The Incubator Company

S.P.I.D.E.S and Egg Storage – Managing your Eggs for Improved Hatch

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Jamesway Help

- Always remember we at Jamesway are here to help. We are a phone call or click away.

- For technical phone support from anywhere in the world and any time of day, please contact our Platinum Response Team.
  PRT +1 226 765 0210

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In these uncertain times….

- With COVID 19

Some of you are having issues selling chicks for a variety of reasons. Others can't hatch chicks fast enough to keep up with demand.

Both scenario's can have a negative impact on your hatchability.

We thought it was important to review basic egg storage practices and then get into a discussion on SPIDES.

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Can I use this Information?

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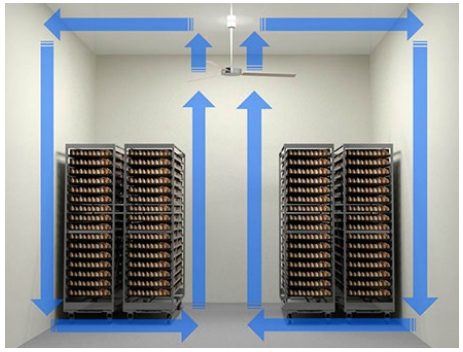
Hatching egg storage

Typical short-term storage



Single stage or Multi-stage

- Optimum Temperature, dry bulb 65 - 68 °F (18 - 20 °C).
- Relative Humidity 75 - 80%.
- Avoid direct blast of cooled air onto exposed eggs. The velocity of the re-circulating air should be kept to a minimum.
- If eggs are to be held longer than 7 days lower temperatures are recommended (58 - 60 °F minimum or 14 - 16 °C).

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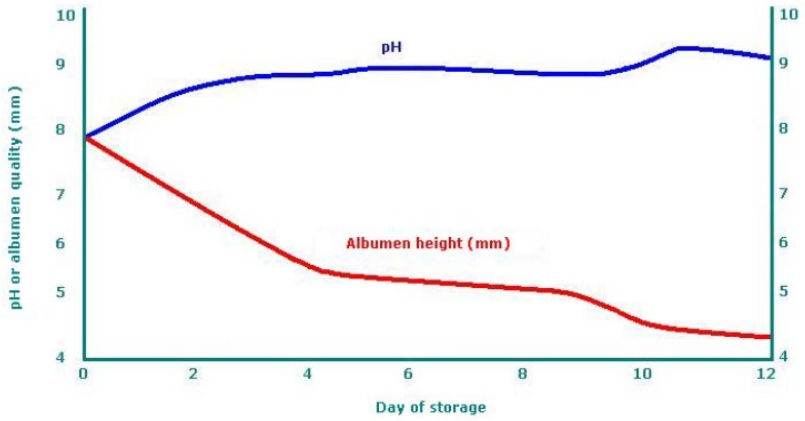
Optimal storage time

Optimal storage time is 2 to 3 days.

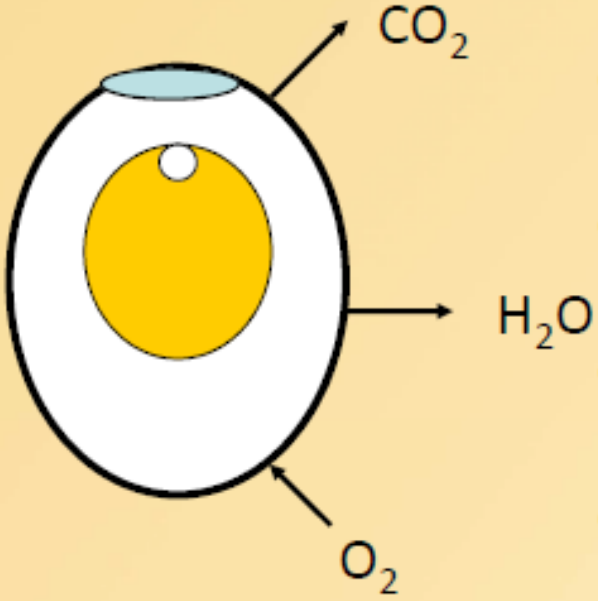
- Reason
  - Allows CO2 to release from the albumen of the egg which increases the pH of the Albumen from 7.6 to 8.8 - 9.3
  - This increase in pH is important and necessary because early embryo development is governed by enzymes that are dependent on this pH change.
  - Equally important this pH change is vital to the protection of the embryo from bacterial contamination.
  - The yolk pH stays relatively the same at 6.0 - 6.5 and this gradient from Albumen to Yolk is thought to optimize embryo development as well.



Adapted from Van de Ven L. (2003)

What happens inside the egg during storage ?

The micro-environment of the embryo



- Albumen pH increases from 7.6 to 9.0
- Albumen height reduces
- Yolk pH increases from 6.0 to 6.5
- Lower strength of yolk membrane
- Size of air cell increases
- Embryo remains in stable stage of development if stored below 24 °C

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Traditional methods to limit the effects of long-term storage

The following methods have been used when eggs were stored long term. Did not prevent a reduction in hatchability but only helped slow down the deterioration.

- Reducing egg storage room temperature
- Turning eggs during storage
- Storing egg pointed end up
- Storing eggs in boxes or skids – and shrink wrapped – to reduce moisture loss

Traditional storage temperatures

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 temperatures help by slow down the deterioration rate of embryonic cells.
- Slows down the physical deterioration of the albumen and yolk membranes.

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Turning during long-term storage

- Turning allows the developing embryo to be in contact with fresh albumen which is vital to optimal embryonic development.
- Useful for older flocks and storage over 14 days.

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Storage of egg small end up

- Yolk remains in contact with the albumen which keeps the embryo from adhering to shell membrane.
- Very labor intensive.
- Can be beneficial if holding longer than 14 days.

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Rule of thumb

- The general rule of thumb when setting eggs stored longer than 5 days is to add one hour of incubation time for each additional day of storage.

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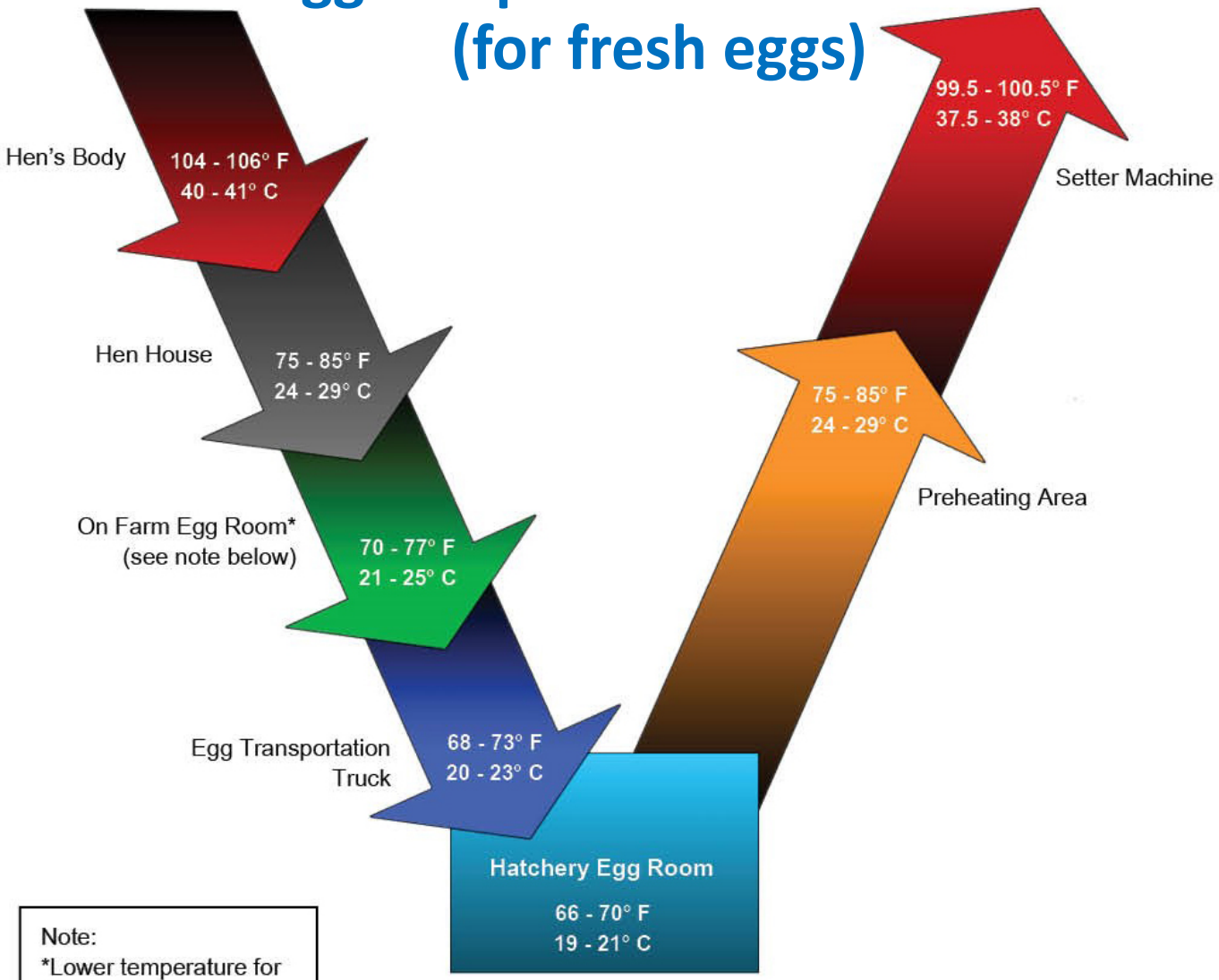
Egg Temperature Flow Chart (for fresh eggs)



Note:
*Lower temperature for eggs stored at the farm.

