

## **Hatchery Management**

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### **Hatching Quality Chicks**

Incubating and hatching domestic fowl eggs is popular among individuals who have a small flock for eggs and meat and hobbyists with ornamental and 'fancy' birds. These individuals benefit largely from the refinements in egg incubation developed by commercial hatchery men. The fundamental techniques of incubation remain the same, whether you are hatching millions of birds per year as a commercial hatchery man or a dozen chicks as a backyard enthusiast.

### **Breeder Flock Management**

Proper management of the breeder flock is essential to produce good hatching eggs. Much vigor and health of a chick depends on the care of its parents before the egg is laid. All birds in the breeder flock should be reared with proper management practices. Birds in the breeding flock should be healthy and free of physical shortcomings that can interfere with proper mating and egg production. The potential parent birds must be able to produce fertile hatching eggs before chick quality can be improved.

The term 'selection as used in breeding' refers to choosing parents for the next generation. Base selection on (1) the ability of parents to produce fertile eggs that hatch into strong, healthy chicks; and (2) genetic traits that can improve desirable traits or performance in offspring. This publication deals with the first basis of selection. Selecting for genetic traits requires much training before continued improvement can be expected.

A breeder bird must not have a deformed beak, slipped wing, blindness in one or both eyes or any defect that may interfere with normal eating, drinking, and maintaining social stature in the flock.

Male birds must be aggressive and have straight, sound legs and toes. Females should reflect good egg laying traits and good health and vigour.

Any of four mating systems can be used to produce hatching eggs. They are (1) 'mass' mating, (2) 'pen' mating, (3) 'stud' mating and (4) artificial insemination.

'Mass' mating means several males are allowed to run with a flock of females. This method, used to obtain the maximum number of hatching eggs, is the most common method of mating used in poultry flocks.

'Pen' mating is mating a pen or small flock of females with a single male. Use this system when you must know the ancestry of each chick. Use it, too, in a small flock in which more than one male is not necessary.

'Stud' mating consists of mating one female with a male in a single pen or coop. The females may be kept together but still be mated to different males. It is possible to mate more females to a single superior male.

Artificial insemination makes it possible to market birds of vastly different sizes. Artificial insemination also makes it possible to mate birds that would normally never mate. This method is used in unusual situations where other methods are impractical.

Provide the breeder flock with proper nesting facilities. Fill the nests with plenty of clean nesting material to prevent breaking or contaminating egg shells with dirt, manure, or other disease-transmitting substances. Follow good sanitation and vaccination programs to control disease and pest problems.

Provide ample drinker and feeder space and plenty of clean, fresh water and feed. Feed a scientifically formulated 'complete' breeder ration to ensure proper nutrition and quality hatching eggs.

### **Selection and Care of Eggs**

Collect the eggs at least once daily, more often when daily high temperatures are above 85 to 90°F. Commercial hatching eggs may be collected as often as four or five times daily to ensure egg quality. Keep

nest eggs separate from eggs found on the floor so disease organisms are not spread. Do not incubate dirty floor eggs; they may spread disease to clean eggs.

Check the eggs for cleanliness soon after collection. Save eggs free of clinging dirt or debris and those with a small amount of adhering dirt easily removed. Never save dirty eggs for incubation. They can spread disease to other eggs and chicks. Never wash hatching eggs. Bacteria may be forced through the porous shell and into the egg. Washing also removes the protective sealing substance from the shell, leaving it vulnerable to penetration by other bacteria.

Incubate only eggs of average size. Excessively large eggs hatch poorly; small eggs hatch into small, unthrifty chicks. Do not incubate abnormally shaped eggs; they probably will not hatch.

Discard all cracked or thin-shelled eggs. These eggs do not keep the moisture needed for proper chick development. Penetration by disease-causing organisms increases in cracked eggs. Discard eggs with loose or bubbly air cells.

### **Some Rules of Egg Collection**

- Wash hands before collecting eggs.
- Collect eggs at least three times a day – the more frequently eggs are collected, the better the hatchability.
- Collect clean nest eggs first, without touching any dirty, cracked or floor eggs.
- Collect the dirty nest eggs, cracked eggs and floor eggs separately.
- Do not put floor eggs into nests to make them easier to collect later, you will only contaminate the nests.
- Remove any dirt and faecal material from the nest and dispose of it onto the floor litter.
- Top up the nest material regularly or, if using nest pads, remove clean and disinfect the pads regularly.
- Clearly identify the naturally clean nest eggs for the hatchery.
- If dirty eggs and floor eggs are sent to the hatchery, they should be clearly identified and segregated from the clean eggs so the hatchery can set them in a separate setter or in the bottom trays on a trolley or rack – so if they do explode they cannot contaminate clean eggs below them.

