

University of Illinois Extension ~ 4-H Youth Development

Incubation and Embryology

Frequently Asked Questions

The following is a list of questions and answers frequently discussed in the incubation-embryology short course. They are arranged by a major subject heading.

POULTRY INDUSTRY AND PRODUCTION QUESTIONS:

1. Why do brown shelled eggs cost more than white shelled eggs?

Brown shelled eggs cost more because the chickens that produce these eggs eat more feed and are less feed efficient.

2. Why are brown shelled eggs bigger than white shelled eggs?

Brown shelled eggs are bigger than white shelled eggs because they are produced from a dual purpose breed (eggs - meat) that is larger in size (6-7 lbs.) than a Leghorn breed that is smaller in size (3-4 lbs.).

3. Does the time of the year affect the fertility rate?

Extreme cold (winter) or extreme heat (summer) can lower fertility rate dramatically.

4. How many females can one male service?

One male egg producing chicken (Leghorn) can service 10-15 females. One male dual purpose chicken (Rhode Island Red) can service 6-8 females.

5. What is the average life of the male chicken?

A male chicken would live on the average of 3-5 years.

6. How long do chickens live?

Broilers reach market age in six to eight weeks. On most commercial egg farms, laying hens have completed their usefulness when they are 18 to 20 months old. Records show that when chickens are allowed to live out their lives naturally, many of them will live in the range of six to ten years, and some claims have been made of some chickens living as long as 22 years.

7. How large are female chickens?

A female White Leghorn is about 4 lbs. and a female Rhode Island Red is about 6-7 lbs.

8. How can you tell a hen from a rooster?

It is difficult to tell at hatch unless they are feather-sexed. (Female primary feathers are longer at 3-4 days of age) In adults, males are larger with longer wattles and larger combs.

9. How can you tell if the chick is male or female?

Unless the males and females have been bred to be different colors or have different rates of feather growth, you cannot tell them apart without special training. Trained chick sexors can determine the sex of a chick by:

Examining the chick's vent for tiny differences in the shape inside.

10. Do you need sunlight to formulate hard shells on eggs?

No. An adequate source of calcium (3.5) in the diet is needed.

11. Do chicken houses need to be heated?

No. Usually chickens in large commercial houses provide their own heat.

12. How much light is needed in a chicken house?

Only enough light is needed to read a newspaper at arms length (about a 1 foot candle).

13. When does production begin?

Production begins at sexual maturity. This is about 17-18 weeks of age for the female hen.

14. What factors affect egg production?

Many factors affect egg production. The most important are diet (nutrition), temperature, humidity, length of artificial light (14 hours of constant light is recommended) and other nutritional and environmental factors.

15. How long after a chick hatches is it considered an adult?

In the case of those developed for egg production, about five months (19 to 22 weeks). Those developed for meat (bigger birds) take longer – about six months.

16. How long does it take to raise a fryer?

It takes about 42-49 days; 6-7 weeks to market weight of 4.5 lbs. to raise a fryer.

17. Can we hold the chicks as soon as they hatch?

Chicks should not be handled until the hatch is completed, and the chicks are dry and completely

fluffed up.

18. If I find a bird egg, such as a robin's, can I hatch it?

First, these are much more difficult to incubate than chicken or quail eggs. Even if you were able to get the chick to hatch, a young bird, like the robin, requires the skilled care of its parents to survive. People cannot provide the same kind of care, and the baby bird will most likely die from starvation, cold, or mismanagement.

19. If a mother hen sits on a fertile egg will it always hatch? If not, what does she do with it?

Not all fertile eggs will hatch even when incubated either by a broody hen or in an incubator. Under some conditions they will contain weak or defective embryos.

Hatchability is influenced by:

- ◆ *Age of eggs at setting*
- ◆ *Conditions under which they were held before incubation*
- ◆ *Parent stock, including its breeding potential, health, and diet*
- ◆ *Conditions while the eggs are being incubated*

So, the fact that a hen is doing the incubating does not guarantee that a fertile egg will hatch. If an egg or eggs do not hatch, the hen eventually leaves them in the nest. She leaves because the hormone that caused her to go broody is no longer secreted, so she stops setting on the eggs. In a way, it could be said that nature has told her to quit the nest.

