

Single Stage Incubation Procedure

Aviagen Turkeys Ltd ®

- Single-stage incubation is when all the eggs within the incubator are at the same stage of development. The machine is filled at each setting and emptied at each transfer. This type of incubation is also known as all-in, all-out incubation.
- The alternative system is multi-stage incubation where the machines are operated continuously, with fresh eggs being set into the machine once or twice a week.
- The major advantages of single-stage incubation are:
- The machines are completely emptied once a month to allow cleaning, disinfection and maintenance.
- The incubation environment can be matched to the requirement of the egg at each stage of incubation.

OBJECTIVES

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

INCUBATION PROGRAMMES

Temperature

- Temperature programmes for single-stage incubators normally start higher than 37.5°C (99.5°F) and then decline through incubation so that they are lower than 37.5°C by the end of incubation.
- The exact temperature programme used will depend on the temperature control characteristics of single-stage machine, but the objective should be to maintain egg temperature.
- Typically a single-stage temperature programme will start at between 37.8 – 38.0°C (100.0 – 100.5°F) and decline to around 37.5°C (99.5°F) by the second week of incubation. After midway through incubation, temperature will need to drop below 37.5°C to compensate for the metabolic heat production of the embryo. A typical single-stage programme will gradually reduce the temperature so that by the time of transfer the machine is operating at between 36.9 – 37.2°C (98.5 – 99.0°F).
- As a general rule, larger turkey eggs require a higher temperature at the start of incubation and a lower temperature at the end of incubation than smaller eggs.

Humidity

- Studies have shown that better results are achieved if humidity is high at the start of incubation and low at the end of incubation but the correct level of egg water loss is achieved at transfer.
- Humidification systems within incubators will cause localised cooling and can result in temperature variations within the machine. Therefore it can be beneficial to try and design the programme to minimise the time the humidifier operates.

Ventilation

- Ventilation is necessary to supply oxygen (O₂) to the developing embryo and to remove carbon dioxide (CO₂).
- In the second half of incubation, ventilation can also have an important function as a supplementary cooling system. If ventilation is the sole system for cooling the incubator then the cooling requirement rather than the oxygen requirement must determine the level of ventilation.

- In single-stage incubators, the amount of ventilation required in the first 12 days of incubation is effectively zero. Therefore, the machine can be kept completely closed and CO₂ levels can reach up to 1% without any adverse impact on performance.
- Keeping the ventilation closed for the first 12 days will raise the humidity and minimise the amount of heating and humidification required within the machine, thereby producing a more stable environment.
- If the incubator is completely sealed, then it may be necessary to open the ventilation slightly if condensation occurs within the machine.
- After day 12, the ventilation must be opened to provide sufficient O₂ and remove CO₂. The degree of ventilation should be set so as to:
 - Maintain CO₂ below 0.8% - if possible at 0.3%.
 - Minimise the water-cooling and humidification requirement.
 - The use of fans to blow air through the machines (forced ventilation) can be beneficial when it is found that unforced ventilation and water-cooling is not able to cool the machine effectively. It is normally better not to use forced ventilation, unless strictly necessary, as this will make it difficult to maintain humidity.

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. In some types of incubator, keeping the eggs horizontal after day 18 increases the spacing between egg trays and so allows better air movement through the eggs resulting in a more uniform egg temperature

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