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Common Incubation Problems: Causes and Remedies

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It is advisable to investigate the cause or causes of problems when poultry hatches are below expectations. This publication can be helpful in determining the cause of incubations that fail and hatches that are below expected levels or have poor chick quality. Diagnose the problem by examining all eggs that fail to hatch or poor-quality chicks, or if not practical, a representative sample of them. The tables below suggest causes of problems that may commonly be observed. Click on highlighted terms for a link to the glossary at the end of this publication.

OBSERVATION: EXCESSIVE INFERTILITY FOR SPECIES

Problem	Causes	Remedies
True infertility.	Poor insemination technique.	Inseminate more frequently at proper depth with good semen.
	Hens not inseminated; wrong male to female ratio.	Inseminate hens; replace males; use more males.
	Preferential mating in pen matings.	Mate hen with different male.
	Male sterility.	Change males.
	Males not mating.	Check for disease, nutrition problems, foot problems, and social dominance of females; provide a healthy environment for the breeding flock; check for heat stress, as it often reduces mating activity.
	Males too old.	Use young males; reinforce natural mating with artificial insemination if old, valuable males must be used.

OBSERVATION: OVER 3% DEAD IN FIRST 3 DAYS OF INCUBATION

Problem	Causes	Remedies
Fertile, preovipositional death.	Inbred strains.	Avoid excessive inbreeding; use young males.
	Parthenogenesis in turkeys.	Do not use genetic stocks showing a high incidence of parthenogenesis as breeders.
Fertile, no development (FND).	Eggs stored at a temperature that is too low.	Store hatching eggs at 55°F to 68°F (12.8° to 20.0°C). See Ernst 2004.
	Eggs stored too long.	Store chicken, pheasant, duck, goose, and quail eggs no longer than 1 week; store turkey and partridge eggs no longer than 2 weeks.



OBSERVATION: OVER 3% DEAD IN FIRST 3 DAYS OF INCUBATION, Cont.

Problem	Causes	Remedies
Fertile, preovipositional death.	Eggs washed at a temperature that is too high.	Dry-clean eggs; eliminate dirty eggs; lower temperature of wash water to 110° to 120°F (43.3° to 48.9°C); produce clean eggs.
Positive development (PD).	Poor collection schedule during hot or cold weather.	When temperature in house or nest box exceeds 80°F (26.6°C), collect eggs 4 or more times during the day.
Blastoderm without embryo (BWE).	Improper storage temperature.	Store eggs at 55° to 68°F (12.8° to 20.0°C). See Ernst 2004.
Cystic embryos.	Eggs stored too long.	Store chicken, pheasant, duck, goose, and quail eggs no longer than 1 week; store turkey and partridge eggs no longer than 2 weeks.
	Rough handling or shipping procedures.	Handle eggs carefully from time eggs are gathered until chicks or poults are hatched.
	Diseased flock (e.g., <i>Mycoplasma</i> spp., Newcastle disease).	Inspect flock for general and specific health conditions; seek veterinary assistance.
	Aged or abnormal spermatozoa.	Check insemination technique; use young males.
	Eggs from inbred flock.	Some losses are unavoidable with inbreeding; change males or introduce new genetic stock.
	Improper egg storage temperature or preincubation temperature.	Do not allow eggs to preincubate: they should not exceed 80°F (26.6°C); use setter temperature of 99.5° to 100°F (37.5° to 37.8°C); check egg storage temperature.
	Eggs from hens housed above 5,000 feet (1,500 m).	Avoid high altitude or add oxygen to the incubator.

OBSERVATION: OVER 0.5% DEAD FROM DAY 4 TO TRANSFER

Problem	Causes	Remedies
Many dead embryos.	Improper incubator temperature.	Check thermometer for accuracy; set temperature at 99.5° to 100°F (37.5° to 37.8°C).
	Power failure.	If power fails, open machine until power is restored.
	Improper turning.	Turn eggs three or more times each day.
	Eggs from inbred stocks.	Avoid inbreeding.
	Poor ventilation of hatchery or incubator.	Provide proper air exchange.
	Diseased or infected eggs.	Use eggs from healthy flocks; seek veterinary assistance; do not wash eggs in cold water.