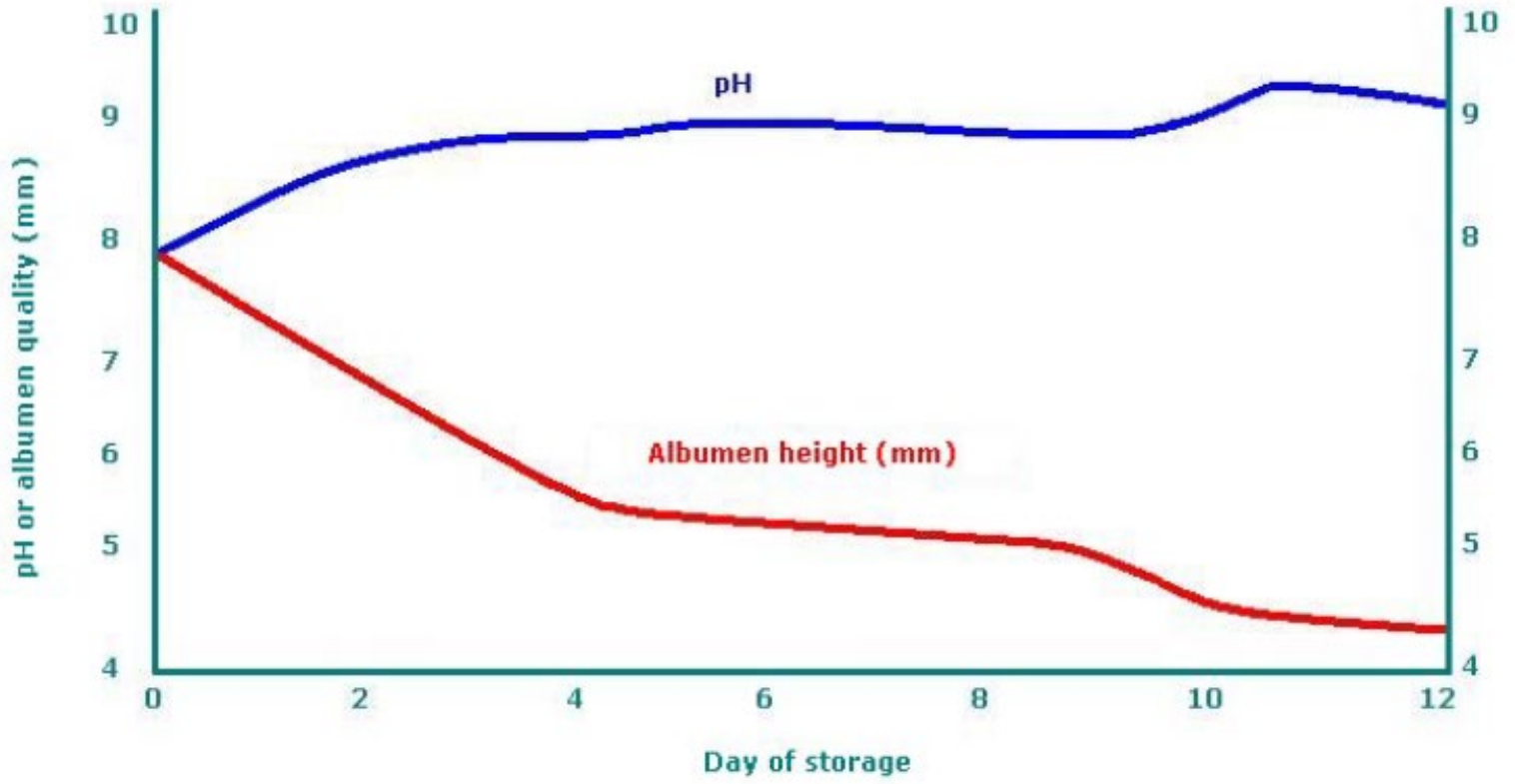
Higher temperature for eggs transported to the hatchery daily.

While the industry recommends storage temperature of 20° C, actual on-farm storage temperature can range from 15.6° C to 23.9° C

Egg sweating

- High RH around cold eggs will cause condensation on the eggs.
- Allows for bacterial contamination.
- Chilling effect on embryo = early embryo mortality.

Changes in the egg during storage



Adapted from Van de Ven L. (2003)

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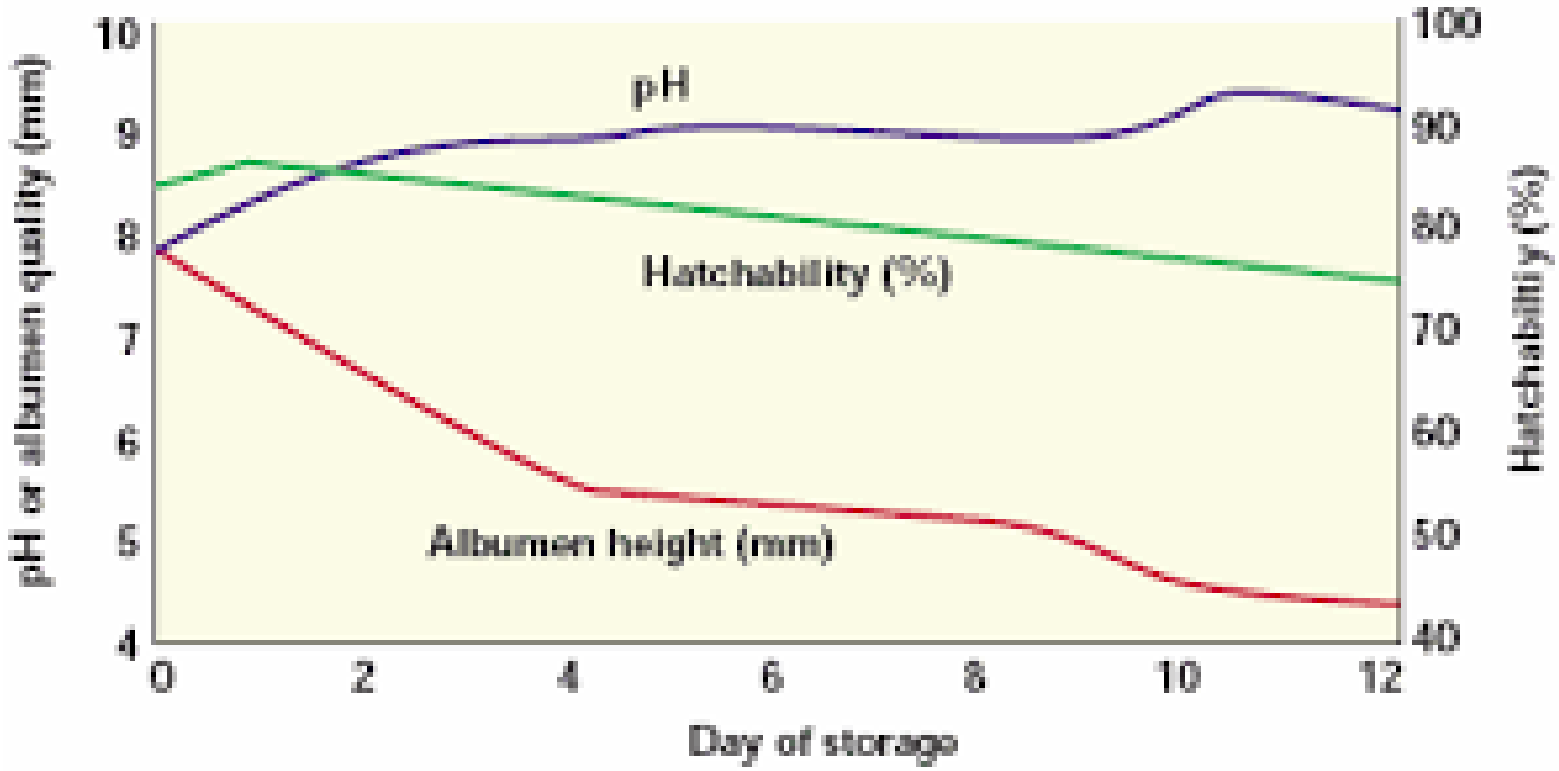
What's happening in the egg during long-term storage



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Following the advice of Mother Nature

- As the mother hens lays her clutch of eggs, she is performing SPIDES on the eggs that were laid before the egg she is about to lay.

