

Multi Stage Incubation Procedure

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DEFINITION

Multi-stage incubation is where the machines are operated continuously, with eggs being set and transferred in the machine once or twice a week. Multi-stage incubation uses the heat generated by the eggs at the end of incubation to warm the eggs at the start of incubation.

The alternative system is single-stage incubation where all the eggs within the incubator are at the same stage of development.

The major advantages of multi-stage incubation are:

- Lower operating costs due to heat output from older eggs in the incubator being used to warm the younger eggs.
- Simplicity of operation

OBJECTIVES

This advice sheet is not able to provide exact incubation programmes for all types of multi-stage incubators, as different incubators will have different requirements. Incubator manufacturer's advice should be taken. However, this advice sheet can indicate some basic principles when looking at multi-stage incubation programmes.

INCUBATOR MANAGEMENT

Setting Patterns

- Multi-stage incubators rely on the efficient transfer of heat from the eggs at the end of incubation to those at the start of incubation.
- Eggs are normally set within a multi-stage machine either weekly or twice weekly.
- To ensure efficient heat transfer it is important that the eggs are set in the correct pattern within the machine. Manufacturer's recommended set pattern should be followed.

It is important that a similar number of eggs from each stage of incubation are placed within the setter and that the stages of incubation are evenly distributed across the incubation period. Examples of good and bad multi-stage machine loading are shown in table 1.

Loading pattern					
Incorrect		Incorrect		Correct	
Day of Incubation	Number of Eggs	Day of Incubation	Number of eggs	Day of Incubation	Number of eggs
1	2,000	8	4000	1	4,000
8	2,000	16	4000	8	4,000
15	2,000	20	4000	15	4,000
22	10,000	24	4000	22	4,000

Table 1: Examples of good and bad multi-stage machine loading

Cleaning and Maintenance

Because multi-stage incubators operate continuously, it is difficult to properly clean, disinfect and carry out routine maintenance within the machines. For this reason it is important to programme a time when the multi-stage machines can be completely emptied of eggs.

If a high incident of contaminated (exploding) eggs occurs it is good practice not to refill the machine until it is empty, to allow thorough cleaning and disinfection.

INCUBATION PROGRAMMES

Temperature

The exact temperature programme used will depend on the temperature control characteristics of multi-stage machine, but the objective should be to maintain egg temperature.

Typically multi-stage incubators will be operating at 37.4 – 37.5°C (99.3 – 99.5°F). However, the tunnel type of incubator will normally operate at cooler temperatures, typically 37.0 – 37.1°C (98.5 – 98.8°F).

If eggs are being set into an empty multi-stage incubator (e.g. after cleaning and maintenance) and there are no end of incubation eggs present, then better results can be obtained if a higher temperature is used. The objective is to compensate for the lack of hot eggs in the setter. As a guide:

- Day 1 –3 after first set: +0.4°C (0.7°F)
- Day 2 – 6 after first set: +0.2°C (0.4°F)
- Day 7 – 9 after first set: +0.1°C (0.2°F)
- Day 10 onwards – normal multi-stage temperature

Humidity

The basic requirements for incubator humidity are given in the [Measuring Egg Water Loss Advice Sheet](#).

Ventilation

Ventilation is necessary to supply oxygen (O₂) to the developing embryo and to remove carbon dioxide (CO₂).

The basic requirements for ventilation are given in the [Incubator Ventilation Advice Sheet](#).

In multi-stage machines the ventilation should be sufficient to keep the CO₂ level below 0.3%. Do not over ventilate as this will result in problems of temperature and humidity control. Where air ventilation is the only method of cooling the incubator, then the level of ventilation must be determined by the machine temperature control system.

Turning

Eggs should be turned hourly for at least the first 18 days of incubation. After day 18 the decision of whether to turn or not will depend on the impact of turning on airflow through the eggs and egg temperature and the machine design. In some machines (e.g. tunnel machines) it is possible to stop turning only eggs after day 18 of incubation and improve the airflow through the eggs. In some cases this has been found beneficial to hatch.

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