Best Practice
in the Hatchery

SPIDES

An Aviagen Brand

What is SPIDES?

SPIDES is an acronym for Short Periods of Incubation During Egg Storage. SPIDES-treated eggs are briefly heated between 35˚C and incubation temperature at 37.8˚C (95 and 100˚F, respectively), repeated weekly for as long as the eggs are stored. Treatment slows the reduction in hatchability and reverses the delay to chick emergence, commonly observed when eggs are stored too long. Correctly followed, SPIDES treatment recovers around 70% of the hatchability normally lost after 10 days of storage.

Why does hatchability drop during long periods of egg storage?

Eggs store well for up to a week after they are laid, but hatchability drops steadily after 8 days. Several factors contribute to the fall in hatchability.

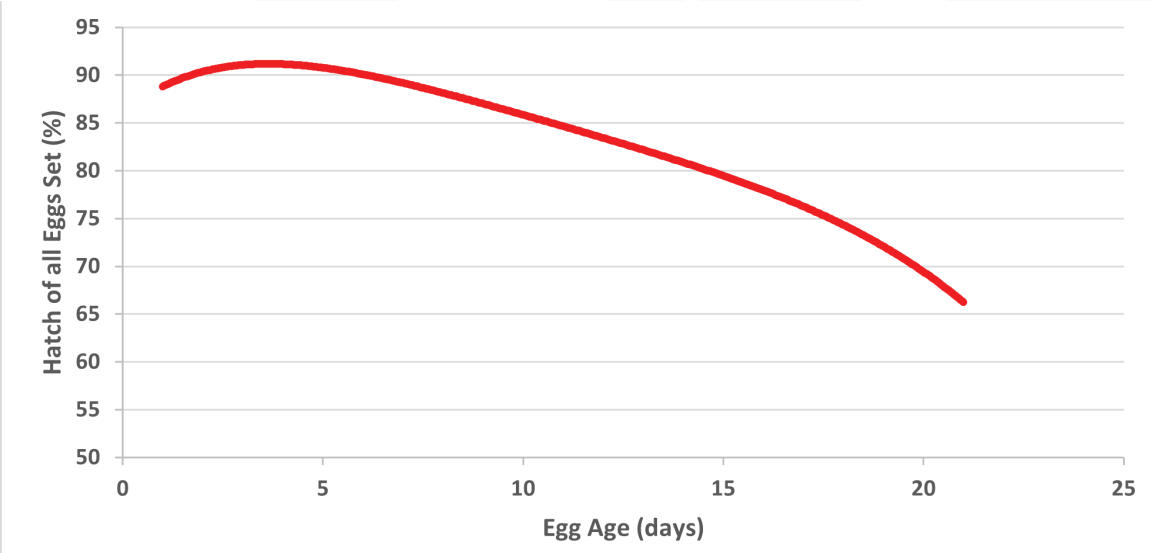
- Cells in the embryos start to die off, which is fatal to the dormant embryo.
- Albumen thins, so it no longer holds the embryo in the optimum position away from the shell membranes.
- Yolk membranes weaken, becoming more likely to break given any mechanical challenge.

SPIDES allows the embryo to restore cell numbers and repair the damage to egg membranes so that the egg continues providing an optimal embryonic development environment.

The rate of fall in hatchability can depend on the conditions in the egg store and can be faster if:

- The store temperature is > 15˚C (59˚F).
- The store environment fluctuates around physiological zero.

Hatchability loss in older stored eggs is due to an increase in early embryo mortality, plus an increase in late embryo mortality and live pips because stored eggs take longer to hatch. In addition, when the hatch is delayed, some chicks may not emerge in time to be counted, causing chick quality to suffer because the chicks are too immature when placed. When assessing the impact of SPIDES, it is important to consider all causes of hatchability loss, not just the hatch of fertile.



Hatchability falls as egg age increases.

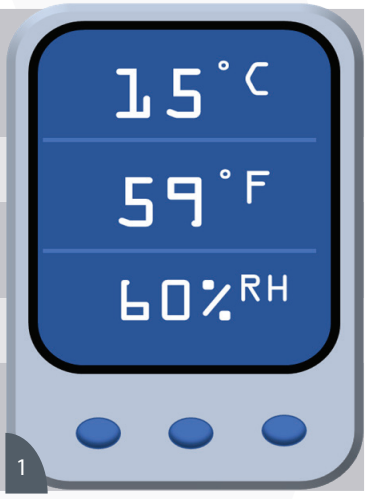
How can hatchability be improved in stored eggs?

While the best option is to plan hatchery utilization so that egg age is as low as possible, sometimes using older eggs is unavoidable. For example, suppose setting patterns are uneven due to varying order sizes or market conditions are slow and have driven down utilization. In that case, the hatchery may find keeping the egg age below 7 days impossible.

