The benefits of using SPIDES for hatching egg storage

Hatchery managers are often required to store fertile eggs longer than is desired, which may occur for a variety of reasons that are usually out of their control.

Without alterations to the egg handling programme, this increase in an extended duration of storage will negatively impact hatchability and, also, chick quality.

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So, what can be done to help improve this situation of long-term egg storage and minimise the expected losses?

Traditional egg storage

Implementing traditional egg storage methods minimises the reduction in hatchability and chick quality that is common when storing hatching eggs.

Following appropriate storage practices and procedures will help slow down the deterioration rate of the egg components, including the embryo itself. As the duration and length of hatching egg storage increases, the conditions in which the eggs are stored should be continually reviewed and customised.

With extended storage duration, the first thing that should be done is to reduce the temperature in the hatchery egg storage room. Lowering the temperature of the egg storage room will help slow down the deterioration rate of the embryonic cells. This practice will also help slow down the physical deterioration rate of the yolk, albumen and the associated membranes. Table 1 shows typical recommendations for the hatchery egg storage room based on days of egg storage.

When storing hatching eggs, always base the egg storage room temperature on the oldest eggs that are being held. This is by far the easiest method and is typical of what most hatchery managers do if eggs need storage for more extended periods of time.

The general rule of thumb, when setting eggs that are stored longer than five days, is to add one hour of incubation time for each additional day of storage.

Another method to help reduce the deterioration effects of long-term storage is to turn eggs during storage. Turning allows the embryonic cells more contact with fresh albumen, which is vital to optimal embryonic health. This approach is particularly useful for the storage of eggs from older breeder flocks and for storage times longer than 14 days.

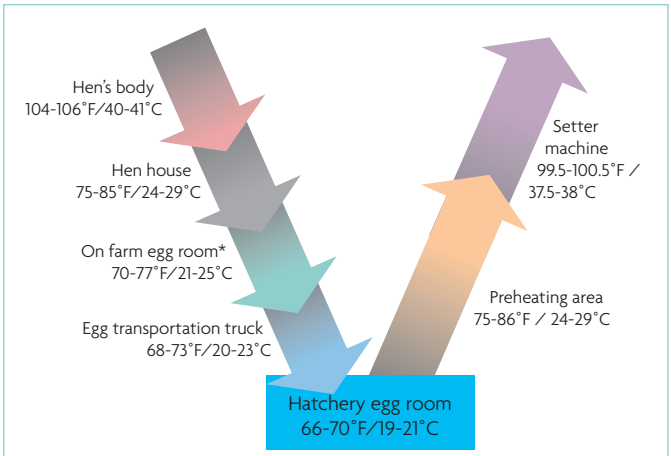
Hatchery managers that practice this technique will either turn the trays on the racks by hand or will have air hookups in the egg storage room to aid in turning of the racks.

If turning eggs in storage is implemented, it is best to turn the eggs at least three times per day (morning, mid-day, late afternoon). The additional turning of the eggs beyond three times daily is not necessary and usually not beneficial to embryo health.

Another thing often overlooked with egg handling practices is the temperature to which the eggs are exposed at every step in the process. Most operations have specific criteria or setpoints for the hen house, the farm egg packing room, the farm egg storage room, the egg transport vehicle, and finally, the egg storage room at the hatchery.

Table 1. Typical recommendations for the hatchery egg storage room based on days of egg storage.

Days	Temperature (°F)	Temperature (°C)	Humidity (%)
1-3	64-70	18-21	70-75
4-7	59-64	15-18	70-75
7-12	54-59	12-15	75-80
12+	54	12	75-80



*Lower temperature for eggs stored at the farm. Higher temperature for eggs transported to the hatchery daily. While the industry recommends storage temperature of 20°C, actual on-farm storage temperature can range from 15.6-23.9°C.

Fig. 1. Temperature for eggs stored at the farm.

Fig. 1 depicts the desired temperature at each stage of the egg handling process. In essence, the temperature at any point before the hatchery egg storage room should be cooler than the previous stage, with the hatchery egg storage room as the coolest point in this process. Once the eggs are ready to be put in the incubator, the temperature should only increase until they are set.

If there are temperature fluctuations in the egg handling process where specific points are warmer or cooler, then the eggs no longer follow the pattern in this V-shaped flow chart.

When temperature fluctuations occur, the embryo is weakened, which often results in higher early embryonic mortality.

It is strongly encouraged that when there is higher early embryonic mortality (higher than 3% of fertile eggs) the entire handling process should be reviewed.

Do not be overly concerned with the actual temperatures on the chart; the important point is that each stage is cooler than the previous stage until the eggs are in the hatchery egg room.

Depending on the physical location or region of the hatchery itself, this may be something that is revisited at the change of each season.

Egg sweating

A general rule of thumb is that egg sweating is not good and needs to be avoided. High humidity around cold eggs will cause condensation to form on the eggs. This moisture on the shell surface from 'sweating' creates an environment for the growth of bacteria. Additionally, moisture on the shell surface establishes a condition where bacteria can more easily enter into the egg and can also create a chilling effect on the embryo resulting in higher early embryonic mortality.