- Cool eggs to below 24°C (75.2°F) within four hours of collection and continue cooling until the optimum storage temperature for the expected egg age at set is achieved.

### **Some Rules of Egg Selection**

The best eggs for the hatchery are those that are naturally clean, a good oval egg shape and collected from clean nests. When the breeder farm and hatchery are short of eggs then anything which is roughly egg-shaped may be considered worthy of setting. However, be aware that:

- Small and large eggs do not hatch as well as medium-sized eggs.
- Round eggs tend to hatch less well than oval shaped eggs.
- Dirty eggs and floor eggs will hatch less well than naturally clean nest eggs and may spread contamination in the hatchery.

### **Some Rules of Egg Disinfection**

- Disinfect egg shells as soon as possible after collection.
- Dry methods are preferable, e.g. fumigation, UV light or ozone.
- Fumigation using formaldehyde gas is the preferred and proven method but may not be allowed in some regions.
- If wetting eggs by spraying or fogging make sure:
  - The products are designed for use with hatching eggs, i.e. they will not react with the cuticle or be left as a deposit on the eggshell that may interfere with gas or water exchange across the eggshell.
  - The solution is warmer than the eggs – otherwise, the contraction of the egg contents may pull the solution and microbes across the shell and cause the eggs to rot and explode.
  - The concentration of disinfectant is appropriate – follow the manufacturer's recommendations.
- If washing or dipping eggs, follow the advice above and keep checking the disinfectant concentration is being maintained. Replenish the solution frequently. Only soiled eggs should be washed.
- Wet eggs should be allowed to dry before they are placed in the egg store.
- Avoid scraping or sanding of the eggshell surface – you can compact the cuticle into the pores and reduce embryo metabolism and growth.

- Avoid using cloths to clean eggs because they quickly become contaminated and will only serve to spread the contamination to other eggs.
- Monitor eggs when moving them from a cold egg store into a warmer environment to make sure condensation does not form on the shell surface. If eggs are sweating do not fumigate them and do not put them into a cold egg store until they are dry.

### **Some Rules of Egg Storage**

- Never put wet eggs (from spraying, washing or dipping) into the egg store. Allow them to dry thoroughly first.
- Eggs benefit from a period of rest after transportation.
- Do not set eggs on arrival at the hatchery, allow them to settle in the egg store for 24 hours.
- Egg store should be well insulated and the door should be kept closed as much as possible.
- Direct the air from inlets and air coolers away from the eggs.
- Take care that the humidification system does not wet the eggs.
- Ceiling fans help provide a gentle air movement through the eggs and will reduce spatial variation in temperature in large egg stores.
- Use the appropriate temperature, humidity and pre-warming depending on the period the eggs are predicted to remain in store before setting:

### **Some Suggestions for Hatchery Recording Forms**

- Form 1. Breakout of Unincubated Eggs
- Form 2. Break-out of Partially Incubated Eggs
- Form 3. Transfer Candling Analysis
- Form 4. Transfer Candling Analysis (Simplified Version)
- Form 5. Hatch Debris Analysis
- Form 6. Hatch Debris Analysis (Simplified Version)
- Form 7. Egg Weights and Chick Weights

### **Routine Quality Control in the Hatchery –**

It may become necessary to carry out a detailed investigation if hatchability or chick quality problems arise. Hatchability of fertile eggs, chick quality and post-hatching performance are affected by the conditions experienced by eggs from oviposition until hatching.

Therefore, any hatchery investigation should encompass all the events between the time the egg is laid through to the start of brooding on the farm. The performance of the chicks during the first week on the farm, especially mortality levels and seven-day body weights should also be examined. Although chick performance is influenced by farm management, the initial impact of hatchery procedures is often underestimated and should also be considered when problems arise.

Careful planning of any hatchery investigation will ensure that the material examined is representative of the system as a whole. The result of an investigation will be to suggest alternative management practices within the process. Quality control routines must then be adapted to monitor the results of any changes which are made and to prevent recurrence of the same problems.