Standard practice in these situations is to reduce the egg store temperature to a maximum of 15˚C (59˚F) and hold the eggs in setter trollies for turning up to 4 times a day. Cooling slows the deterioration of the albumen, and turning prevents the embryo from sticking to the shell membranes. Turning and cooling affect different processes to prevent deterioration in hatch, so their effects are additive. SPIDES treatment allows the embryo to replace cells that died during the storage period, reverses damage to embryo development pathways and allows egg membranes to revive and repair themselves. As such, its effect can be in addition to that of cooling and turning.

On the Farm

1	Farm egg stores should be well insulated and equipped with cooling and heating to allow the eggs to cool to 15˚C (59˚F) within 4-5 hours and to hold that temperature steady. Do not use humidification except in very arid climates.
2	Keep the egg store doors closed unless moving eggs in or out of the store.
3	Disinfect eggshell surfaces using a disinfectant and process which does not damage the cuticle.
4	After collection, transfer the eggs to the farm store quickly and allow them to cool.
5	Hold eggs in setter trays that are spaced out to allow air to pass between the layers and cool the eggs. Stack trollies bottom up, so warm eggs are always placed above cooled ones to prevent cold eggs from reheating as heat dissipates and rises.



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The Hatchery Egg Store

1	Keep the egg store cooled and maintained at 15˚C (59˚F). Avoid humidifying if possible; the process can often be a source of contamination.
2	Organize the egg store so that all the eggs can be accessed and rotated for SPIDES treatment.
3	Do not return eggs to the store while still warm; use the treatment cabinet to cool them by running cooling and fans to bring temperatures below 24˚C (75˚F) before moving them back to the egg store.

SPIDES Treatment

It is possible to treat the eggs in a standard setter cabinet or use one of the specialized SPIDES cabinets offered by incubator manufacturers. Trials conducted in Aviagen hatcheries have shown beneficial results using most types of multi- and single-stage setters.

For treatment to be effective, observe the following criteria:

1	Place eggs on setter trays, held in either farm or setter trollies, with well-separated trays. Closely stacked plastic setter or egg trays are unsuitable because air cannot move between the layers to heat or cool the eggs. It is not possible to treat eggs held in stacked or boxed fiber trays.
2	Use temperature loggers to check the heating and cooling profiles of the eggs at different places in the machine.
3	Heat eggs to an eggshell temperature (EST) of at least 35˚C (95˚F) at all points in the machine; the more even the temperature, the more consistent the results.
4	Give the first treatment before hatchability starts to fall, ideally around 5-6 days after lay, but earlier is acceptable.
5	Treatments should ideally be repeated weekly throughout storage; if this is done, acceptable hatchability can be observed in eggs up to 28 days old.
6	Consistent and reasonably rapid cooling after treatment is essential. The impact of multiple SPIDES treatments on hatchability is maximized when the total number of hours the eggs are above 32˚C (89.6˚F) is between 4 and 12 hours. Cooling the eggs slowly may result in an unwanted increase in the number of hours at the effective temperature, causing a reduction in the hatch recovery compared to a better-managed system.


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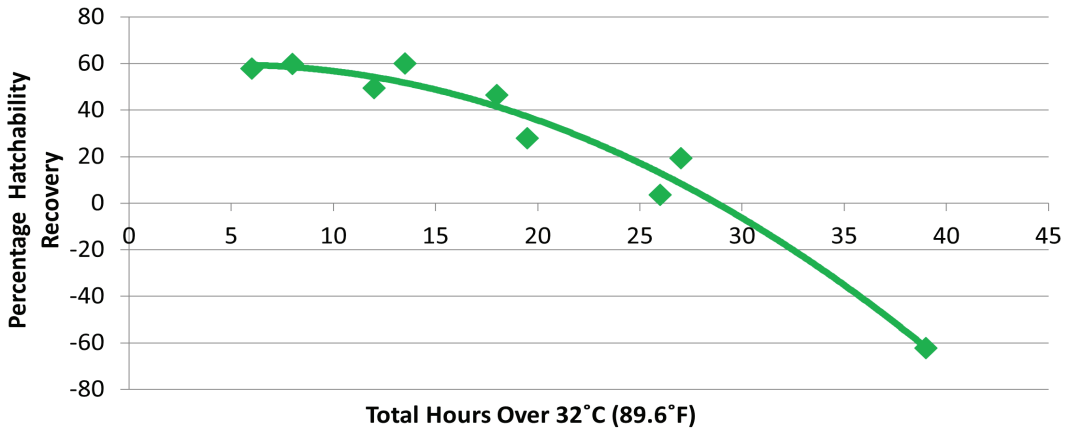
7	Do not allow the cumulative time above 32˚C (89.6˚F) to exceed 24 hours, as there may be no benefit to SPIDES treatment. Exceeding 24 cumulative hours can cause treated eggs to have a poorer hatchability than untreated eggs.
8	In standard single-stage setters, placing trays on alternate levels for SPIDES treatment is usually better. This arrangement allows for good airflow between trays and minimizes the time needed for a full heating and cooling cycle.
9	Longer-stored eggs usually need a longer incubation period to allow the embryos to recover from normal cell deaths in stored eggs. If the eggs have been SPIDES treated, adjusting set times for the older eggs is not required because the SPIDES treatment gives the embryos time to recover. If the eggs are given longer, the resulting chicks are held in the hatcher while the fresher eggs catch up, causing dehydration and depletion of residual yolk reserves.
10	Avoid SPIDES treating washed or soiled eggs; when eggs are cooled, there is a pressure drop across the shell, and bacteria are more likely to be drawn through the shell pores.