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S.P.I.D.E.S?

- What does S.P.I.D.E.S stand for?
- **S**hort **P**eriods of **I**ncubation **D**uring **E**gg **S**torage.

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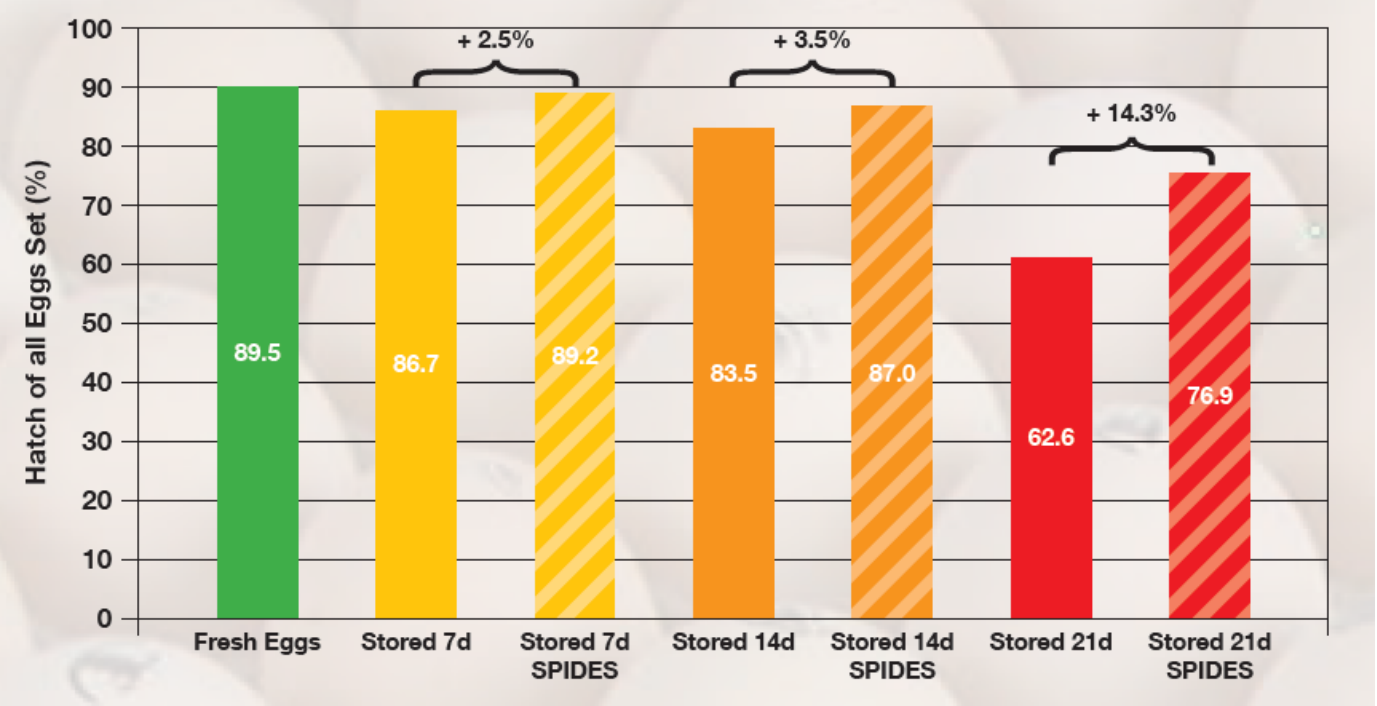
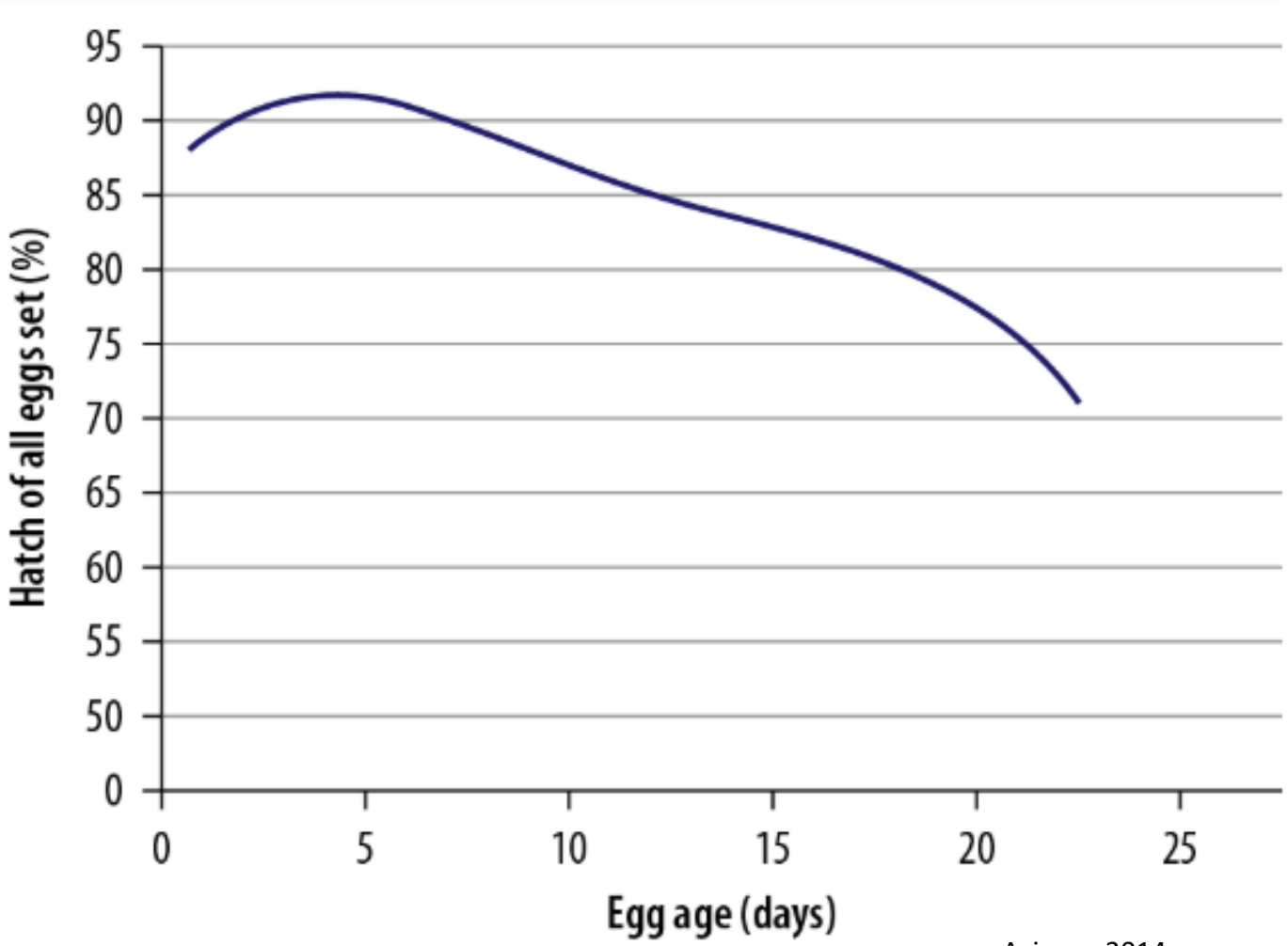
Why SPIDES

- Hatchability decreases as egg age increases.
- Studies show that you can gain back 60% or more of what would have been lost if SPIDES was not performed.
- The longer eggs are stored the potential gain increases.