20. How long can the mother hen be off the nest during the day? What will happen if she stays off too long?

A setting hen can be off the nest 15 to 20 minutes or a little longer at one time without harming the embryos, unless the weather is extremely cold. If she remains off too long, the embryos will be chilled too much. Then, some of the chick may be so weakened that they cannot hatch, and so will die in the shell.

21. What is a blood spot?

A blood spot occurs from a broken blood vessel across the stigma line on the yolk follicle when the yolk is released into the reproductive tract.

22. What is a meat spot?

A meat spot occurs when a part of the oviduct peels off, as when the egg is formed.

23. Is there one kind of egg carton that is better than another?

A Styrofoam carton is preferred to a paper carton because it protects the egg better.

24. What is salmonella?

Salmonella is a bacterium that can form on the outside of the shell when an egg or its contents become contaminated. It can cause food poisoning if eggs are not properly handled and cooked.

25. What are the critical issues related to salmonella?

Issues are: Eggs and other food should be properly handled and cooked. Salmonella poisoning is not a problem if food products are properly prepared.

26. How often are eggs infected with salmonella?

It has been shown that possibly one egg in one million eggs produced may have some salmonella growing inside an intact egg.

27. What is the proper way to cook an egg?

Eggs can be cooked in many different ways. Thoroughly cooked eggs include: eggs cooked until the whites and yolks are not runny, hard-cooked eggs, baked eggs and other egg-rich foods cooked to an internal temperature of at least 106 degrees F.

28. Do brown eggs have more cholesterol than white eggs?

Brown and white shelled eggs have the same amount of cholesterol (200-210 mg per egg).

29. How many eggs does a chicken lay per year?

A chicken lays 250-270 eggs per year.

30. What causes a double yolk egg?

*It is an egg which has two yolks in it. Both yolks were ovulated (released) at or about the same time and enclosed in the same shell. Many eggs with double yolks occur when a young hen first starts producing eggs. Their egg-forming organs are not adjusted or well synchronized yet, so two yolks of about the same size are released together. Within a few weeks after egg production starts, the chickens' bodies adjust, and for the most part, they then lay eggs with only one yolk. But, there are some chickens which inherit the characteristic to lay eggs with two **or more** yolks (as many as **nine** for one extraordinary hen!) and these hens usually continue to do so throughout their life.*

31. Is the shell hard or soft when laid?

The shell is hard when laid by the hen.

32. How is the egg fertilized?

When the rooster inseminates the hen, the male sperm swim up the reproductive tract and localize in sperm host glands in the infundibulum. When a yolk is released one sperm penetrates the germinal disc and fertilization has begun.

33. How can one tell a fertile egg from an infertile one? How can one tell when an egg was fertilized?

It is not possible to visually distinguish between fresh fertile and infertile eggs unless you break them out of the shell. After they have been incubated three days, a small reddish area with blood vessels extending from it will be visible in fertile eggs when they are candled or broken out; infertile eggs will not show this (clear eggs). When broken out, fresh infertile eggs show a smaller, solid white germ spot than fertile ones. This is because cell division has not occurred in infertile eggs but has in fertile ones. Fertile eggs have larger germ spots that usually have a darker central region (a white ring around a darker center).

By 24 hours of incubation, you can often see a small, thumb-shaped shadow on the yolk extending towards the air cell.

34. When do the chicks need water?

Chicks need water immediately. They need to drink water when they are transferred to the brooder box.

35. When do they need food?

The chicks need food preferably the first day, but can survive for up to 3 days after hatching.

36. What are hackle feathers?

Hackle feathers are neck feathers on a chicken. A rooster has long pointed ones and the female has short rounded ones.

37. What are saddle feathers?

Saddle feathers are feathers toward the tail end of the chicken. The size and shape of these are the same as these of the hackle feathers.

