

S.P.I.D.E.S. - Short Period of Incubation during Egg Storage

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Introduction

If hatching eggs are stored for more than a week before being set in an incubator their hatchability begins to drop. When they are stored for longer than 14 days, the hatch loss can be substantial, and is often hard to predict. Due to variable order patterns and sizes as well as seasonal fluctuations in demand is not always possible to set all eggs within 7 days of lay.

Where this problem is foreseen adjustments in storage practices can be made slightly reduced temperature and increased humidity, storage in boxes or plastic bags to reduce moisture loss, flushing with CO₂, storing the eggs pointed end up turning Eggs during storage. However these precautions will not prevent a reduction in hatchability but will only help slow down the deterioration.

Storage effects

Prolonged egg storage affects both the dormant embryo and the incubation chamber (egg) that contains it. With increased storage the internal quality of the egg deteriorates, this affects both the albumen quality and vitelline membrane integrity. Embryo metabolism is also depressed, and there will be increased embryonic cell death. This deterioration in quality within stored eggs results in a higher proportion of candled clears due to increased early embryo mortality.

Eggs will also take longer to hatch and there are typically an increased proportion of culled first day old chicks. There is evidence that strategically applied heat treatments during the storage period can advance the developmental stage of the embryo, taking it to a state better able to survive storage. It is thought that these brief periods of incubation induce the repair/regeneration of embryonic cells, and thus minimise the damage induced by long term storage. Research on this topic initially looked at treatments given on-farm (pre-storage incubation) aiming to advance embryonic developments before the eggs were cooled. This showed some benefits, but proved difficult to manage on a large scale practical basis. Application of heat treatments during egg storage (Ar and Meir 2002) raised the possibility of applying this technique on a larger scale in the holding area of a hatchery or in a storage depot. This technique of short periods of incubation during egg storage became known as S.P.I.D.E.S. Aviagen have been looking at the implementation of S.P.I.D.E.S. within their chicken hatching operation as a way of improving results within hatcheries where egg age is often over 7 days due to natural rhythms in egg production and chick order patterns. To date, the SPIDES technique has been found to give 2-3% better hatch in eggs stored for 7-14 days and higher benefits when eggs are stored for over two weeks.

Following these successful trials with chicken hatching eggs Aviagen Turkeys have been looking at the application of the technique to turkey eggs. Several trials have been completed at the Grantham hatchery. In one trial eggs were stored for 11 and 12 days under normal storage conditions. Half of these eggs were raised to 38°C for 6 hours on day 8 and then returned to normal storage until setting. Benefits were seen in hatchability in the group having the heat treatment over the control group.

	Brown N BA21	Grey BA 21	Benefits
Treatment	Control	1x 6hr treatment	
Egg Age	11-12 days	11-12 days	
Eggs set	462	465	
Live poults	380	391	
Hatch of set	82.30%	84.10%	+1.80%
Hatch of Fertiles	84.40%	86.50%	+2.10%
Cull	0	0	0
Live pipped	13	8	-5
Dead pipped	3	3	0
Clear	12	13	1
23-28 days	9	7	-2
16-22 days	7	11	4
10-15 days	6	2	-4
3-9 days	19	20	1
0-2 days	13	10	-3
Unhatched/Cull	82	74	-8

A second trial looked at the effect of turning in combination with a heat treatment. The results from this work are shown below and demonstrate a benefit from the treatment including turning.

Treatment	Control	1x12 hrs turned	Benefits over control	1x 12 hrs not turned	Benefits over control
Egg age	15-17 days	15-17 days		15-17 days	
Eggs set	1116	1116		1116	
Live poults	769	879		910	
Hatch of set	68.91%	78.76%	9.85%	81.54%	12.63%
Hatch of Fertiles	72.89%	83.32%	10.43%	85.45%	12.56%
Cull	1	3	2	3	2
Live pipped	45	35	-10	21	-24
Dead pipped	28	16	-12	20	-8
Clear	61	61	0	51	-10
23-28 days	20	16	-4	13	-7
16-22 days	31	24	-7	22	-9
10-15 days	24	21	-3	19	-5
3-9 days	63	27	-36	39	-24
0-2 days	68	30	-38	21	-44
Unhatched/Cull	3	0	-3	1	-2

There has been much less research performed on SPIDES in turkey eggs that have been stored long term. However it appears that the basic principles that were applied to SPIDES treatment of chicken eggs are applicable to the turkey. More work will continue on this topic.

Suggested guidelines

- A single SPIDES treatment is sufficient to improve hatch in eggs stored from 15-17 days, but needs to be given on or around 8-10 days.
- Hatch improvements can be greater if 2 or 3 treatments are given depending upon how long the eggs are stored.
- Typically no more than 7 days should be left between treatments.
- Where multiple treatments are applied there should be an equal amount of time left between treatments.
- SPIDES works in all incubator makes and types tested so far, so long as the heating times are adjusted as necessary.
- It is not helpful to pre-define a heat treatment in terms of time – as this will vary with egg numbers and incubator type. **What is important is that the eggs are warmed to just below incubation temperature and then cooled.**
- Greater hatch improvements are likely to be seen with eggs that have been stored for more prolonged periods and have lost a lot of hatchability – the higher the hatch loss, the greater the improvement.
- SPIDES treatments give a tighter hatch window – less hatch delay from SPIDES treated stored eggs.
- Infertile eggs will not be affected.
- It is possible to overdo the heat treatments and kill the embryos.
- Poults quality will generally be better after SPIDES treatment compared to untreated eggs.
- Setting too soon after heat treatment can have negative effects

Anyone wanting to evaluate this technique should contact Aviagen Turkeys Technical Staff to discuss local conditions prior to any trials being started. This information is supplied in good faith and Aviagen Turkeys will not accept responsibility for any losses based on this preliminary information.

Reference

Ar, A., and M. Meir. 2002. Principles of preservation of embryonic viability during pre-incubation egg storage. 11th European Poultry Conference Proceedings. Bremen. 1-14

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