Decrease in hatchability with long-term storage



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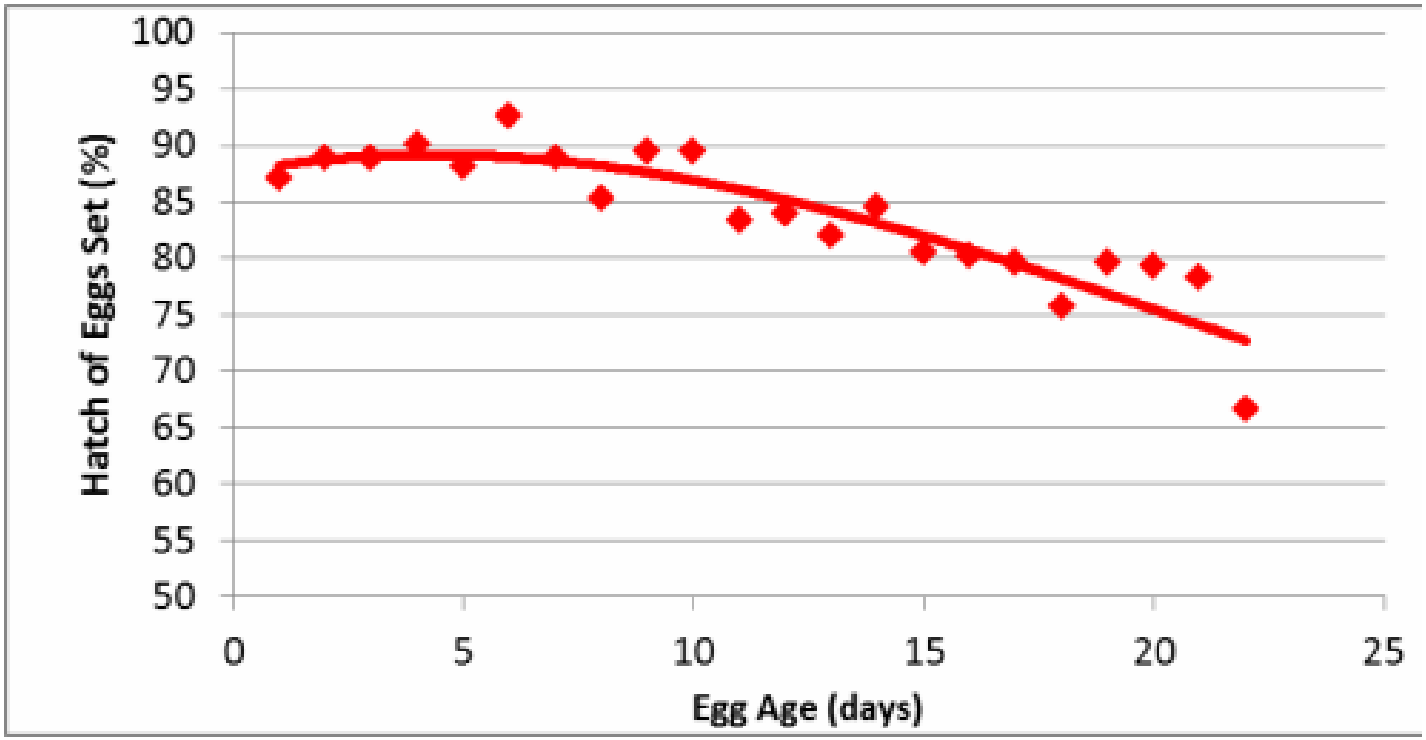
Decrease in hatchability with long-term storage



Lohmann 2013

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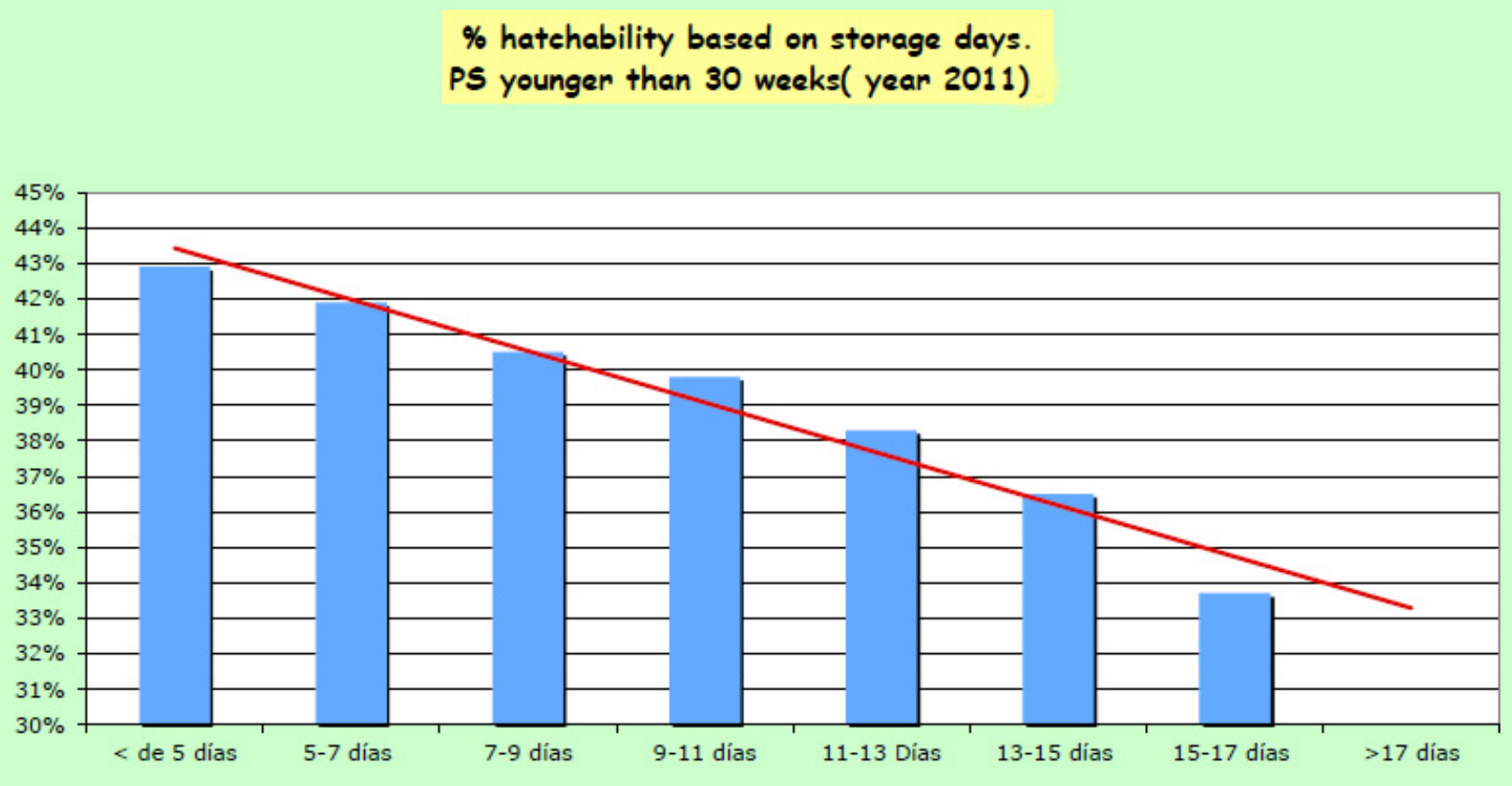

H&N 2017

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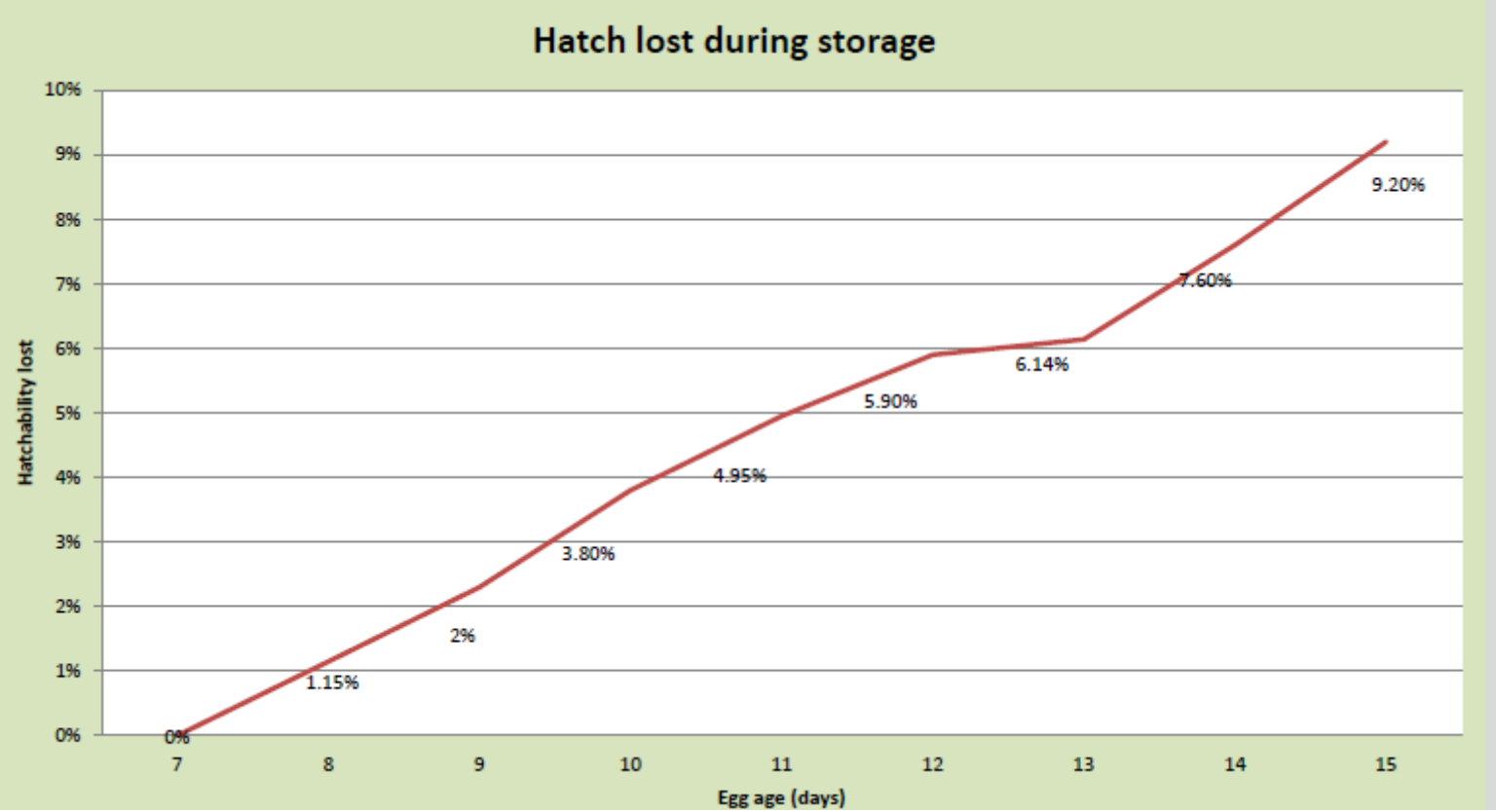
Hatch loss during storage