38. Can you tell the sex of the chicken from the feathers alone?

You can if the breed is feather sexed. The female chick's primary feathers will be longer than the males. It is difficult to tell the sex of a newly hatched chick if the breed does not have the feather sexed characteristic.

39. Is there a pecking order?

Yes, within a group from 2 chickens to hundreds they establish a pecking order of dominance.

40. If a female chicken is hatched with about 14,000 ova and lays only 240 to 250 eggs a year, what happens to the remainder of the ova?

Depending on the state of health and condition of the chicken, the remaining ova can:

- *Continue to exist in the hen's body ready to form a yolk*

- *Be absorbed by the hen's body*

41. Can I hatch the eggs I buy at the store?

No. The eggs in grocery stores are infertile and will not hatch.

BREEDS OF CHICKENS:

42. Why are brown shelled eggs bigger than white shelled eggs?

Brown shelled eggs are bigger than white shelled eggs, because they are produced from a dual purpose breed (egg-meat) that is larger in size (6-7 lbs.) than a Leghorn breed that is smaller in size (3-4 lbs.).

43. How do you know what color shell the eggs will have?

The earlobes of the chicken dictate the color of the shell (white earlobes = white eggs; red earlobes = brown eggs).

44. What kind of chicken lays green shelled eggs?

An Arucana or Ameraucana chickens lay green shelled eggs.

EGG GRADING AND CANDLING:

45. What is the weight of jumbo, extra large, large, medium, small, and pee wee eggs?

*Jumbo - 30 ounces per dozen
Extra Large - 27 ounces per dozen
Large - 24 ounces per dozen
Medium - 21 ounces per dozen
Small - 18 ounces per dozen
Pee Wee - 15 ounces per dozen*

46. What are the egg grades?

Egg grades are: AA - shell clean, air cell 1/8" or less in depth, white clear and firm; A - shell clean, air cell 3/16" in depth, white clear; and B - shell clean to slightly stained, air cell over 3/16" deep, white weaker and watery.

47. What is a leaker?

A leaker is a broken egg where the contents leak out of the shell.

48. What is candling?

Candling is shining a bright light near the egg to determine the egg quality and embryonic development.

49. When should the eggs be candled?

Eggs can be candled anytime from about day 5 of incubation through day 17.

50. How many eggs should be candled at a time?

Out of two dozen eggs in the incubator probably no more than 5-7 eggs should be candled at one setting.

51. How long should the eggs be out of the incubator?

Eggs should be out no more than 5 to 10 minutes at a time.

INCUBATION

52. What is the best temperature for storing eggs?

Egg storage temperature should be between 55 and 60 degrees F.

53. How much humidity is needed?

Enough humidity is needed to maintain a wet bulb temperature of about 85 to 87 degrees F. (50-55% relative humidity). This is normally attained if water channels in the incubator are kept full.

54. How does one know when the humidity is enough or too much?

In small classroom incubators, there is no exact or precise way to measure humidity. Hygrometers do not work well in these incubators. If you have a factory-made incubator, use a water pan or pans equal in size to at least one-half and preferable more of the incubator's floor space. During the last three days of incubation, place moist sponges or cloths in the incubator to increase humidity but don't let the sponges or cloths come into contact with the eggs.

Wet Bulb Readings: *Using a thermometer similar to the one you monitor incubator temperature, slip a small piece of shoelace over the bulb end (this is called a cock or wick). Wet this, and then put into incubator. Let sit for at least 10 minutes. There are charts that can be used if you have a "wet" bulb and "dry" bulb.*

55. How do you disinfect the incubator?

Disinfect the incubator with 10 percent Clorox bleach solution, and then wash with warm soapy water and rinse thoroughly.

56. Does when the egg was laid affect the hatch date?

No. If fertile eggs are stored properly (55-60 degrees F.) then hatch date for the chicken will be about 21 days following the time they are placed in the incubator.

57. When should the incubator be prepared for the eggs?

The incubator should be prepared about one week before starting the incubation process.

58. Where should the eggs be stored if they cannot be set right away?

If they cannot be put in an incubator right away, then they should be kept in the vegetable section of a refrigerator or at a temperature of 55-60 degrees F.