Treatment in Standard Setter Cabinets

Multi-Stage Setters

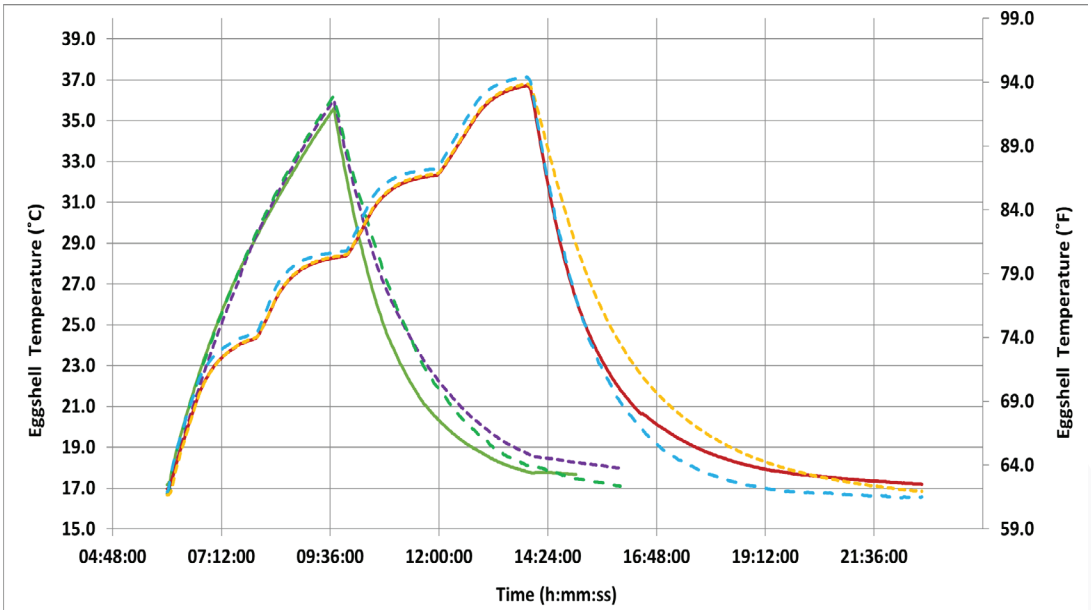
Multi-stage corridor setters work well for SPIDES treatment, whether fixed rack or trolley set. Their advantage is that the presence of eggs with late-stage embryos forms a useful heat bank and helps to maintain a constant temperature. The eggs heat to an acceptable eggshell temperature in around 4 hours.

Multi-stage machines without corridors need careful planning to ensure that using them for SPIDES treatment does not damage the early incubation of the youngest eggs (just set or due to be set), and it is crucial to check EST on these eggs during treatment and adjust timings if necessary.