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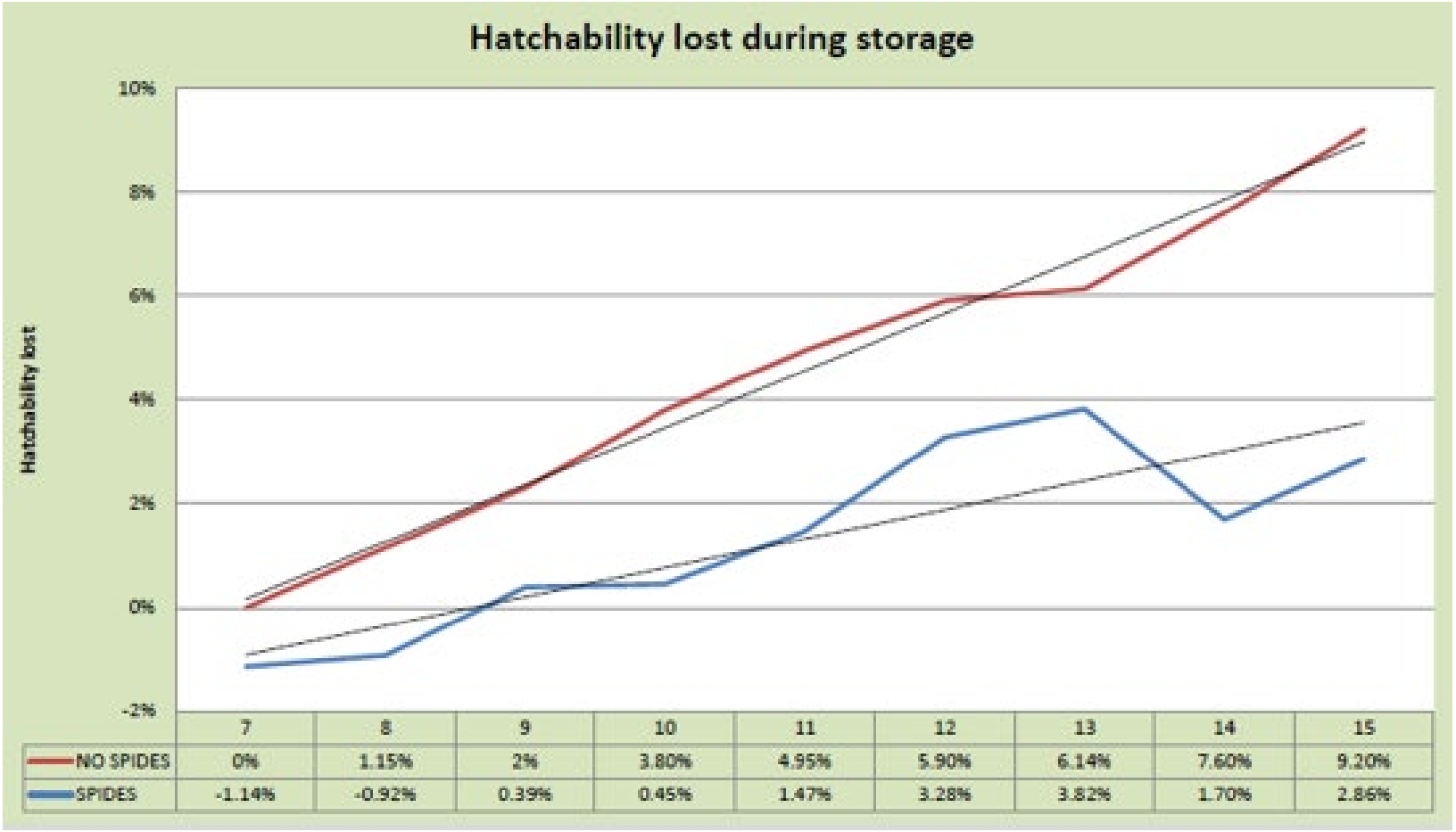
Hatch loss during storage – SPIDES and No SPIDES



	7	8	9	10	11	12	13	14	15
NO SPIDES	0%	1.15%	2%	3.80%	4.95%	5.90%	6.14%	7.60%	9.20%
SPIDES	-1.14%	-0.92%	0.39%	0.45%	1.47%	3.28%	3.82%	1.70%	2.86%

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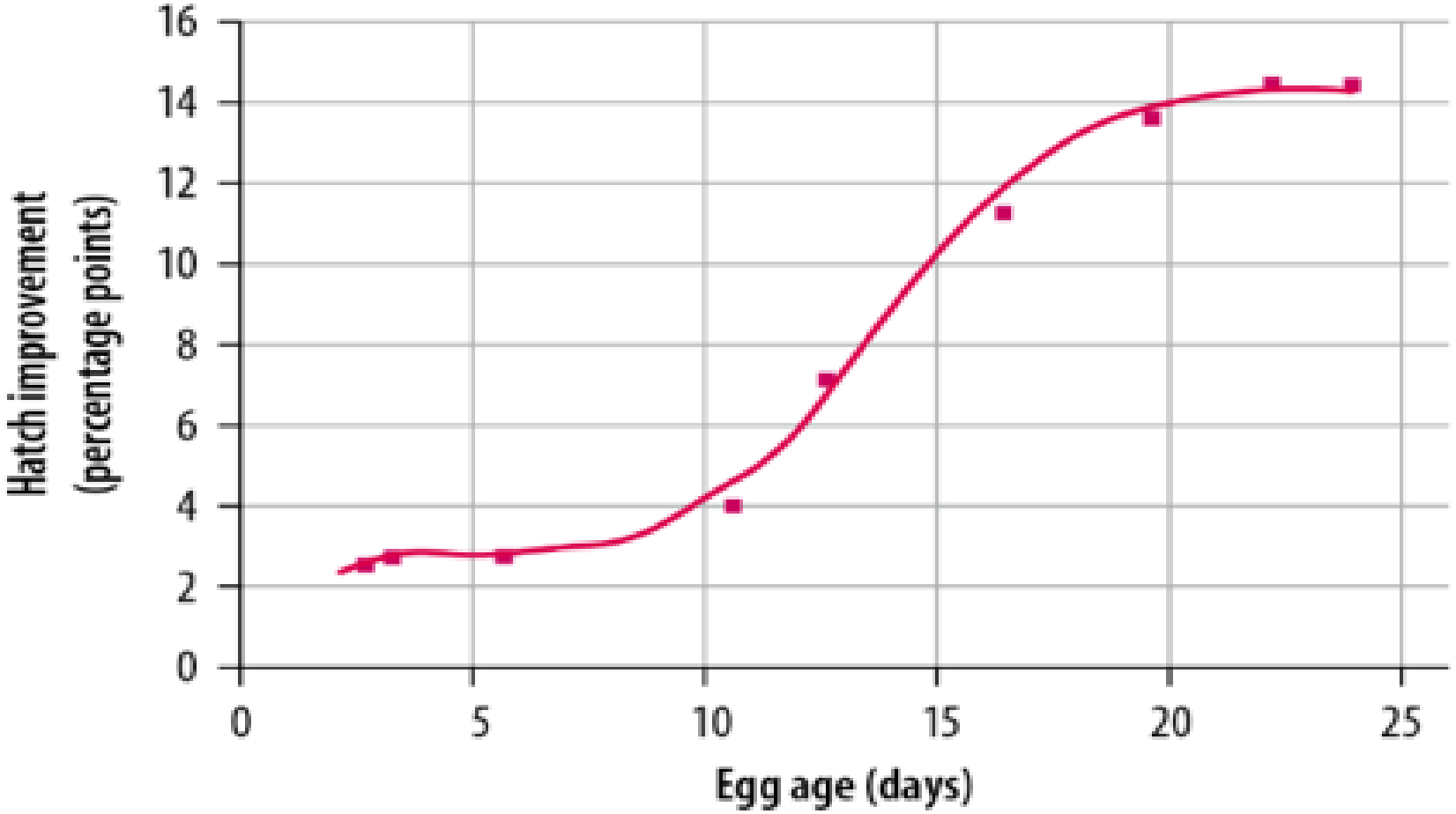
Hatchability improvements following SPIDES