59. What is the longest time an egg should be held before incubating?

Eggs should be kept no more than seven days.

60. What is the correct temperature for incubating fertile eggs?

Optimum temperature is 100.5 degrees F.

61. What is the temperature range that is acceptable during incubation?

Temperature range for incubation is 99-103 degrees F.

62. What is the lowest temperature?

The lowest temperature for incubation is 99 degrees F.

63. What is the highest temperature?

The highest temperature for incubation is 103 degrees F. NEVER keep at 103 degrees F. for more than a few hours.

64. How do you check the accuracy of the incubator thermometer?

Accuracy of an incubator thermometer can be checked by placing a medical thermometer and an incubator thermometer in a pan of 100 degrees F. water or take a good thermometer from the science storeroom and place it next to the incubator thermometer in the incubator at 100 degrees F.

65. When should the plugs be removed from the incubator?

Remove plugs (air holes) from the top of the incubator when you see the chicks start to hatch.

66. What are the factors for success?

Successful hatches can be obtained by: 1) securing fertile eggs; 2) maintaining the correct temperature; 3) maintaining correct humidity levels; 4) increasing ventilation when chicks hatch; 5) turning the eggs properly.

67. What should be used to mark the eggs?

A lead pencil only should be used.

68. Do I need to take the eggs home for the weekends?

Yes, you are encouraged to take eggs home on the first two weekends to turn the eggs and regulate temperature.

69. How do I transport the incubated eggs from school to home and back?

Carefully. Put the eggs in a Styrofoam egg carton and the carton in a blanket; or leave eggs in the incubator and place a blanket over them so they won't roll around.

70. Where should the eggs be placed in the car when taking them home?

Place the eggs on the front floor on the passenger side and turn on the heat.

71. What is the normal hatch time for a fertile incubated egg?

Normal hatch time for chicken eggs is 21 days.

72. What will delay the hatch?

An average temperature that is too low will delay the hatch.

73. Why are the chicks sometimes very wet and mushy?

Chicks are wet and mushy if humidity in the incubator is too high. To lower the humidity at the end of the incubation period, do not place more than one sponge in the bottom of the incubator.

74. How can I be sure that I have enough humidity?

If the proper water level is maintained in the bottom of the incubator, the correct humidity should be maintained.

75. How can I tell if I have too much humidity?

If there is too much condensation on the inside of the incubator windows, then there is probably too much moisture in it. This usually is not a big problem.

76. How long should I leave the eggs in the incubator if they do not hatch on the twenty-first day?

Leave the unhatched eggs until the 23rd or 24th day.

77. What causes deformed legs?

Deformed legs are caused by poor nutrition for the hen. Other factors are disease, contamination and improper temperature.

78. How do I add water?

Add warm water (100 degrees F.) with a squeeze bottle or turkey baster; do not get eggs wet.

79. How do I count the days?

Count the days of incubation from the first day the eggs are placed in the incubator. If eggs are placed in the a.m. that day would be Day 1; if placed in the p.m. that would be Day 0; the next day would be Day 1.

80. When do I stop turning the eggs?

Stop turning the eggs on Day 18.

81. When should I put the crinoline on the wire grate?

Put the crinoline (cheese cloth) on the wire grate of the incubator at the end of Day 17 or beginning of Day 18.

82. How can I add additional humidity?

Add additional humidity on Day 18 by placing 2-3 wet sponges on the bottom of the incubator.

83. Can I find the egg tooth and keep it after it falls off?

It peels off, like a tiny sticker, usually in the first couple of days after hatching. As it is very small and thin, it would be difficult to find in the litter.

84. If an embryo dies during incubation, does it feel pain?

We cannot know for sure, but it appears more like the embryo just sort of goes to sleep.

85. What should I do if the chicks do not fluff up?

If chicks do not fluff up, remove sponges from the incubator and water from the channels.

86. What is the brooder box?

A brooder box is a temporary home for baby chicks up to one week of age. It contains 2-3 inches of litter, a feeder and waterer. It also includes a heat source suspended above the box.