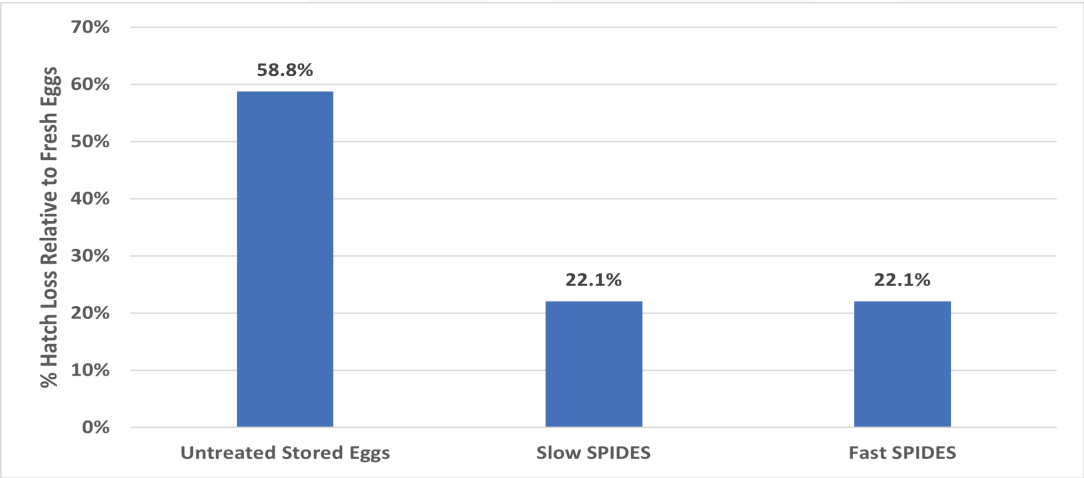
The main challenge with multi-stage machines is finding a suitable place to cool the eggs after treatment; they cannot be returned to the egg holding room at incubation temperature without causing partial warming to adjacent eggs, damaging their hatchability. The safest option is to enclose a part of the egg store, fit additional fans and keep treated eggs in the enclosure until their EST has fallen to 24˚C (75˚F) or lower.

Single-Stage Setters

Although single-stage setters take longer to bring a full load of eggs to temperature than corridor machines, this does not seem to be a problem. In a trial where the time to reach the treatment temperature was controlled to take 4 or 8 hours, the treated eggs had identical hatchability after 4 treatments and 22-25 days of storage.



Eggshell temperatures of eggs heated to incubation temperature in 4 hours compared to 8 hours.



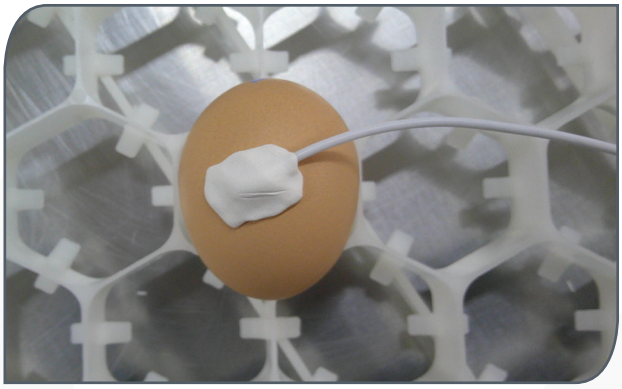
% Hatch loss in eggs stored for 24 days. SPIDES treated eggs recovered 63% of hatch loss due to long storage. The speed of heating made no difference in hatchability.

It is relatively easy to cool eggs in a single-stage setter by using the pre-heating program to bring eggs down to around 24˚C (75˚F).

Dedicated SPIDES Machines

Most commercial incubator companies sell dedicated SPIDES machines. These are modified setters, sold without the capacity to turn trays or humidify the cabinet. The heating capacity is substantially increased (often doubled), as well as the cooling and fan capacities. Ideally, the hatchery can run a complete SPIDES cycle in a dedicated machine in under 12 hours to maximize throughput.

Some machines allow the operator to measure EST automatically, and the measurement is used to control heating and cooling time. This makes it much easier to adjust timings for egg size and also to adjust for partial loads. Data loggers can be used to measure EST in models where automatic EST is not included. In the past, most data loggers could not be read without opening the machine doors. More recently, Bluetooth data logging devices are available that can connect to a smartphone and read in real-time. Progress of the SPIDES treatment can be checked by hatchery staff without disturbing the inside of the cabinet and adjusted as needed for each batch. Check with your hatchery specialist for data logger options available in your region.



What can go wrong?

The main risk of SPIDES is prolonged or multiple treatments where the cumulative heated time exceeds 12 hours above 32˚C (89.6˚F). If this happens, the hatch lift is less than it could be, and if the time above 32˚C (89.6˚F) exceeds 24 hours, then the effect can be negative. It is good practice to label trollies with dates and times of SPIDES treatments and to log the hours above 32˚C (89.6˚F).

When eggs cool down, the contents shrink, and any bacteria on the surface can be drawn into the egg through the open pores. For this reason, it is sensible to avoid multiple SPIDES treatments of washed or heavily soiled eggs because of the increased risk of bacterial contamination.

Avoid disinfecting eggs during a SPIDES treatment because of the risk of pulling disinfectant into the eggs as they cool, which might kill embryos.

SPIDES can restore the hatchability of stored eggs, but it can only work on fertile eggs. If the batch of eggs has a high rate of true infertility, then SPIDES will have relatively little effect because it only acts on the fertile eggs.

Notes

Notes

Every attempt has been made to ensure the accuracy and relevance of the information presented. However, Aviagen® accepts no liability for the consequences of using the information for the management of chickens.

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