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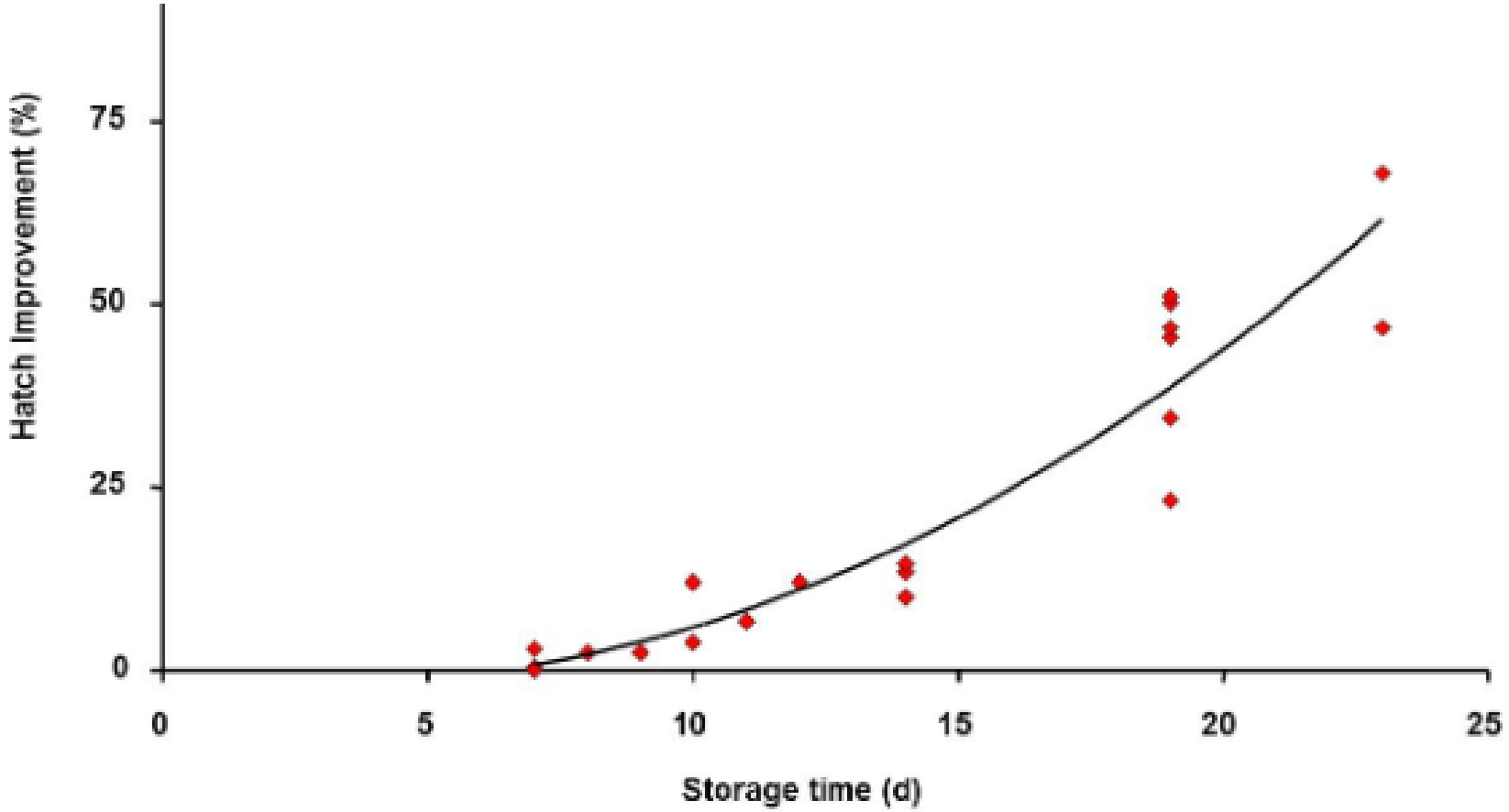

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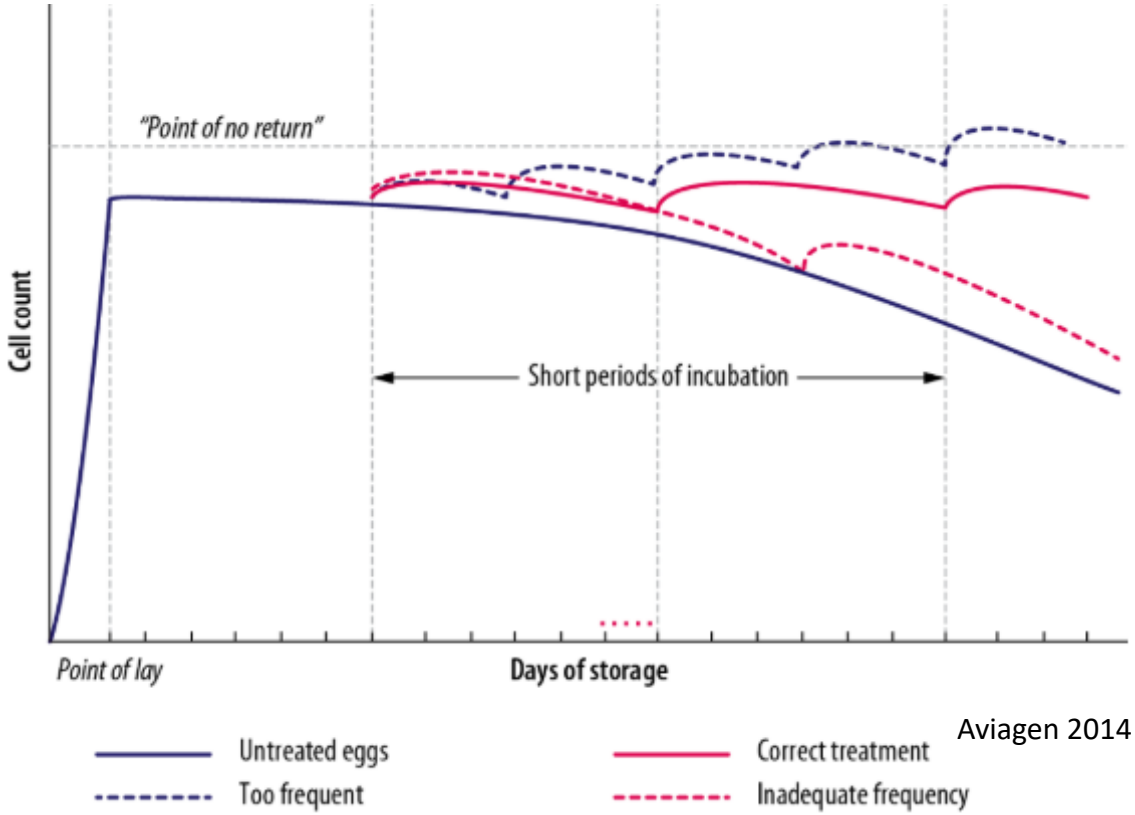
Why are we seeing these improvements with SPIDES?

- There is evidence that SPIDES rescues cells from dying while being held in storage.