**The following equipment will be required when investigating hatchery problems:**

- Scales with which to weigh entire trays of eggs to the nearest 10g (0.4 oz)
- Miniature temperature data loggers capable of measuring temperature to an accuracy of 0.2°C (0.4°F)
- Forceps, knife or scissors to open eggs
- A table placed in good light, away from routine hatchery work
- A plentiful supply of egg trays
- A large waterproof bin to receive waste
- Paper towels
- Recording forms (see examples in Appendix)
- Disinfectant spray
- Gloves

**As a minimum requirement the following are suggested for inclusion into any routine quality control system:**

- At least three setter trays of eggs should be monitored weekly for each flock in lay; ideally the sample trays should be representative of the whole hatch.
- The three setter trays should be weighed empty and the weight recorded.
- The trays should then be filled with eggs and the weight of each tray plus eggs recorded.
- The trays should be weighed again at the time of transfer to the hatcher. The eggs should then be candled and the 'clear' eggs

broken out to enable categorisation and enumeration of infertiles and early deads, mid-term deads and contaminated eggs.

- At chick take-off the number of chicks should be counted and recorded from each of the three trays and the chick weight expressed as a percentage of the fresh egg weight or egg weight at setting.
- Examination of the hatch debris from the same trays will complete the records.
- All data should be recorded to flock age and the setter and hatcher the eggs were incubated in.
- The percentage of eggs falling into the different categories should be calculated and compared with the working targets set from historical data. Any large deviations from the working targets should be investigated.

**Common problems in relation to temperature during egg handling include:**

- Eggs left too long in the nest, allowing them to re-warm when another hen occupies the nest.
- Infrequent collection in automatic nests where eggs are held at house temperature without cooling.
- Eggs packed on to fibre egg trays, which only allow very slow cooling. Use plastic egg trays.
- Eggs held in the poultry house after packing until the end of the working day, rather than being moved into the cooled store immediately.
- Egg store door left open, especially during hot weather.
- Temperature control in egg store inadequate with high diurnal variation due to hot weather, poor cooler capacity and/or poor insulation. This will weaken the embryos and could result in weaker chicks
- Trolleys held outside the egg store prior to arrival and loading of egg collection vehicle.
- Egg collection vehicle not temperature-controlled.
- Farm and hatchery stores held at different temperatures, and
- Prolonged pre-warming of eggs in an environment fluctuating around Physiological Zero.

**Procedures for Monitoring Hatchery Performance**

Procedures and skills that can be used in routine hatchery quality control, when carrying out a hatchery investigation and when troubleshooting hatchability problems include:

- Assessing fertility

- breaking out fresh unincubated eggs
- breaking out partially incubated eggs
- breaking out incubator 'clears'
- Examining the hatch debris
- recognising developmental stages and malformations
- recognising the normal hatching position and malpositions
- recognising egg contamination
- Monitoring weight loss during incubation
- egg weight loss to 18 days
- chick yield
- Monitoring temperatures
- monitoring the temperature exposure profiles of eggs
- measuring eggshell temperatures during incubation
- Monitoring the hatch window.

Incubation Period and Incubator Operation for Eggs of Domestic Birds													
Requirements	Chicken and Bantam Turkey	Turkey	Duck <sup>1</sup>	Muscovy Duck	Goose	Guinea	Pheasant	Peafowl	Bobwhite Quail	Coturnix Quail	Chukar Partridge	Grouse	Pigeon
Incubation Period (days)	21	28	28	35-37	28-34	28	23-28	28-30	23-24	17	23-24	25	17
Forced-Air Operating Temperature <sup>2</sup> (°F, dry bulb)	100	99	100	100	99	100	100	99	100	100	100	100	100
Humidity (°F, wet bulb)	85-87	84-86	85-86	85-86	86-88	85-87	86-88	84-86	84-87	85-86	81-83	83-87	85-87
Do Not Turn Eggs After	18th day	25th day	25th day	31th day	25th day	25th day	21th day	25th day	20th day	15th day	20th day	22th day	15th day
Humidity During Last 3 Days of Incubation (°F, wet bulb)	90	90	90	90	90	90	92	90	90	90	90	90	90
Open Ventilation Holes an Additional ¼	10th day	14th day	12th day	15th day	1st day	14th day	12th day	14th day	12th day	8th day	12th day	12th day	8th day
Open Ventilation Holes Further if Needed To Control Temperature	18th day	25th day	25th day	30th day	25th day	24th day	20th day	25th day	20th day	14th day	20th day	21st day	14th day

<sup>1</sup>Duck eggs reportedly hatch better in still-air incubators than in forced-air incubators.  
<sup>2</sup>For still-sir incubators, add 2 to 3 ° F. to the recommended operating temperatures.  
<sup>3</sup>Better hatchability may be obtained if goose eggs are sprinkled with warm water or dipped in lukewarm water for half a minute each day during the last half of the incubation period.