of Agriculture (USDA) has a national toll-free hotline to report significant illness or deaths consistent with avian influenza and exotic Newcastle disease, both highly contagious viral diseases. These signs can include:

- sudden death without clinical signs
- lack of energy or appetite
- decreased egg production
- soft-shelled or misshapen eggs
- swelling or purple discoloration of head, eyelids, comb, hocks
- nasal discharge
- coughing
- sneezing
- incoordination
- diarrhea

If applicable to your situation, call the USDA Healthy Birds Hotline: 866-536-7593. Callers will be routed to a state or federal veterinarian in Pennsylvania for a case assessment.

Penn State Extension

The [Penn State Extension Poultry Team](https://extension.psu.edu/animals-and-livestock/poultry/poultry-experts) (<https://extension.psu.edu/animals-and-livestock/poultry/poultry-experts>) has experts in many other areas of keeping poultry, including breeding, incubation, genetics, judging, nutrition, housing, ventilation, etc. Many health problems are related to these factors rather than infectious disease agents alone.

What else should I do?

If birds are dying, the dead should be double-bagged and refrigerated (do not freeze) for possible testing. Meanwhile, until the problem is investigated further, diagnosed, and/or resolved, put your flock on "voluntary quarantine." This means operating as a closed flock during this time. Do not buy, sell, trade, or otherwise move birds to or from your premises. Do not visit other flocks, poultry auctions or shows, or receive visitors who have their own birds. These measures will help prevent potential disease-causing agents from being transmitted to other flocks and new agents from being introduced into yours.

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