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From fertilization to oviposition

Fertilization

First cellular divisions

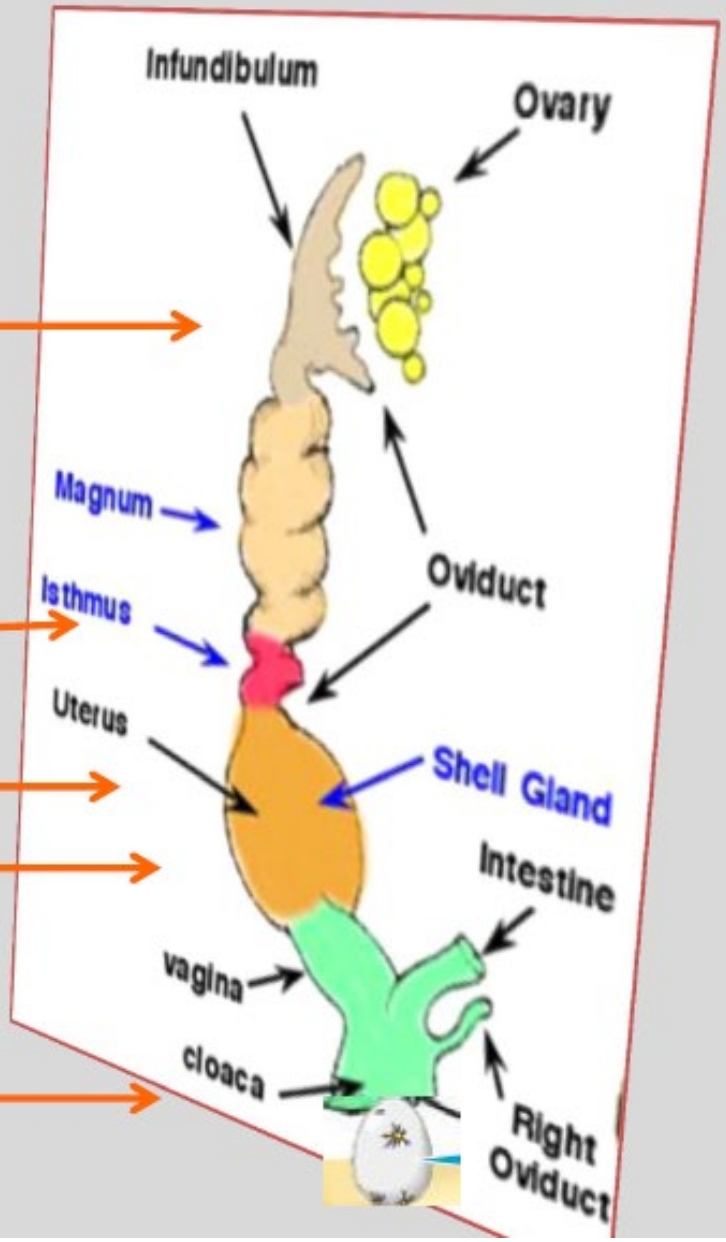
mórula phase (16 cells, or blastómeros)

First blastula

Secondary Blástula

Pre-gástrula phase

30.000-50.000 cells



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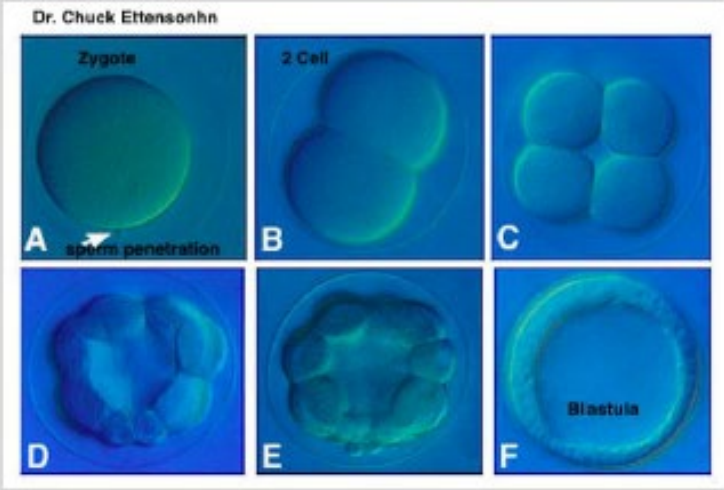
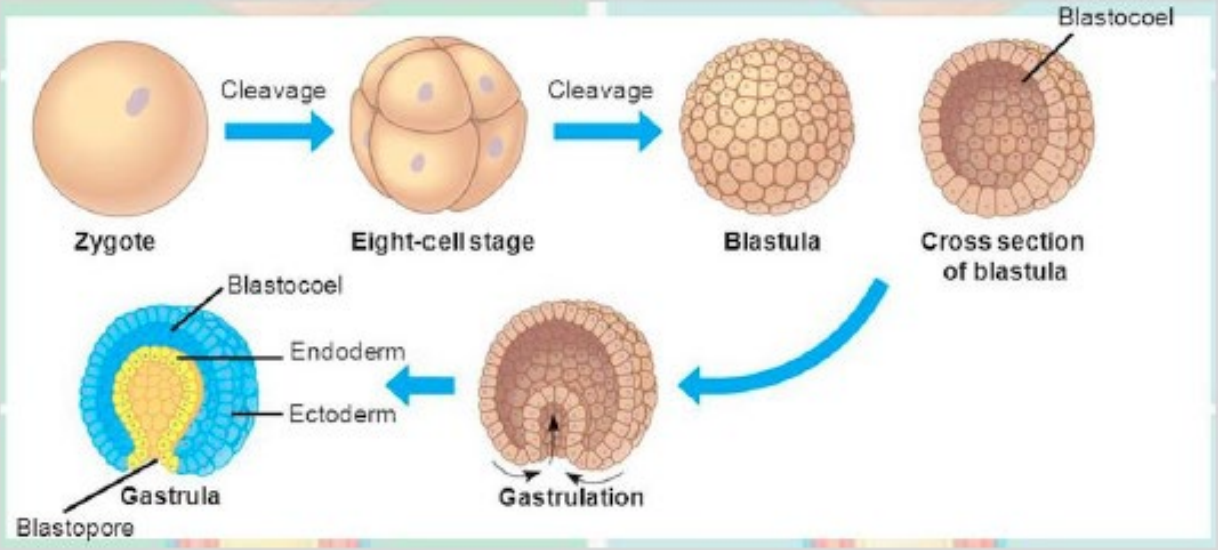
Embryo development

The embryo, at the time it's laid, reaches the pre-gastrula phase, having around 30.000/ 50.000 cells



Huevo fértil



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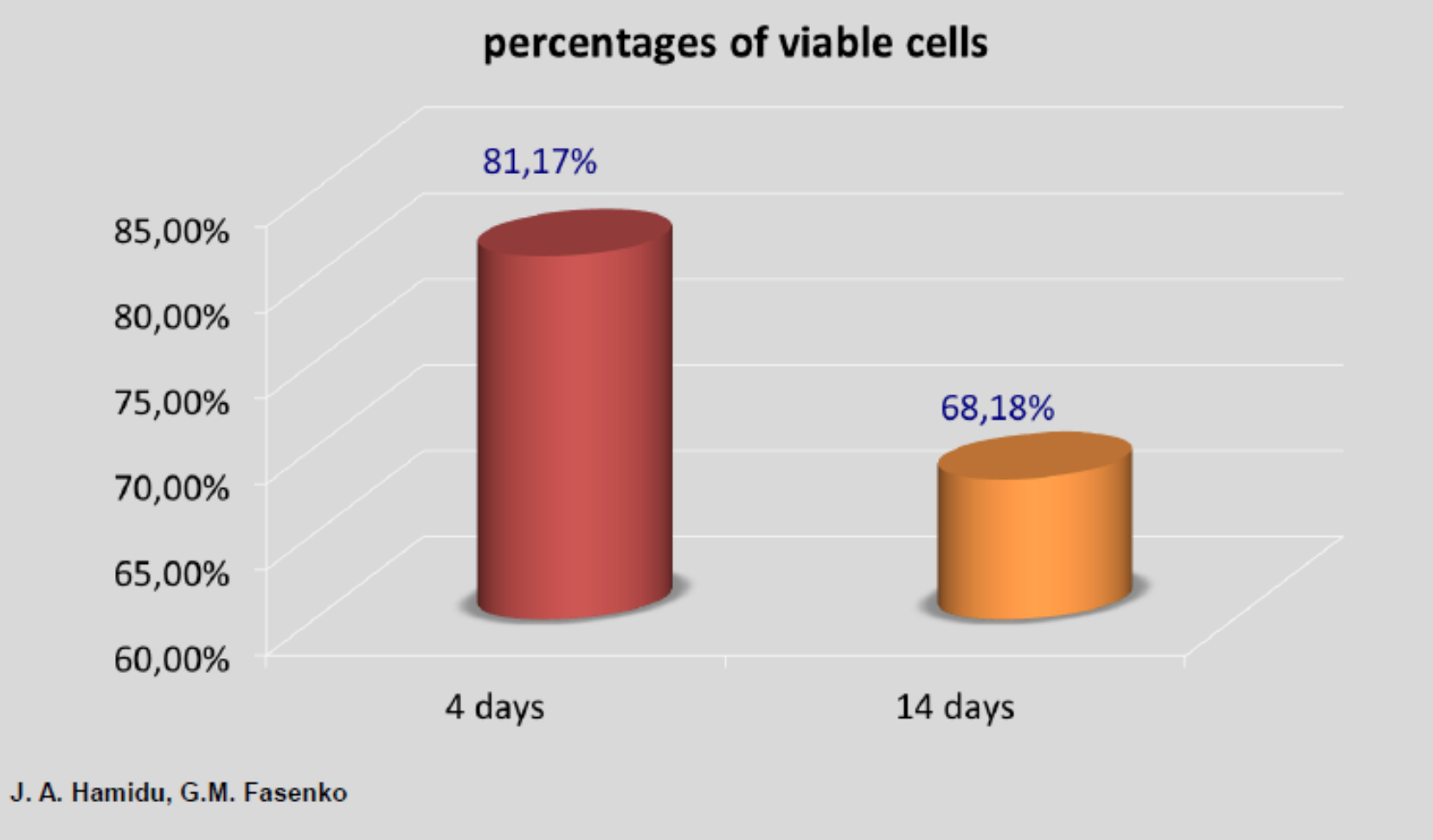
Embryonic cell mortality in relation to storage period