OBSERVATION: OVER 8% DEAD AFTER TRANSFER		
Problem	Causes	Remedies
Embryos die before pipping.	Low-temperature incubating conditions; relative humidity too high.	Maintain 99.5°F (37.5°C) dry-bulb and 86°F (30.0°C) wet-bulb temperature in fan-ventilated setter.
	Infected eggs.	Do not wash eggs in cold water. Use wash water temperature of 110° to 120°F (43.3° to 48.9° C); set only nest-clean eggs.
	Poor nutrition of breeder flock.	Check breeder diet; nearly all known vitamins and minerals, if absent or in short supply, can cause late mortality and poor chick quality.
	Presence of lethal genes in stock.	Use vigorous strains; avoid inbreeding.
Embryos weak and fail to pip or pip weakly.	Vitamin E deficiency.	Use fresh feed or supplement Vitamin E in water (48 IU Vitamin E/gal water).
Many pips stuck to shell.	Hatcher relative humidity too low.	Maintain 90°F (32.2°C) wet-bulb temperature after pipping begins.
	Excessive residual albumen caused by high relative humidity and/or low temperature incubation.	Check thermometers and thermostats; monitor temperature and relative humidity.
Chicks pipped and dead.	Disease.	Use healthy stock; seek veterinary advice.
	Overheating in hatcher; low hatcher relative humidity.	Check hatcher temperature and relative humidity.
	Nutritional deficiency.	Feed balanced diet; see <i>Nutrient Requirements of Poultry</i> 1994.
Malpositions.	Eggs set small-end up.	Position eggs properly in trays (large end up or horizontal).
Chicks hatch too early, are thin and noisy.	Temperature too high during incubation period.	Check thermometer; 1°F (0.6°C) in excess of 99.5°F (37.5°C) will cause hatch approximately 24 hours early.
Chicks hatch late, are soft and lethargic.	Temperature too low and relative humidity too high during incubation period.	Check thermometer; 1°F (0.6°C) below 99.5°F (37.5°C) will cause late hatch.
	Old eggs.	Set only fresh eggs; allow extra time for hatch by setting old eggs early.
Sudden losses at any time.	Improper fumigation; use only approved fumigants and follow label directions.	Do not fumigate from 24 to 96 hours of incubation.
	Mercury spilled in incubator or hatcher.	Check for broken thermometer or thermostat; clean up all spilled mercury immediately.
	Power or equipment failure or overheating.	Check incubator temperature at least twice daily; refer to instruction manual for proper maintenance procedure.

GLOSSARY

blastoderm without embryo (BWE). When candled, a BWE egg shows a blood ring; on breakout there are no visible embryo structures.

blastodisc. The small disc-shaped region on the yolk that contains the egg nucleus.

blood ring. Circular blood remnant visible when an egg is candled; signifies that the embryo has died at a young age.

breakout. The examination of egg contents to determine whether the blastodisc was fertilized or embryonic structures were present.

candled fertility. The percentage of eggs remaining after clears are removed by candling; compare with true fertility.

candled out. Clearing eggs removed from the incubator following candling.

candling. Transluminating an egg with light to determine the presence or absence of a viable embryo or to look for shell defects before setting.

clears. Incubated eggs that appear clear when candled, indicating that they do not contain a live embryo.

cystic embryo. Embryo that dies early in gestation; the broken-out appearance is similar to a BWE except that embryo tissue is visible.

dry-bulb temperature. Temperature measured with a standard thermometer or electronic sensor; compare with wet-bulb temperature.

embryo. An organism in the early stages of its development before hatching.

fertile, no development (FND). Rarely diagnosed condition in which the blastodisc was fertilized but died before the egg was laid or before growth could be initiated in the incubator.

fertile, preovipositional death. Rarely diagnosed condition characterized by a blastodisc that appears to be fertile but dies before the egg is laid by the hen.

germ, germinal disc. Fertilized blastodisc; the embryo has about 50,000 cells when the egg is laid.

hatch, percent hatch, hatching percent, hatch of total. Percentage of all eggs set that hatch whether they were fertile or not (a typical hatch might be 80% to 90%).

hatch of fertile eggs, hatchability. Percentage of fertile eggs that hatch (should be above 85%).

hatcher. Machine used to maintain proper conditions for embryos during the final few (usually 3) days before hatching.

inbred. Birds or flocks that have some degree of inbreeding.

inbreeding. The result of mating closely related birds, such as father to daughter or brother to sister. As inbreeding increases, the ability of the stock to reproduce usually declines.

incubation. Maintaining the temperature and humidity needed to initiate embryo growth and hatching of avian eggs by a female or using a machine.

incubator. Machine that maintains proper conditions for incubating or setting avian eggs. Also referred to as a setter.

malposition. Hatching embryo in any position except the head under the right wing positioned in the large end of the shell; for example, the head under the left wing or the head between the legs.

parthenogenesis. Development of an egg without fertilization, which occurs at low levels in chickens and turkeys. Embryos usually die; if the embryo hatches it will be a male with a diploid (2n) number of chromosomes.

pip. Egg in which the chick has broken the shell in an attempt to hatch; also, the act of breaking the shell. Chicks may die after pipping or may be unable to get out of the shell.

positive development (PD). Eggs are candled out as clears because there is no blood formation; the germ was fertile, but it died soon after cell growth resumed when the egg was warmed above 80°F (26.7°C).

relative humidity. Measure of the water vapor or moisture in air; can be determined from the wet-bulb and dry-bulb temperature using a psychometric chart.

set. To place eggs in an incubator or under a female for incubation.

setter. An incubator.

spread. The difference between percent of fertile eggs and percent hatch (a 10% to 12% spread is typical for chicken eggs).

true fertility. Percentage of hatching eggs that are fertile. This can be determined only by incubation, candling, and breakout of the clears to determine which eggs were fertile or by breaking out potentially fertile eggs to examine the germinal disc (e.g., a sample might be examined to estimate fertility of a flock).

true infertility. Lack of true fertility.

wet-bulb temperature. Temperature measured by a standard thermometer equipped with a wet sock over the bulb. For accurate measurements, air must be moving over the wet sock to provide evaporation. Electronic sensors are now available to measure the relative humidity of air in incubators and egg storage rooms.

REFERENCES

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Ernst, R. A. 2004. Hatching egg sanitation: The key step in successful storage and production. Oakland: University of California Division of Agriculture and Natural Resources Publication 8120. Available for free downloading from the Communication Services Web site, <http://anrcatalog.ucdavis.edu/pdf/8120/pdf>.

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