87. How do I make a brooder box?

Take a cardboard box (2' X 3' X 1') and place in it items mentioned in answer above.

88. What should be used in the bottom of the brooder box?

Soft pine-wood shavings, untreated cat litter, sand, rice hulls and ground corn cobs may be placed in the box.

DO NOT PUT NEWSPAPER IN BOX.

89. Do the teachers need to teach the chicks to drink and eat?

Yes, it would be a good idea to dip the baby chick's beak in the feed and water so they know where it is.

90. Can you open the shell for the chick?

Yes, but it is not recommended. To do so frequently kills the chick, as you will usually break open the Chorio-Allantoic Membrane (CAM) vessels which cause the chick to bleed to death. It is best to let the chick hatch individually.

91. Where should the thermometer be placed in the incubator?

Place the thermometer on the wire grate away from the heat source and in the center of the incubator.

92. What is the function of the air cell?

The air cell function is to provide the chick with air when it first starts to break open the shell.

93. What is the critical period in hatching?

The first 3-5 days and Days 18 and 19 are critical since embryo is forming in the early days and it gets in position to hatch the last days.

94. How often should the eggs be turned?

Eggs should be turned at least three times a day.

95. What happens if the eggs are not turned?

If eggs are not turned, the embryo will die about Day 11.

96. What causes the embryo to develop fully, but not pip the shell or hatch?

Too low or too high temperature and too low or too high humidity are causes.

97. Do you need to do anything to prevent the chicks from drowning?

Place marbles or rock in the water pan in the brooder box to keep chicks from drowning.

98. Why shouldn't a chick be helped out of the shell?

The chick is weak and would not survive on its own.

99. Why do chicks stick to the shell?

Too low humidity during incubation causes chickens to stick to the shell.

100. What causes the navel to be sore?

Too high temperature during incubation, excessive humidity near the end of incubation or infected embryo early in incubation.

101. Why does the eye get so big and why does it grow so fast?

We do not have the exact answer to this. However, it is possible that both size of the eye and speed of its growth could be at least partially due to the eye being so very complex and so important. Thus, considerable time is needed to completely form and develop it.

102. Why does the heart grow on the outside of the body at first?

We do not know why it does so. It is known that the heart helps to circulate blood in both the embryo's circulatory system and in the membranes outside the embryo which are carrying food to the embryo as it develops. Actually, in some ways, the early heart is inside, since it is right next to the yolk sac, which is really part of the "inside" of the embryo!

103. If you break open the shell, say on the 8th or 9th day, how long can the embryo live?

The length of time it will live varies with the conditions around it such as temperature. It is not likely to live more than 5 to 10 minutes in most instances. It is possible to remove the shell at the large end of the egg, replace it with a plastic cap, continue to incubate the egg, and the embryo can then live several days, or even go to hatch, if conditions were kept very sterile during the opening and the egg was fully resealed.

104. What should you do if the chicks pick at one another?

Separate them from each other in the brooder box or construct another brooder box and separate the chicks.

105. Can chicks be marked?

Yes.

106. How do you color embryos?

*To color embryos you inject about .2 to .5 milliliters of a colored dye into the egg with a hypodermic needle near the bottom of the egg. A more detailed description is given in the **From Egg to Chick Manual** - Circular 878.*

EMBRYOLOGY:

107. How do you preserve embryos using formalin or glycerin and ethyl alcohol?

*Embryos can be successfully preserved by storing them in a 10% formalin solution (1 part 37% formaldehyde to 9 parts of water). Or they can be preserved in an alcohol solution (3-4 drops of glycerin on embryo) then immerse in 70% alcohol (14 parts of 95% ethyl alcohol to 5 parts of water). **The preferred method is to use glycerin or ethyl alcohol.***

108. What is the correct procedure for breaking out an embryo?

Break open the shell on the large end of the egg, then pour out the liquid contents and carefully drop the embryo on a pie tin.

109. How long does it take to pip the shell completely?

It normally takes two to four hours.