Why is there an accelerated rate of deterioration in hatchability and chick quality the longer eggs are stored? Fig. 2 shows that one reason hatchability and chick quality deteriorate is because the embryo cells are continually dying during egg storage.

Long-term egg storage

It is possible to help overcome or revitalise these cells through a process called SPIDES, which can be implemented to improve hatchability and chick quality of eggs stored long-term.

SPIDES stands for Short Periods of Incubation During Egg Storage. Although the principle has been around for many years, Aviagen tested and refined this programme to make it applicable in commercial conditions, and it has since been used by some in the industry for the past 8-10 years with excellent results.

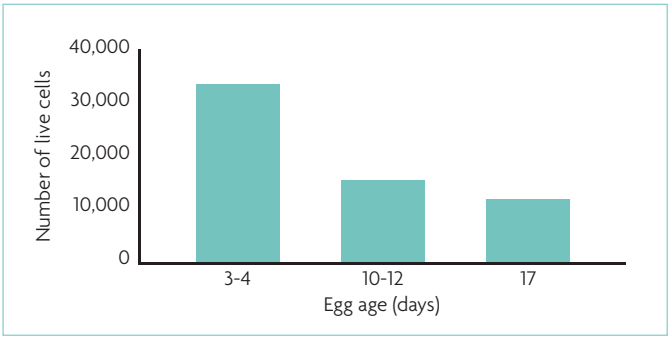
So why does SPIDES work so well? Here are some facts on why we see such improvements.

- As egg age increases, hatchability and chick quality decreases, this is partly due to the continued death of some of the embryo's cells.
- Studies show 60% or more of what would have been lost can be restored by performing SPIDES treatment.
- The longer hatching eggs are stored the potential hatchability improvement increases over eggs that were not SPIDES treated.
- As storage days increase, so does the destruction and death of embryonic cells.
- With storage times greater than 17 days, up to 70% of the embryo's cells that were present at the time they entered storage will have died.
- Applying SPIDES for eggs held during long-term storage helps overcome cell mortality.

SPIDES procedure

- Eggs are placed on incubator egg trays. These egg trays are inserted into incubator racks or farm racks.
- Eggs on plastic, or fibre flats on skids or in boxes, is not advisable.
- Eggs can be treated in single-stage (best), or multi-stage incubators. However, much caution must be used with multi-stage incubators that the heating capacity is not overloaded and that air flow in the machine is not disrupted.
- Eggs must be given enough time to reach a minimum of 90°F (32°C). Use temperature data loggers to monitor the shell temperature of these eggs.
- Give the first treatment after 5-6 days of egg storage. Additional treatments are to be given every 5-6 days thereafter.
- Once the eggshell temperature on all eggs has reached a minimum of 90°F (32°C), begin to cool the eggs as quickly and evenly as possible back to the temperature of the egg storage room.
- With single-stage machines, cool the eggs in the machine if possible. With multi-stage machines, remove the eggs and return them to the egg storage room. Keep in mind not to place them next to other eggs that are not SPIDES. Also, it is very important to space out the racks so the eggs can cool back down evenly and quickly.
- As a general guideline for using the Jamesway single-stage machine to perform SPIDES, adjust the temperature setpoint to 99.0°F (37.2°C). Once the machine attains the desired set point, hold the eggs at this temperature for 2-4 hours then begin the cooling process as quickly and evenly as possible.
- The use of multi-stage machines requires some guidelines and will vary greatly.
- Turning eggs is not necessary, and the humidity level is not as critical.

Fig. 2. Embryo cell number after egg storage (Dinah Nicholson, Aviagen).



Advantages and disadvantages of SPIDES

Advantages:

- Allows for long term egg storage with acceptable hatchability.
- Allows for long term egg storage with acceptable chick quality.
- Narrows the hatch window, so eggs can now be set from eggs stored for 4-14 days in the same machine with a much tighter hatch window.
- Lowers embryo mortality.
- Allows for large chick orders with a smaller number of breeders.

Disadvantages:

- Increases labour/staff-hours to handle eggs.
- Complicates the egg flow in the egg storage room.

Practical advice

- If holding eggs over 10 days: Perform one SPIDES treatment, The treatment is given between 5-6 days of egg storage.

- If holding eggs over 15 days: perform two SPIDES treatments:
  - The first treatment is given between 5-6 days of egg storage.
  - The second treatment is given between 10-12 days of egg storage.

- If holding eggs over 21 days: perform two or three SPIDES treatments:
  - The first treatment is given between 5-6 days of egg storage.
  - The second treatment is given between 10-12 days of egg storage.
  - The third treatment is given between 15-18 days of storage.

Conclusion

SPIDES is a great tool for hatchery managers to be able to hatch eggs that must be held long-term in storage and still achieve acceptable hatchability and chick quality.

For the best results, please take the time to test and develop a SPIDES programme that will work in each hatchery situation. ■