

How to Check Incubation Temperature

This bulletin describes how to measure incubation temperature and interpret the results.

- The correct temperature is critical for incubation success and even deviations of 1.8°F (1.0°C) from the optimum can have a major impact on hatching success.
- The temperature experienced by the embryo is not the same as the temperature indicated on the front of an incubator and **it is embryo temperature that is critical for success.**
- The difference between setter and embryo temperature depends primarily on the rate of heat transfer between egg and incubator air (determined by airflow) and the amount of metabolic heat generated by the embryo (determined mainly by embryo age).

Procedures

There are several methods that can be used for identifying incorrect egg temperatures.

1. Incorrect incubation time

- If egg temperature is too high then incubation time will be advanced. The opposite is true if egg temperature is too low. Incubation time can be a good early indicator of temperature problems.

2. Handheld infrared thermometer

- Handheld infrared thermometers can be accurate tools for measuring egg surface temperature.
- Place the thermometer against the shell just below the shoulder of the egg to obtain a reading. (Figures 1 & 2).
- This technique is excellent for obtaining spot checks on egg temperatures within incubators, particularly when it is possible for the operator to enter the machine while it is operating.



Figure 1: Handheld infrared thermometer



Figure 2: Using an infrared thermometer

- The table below shows the target eggshell temperature for turkey eggs during the first weeks of incubation.
 - In most cases there will be some egg-to-egg temperature variation so the objective is to get as many eggs as possible within the target range.
 - Be more concerned about incubation temperatures that exceed the target range.
 - Note that infertile and early dead germ eggs will have a lower temperature after day 12 of incubation, as these eggs are not generating any metabolic heat.

Minimum and maximum eggshell temperature

Week of Incubation	Temperature (°F)		Temperature (°C)	
	Min	Max	Min	Max
1	99.7	100.6	37.6	38.1
2	99.5	100.6	37.5	38.1
3	99.5	100.6	37.5	38.1
4	99.5	100.8	37.5	38.2

3. Data loggers with thermistor probes

- It is possible to obtain data loggers (Figures 3 & 4) with one or more external thermistors that can be taped to the egg on the center of a setter tray.

- When choosing a data logger it is important that the readability of the instrument is at least to 0.1°F (0.05°C) and as accurate as possible.



Figure 3: Data logger



Figure 4: Positioning of data logger probe on egg tray

- The advantage of this type of equipment is that it can be located within the center of the egg mass and provide a continuous record of temperature throughout the whole incubation period.
- The difficulty is that the thermistor will measure the temperature of the air around the egg rather than the surface temperature and in most cases this will underestimate the egg temperature.
- Target air temperatures around the egg are shown in the following table:

Minimum and maximum air temperature around turkey eggs

Week of Incubation	Temperature (°F)		Temperature (°C)	
	Min	Max	Min	Max
1	99.5	100.6	37.5	38.1
2	99.5	99.9	37.5	37.7
3	98.6	100.6	37.0	38.1
4	98.6	100.6	37.0	38.1

4. Dead-in-shell breakout analysis

Studies have shown that **high incubation temperatures** will show some typical patterns of embryo mortality:

- Increased incidences of mortality in the 16 – 24 day of incubation.
- Increased incidence of embryo malposition, particularly upside-down.

- Increased incidence of eye cataracts, oedematous heads, swollen down plumules, ruptured yolk sacs and excess albumen.

Low incubation temperatures tend to be associated with:

- Increased incidence of late hatching or live unhatched embryos.

Correcting Incubation Temperature

It is not possible to provide complete advice on how to correct incubation temperature problems that applies to all types of incubators, but the following issues should be considered.

If all the eggs are either too warm or cold:

- Is the incubator correctly calibrated?
- Can the incubator operating temperature be raised or lowered to bring the eggs into the correct target range?
- In multi-stage incubators are the correct setting patterns being applied?
- Can the airflow around the eggs be increased to reduce temperature?

If there are hot or cold spots within the incubator:

- If there are multiple temperature control sensors are they all correctly calibrated?
- Is there a uniform airflow around the eggs within the machine? Is airflow being restricted by insufficient space between egg trays?
- In multi-stage incubators, are the correct setting patterns being applied?
- Are the incubators over ventilated so that too much cool, dry air is being brought into the machines?
- If spray humidifiers are being used, are they wetting the eggs or not functioning correctly? Are all heater bars working correctly? Has the machine been properly maintained?