J. A. Hamidu, G.M. Fasenko

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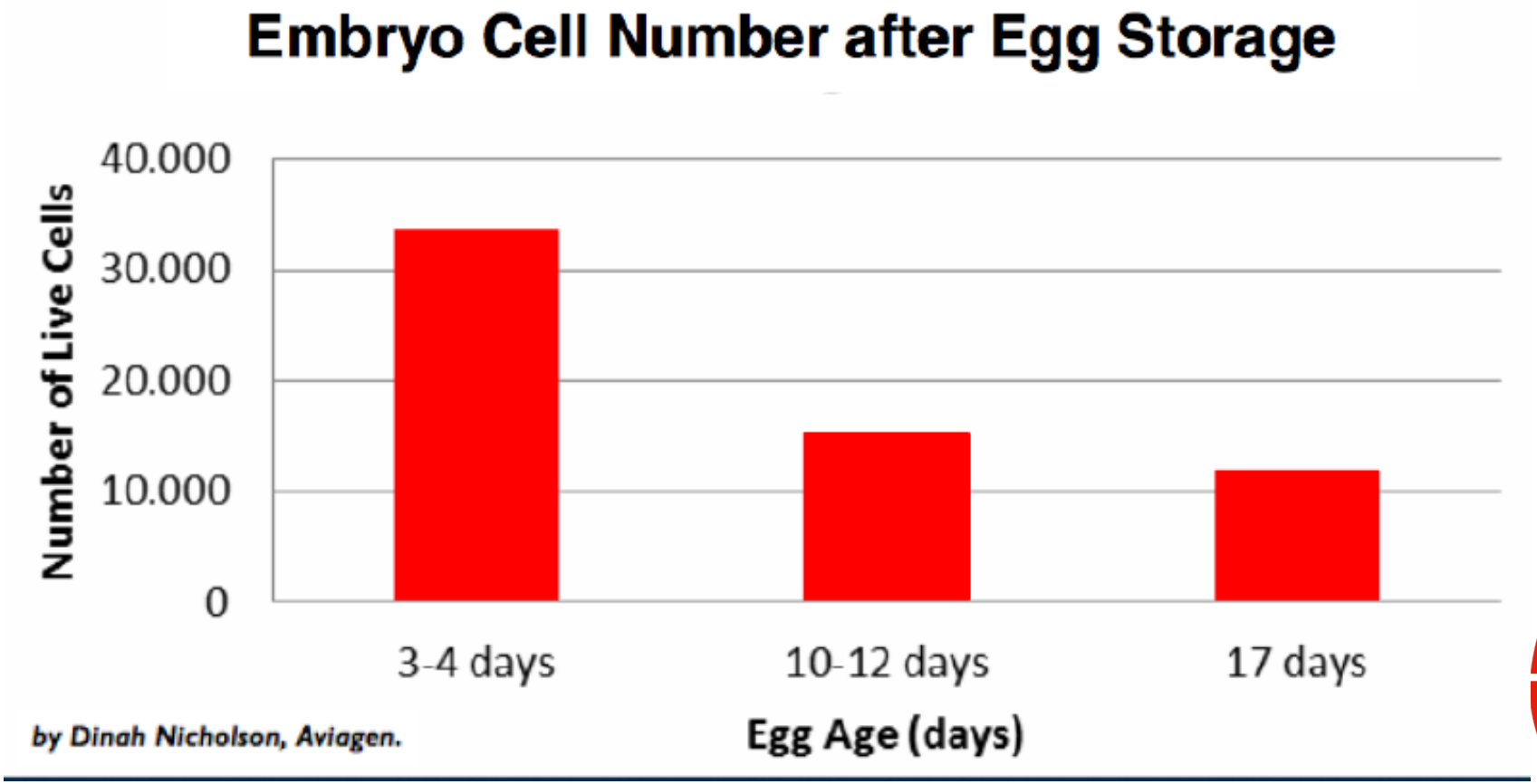

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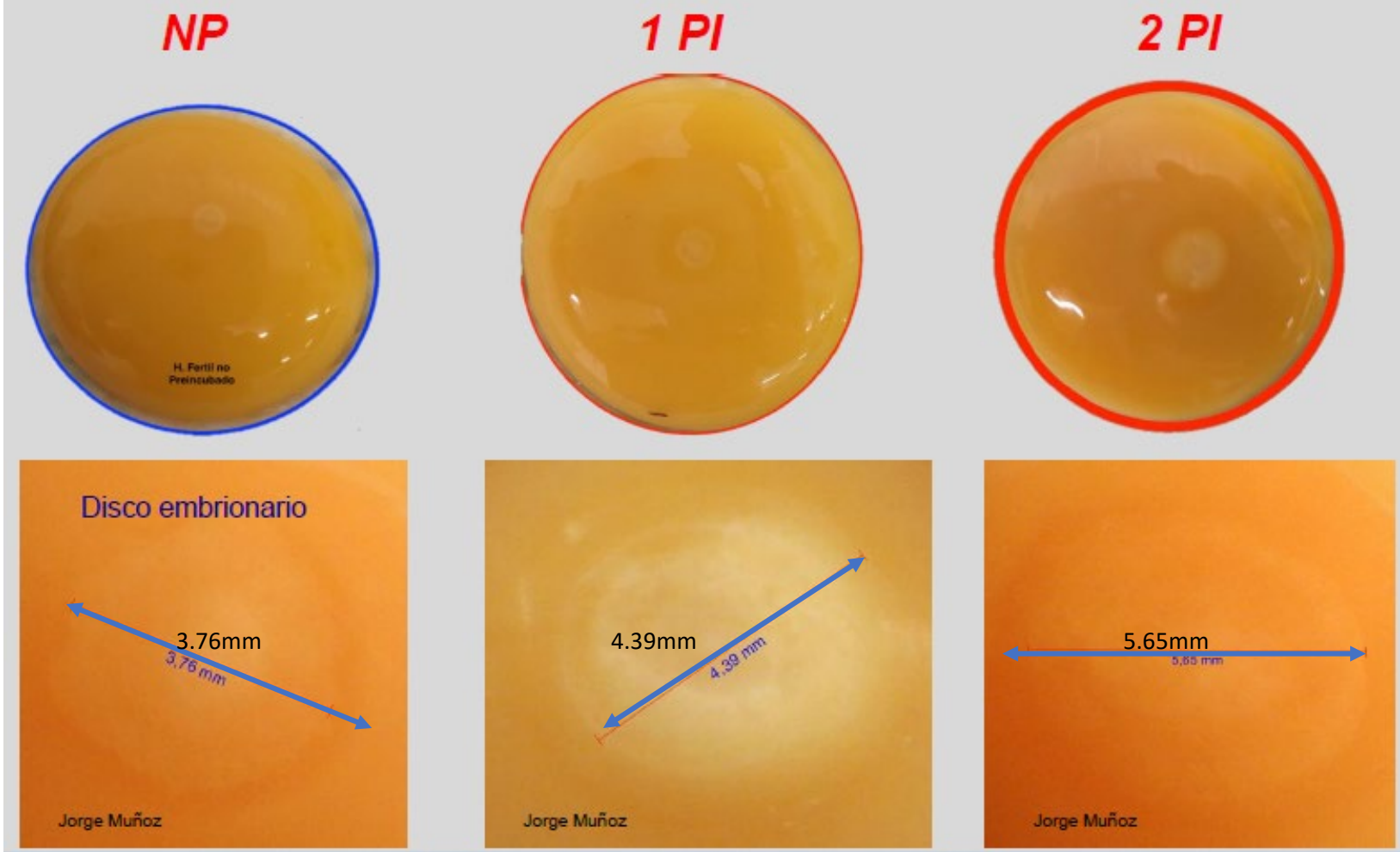
Comparation of preincubated and non-preincubated eggs (3,5 h. at 100 ºF)



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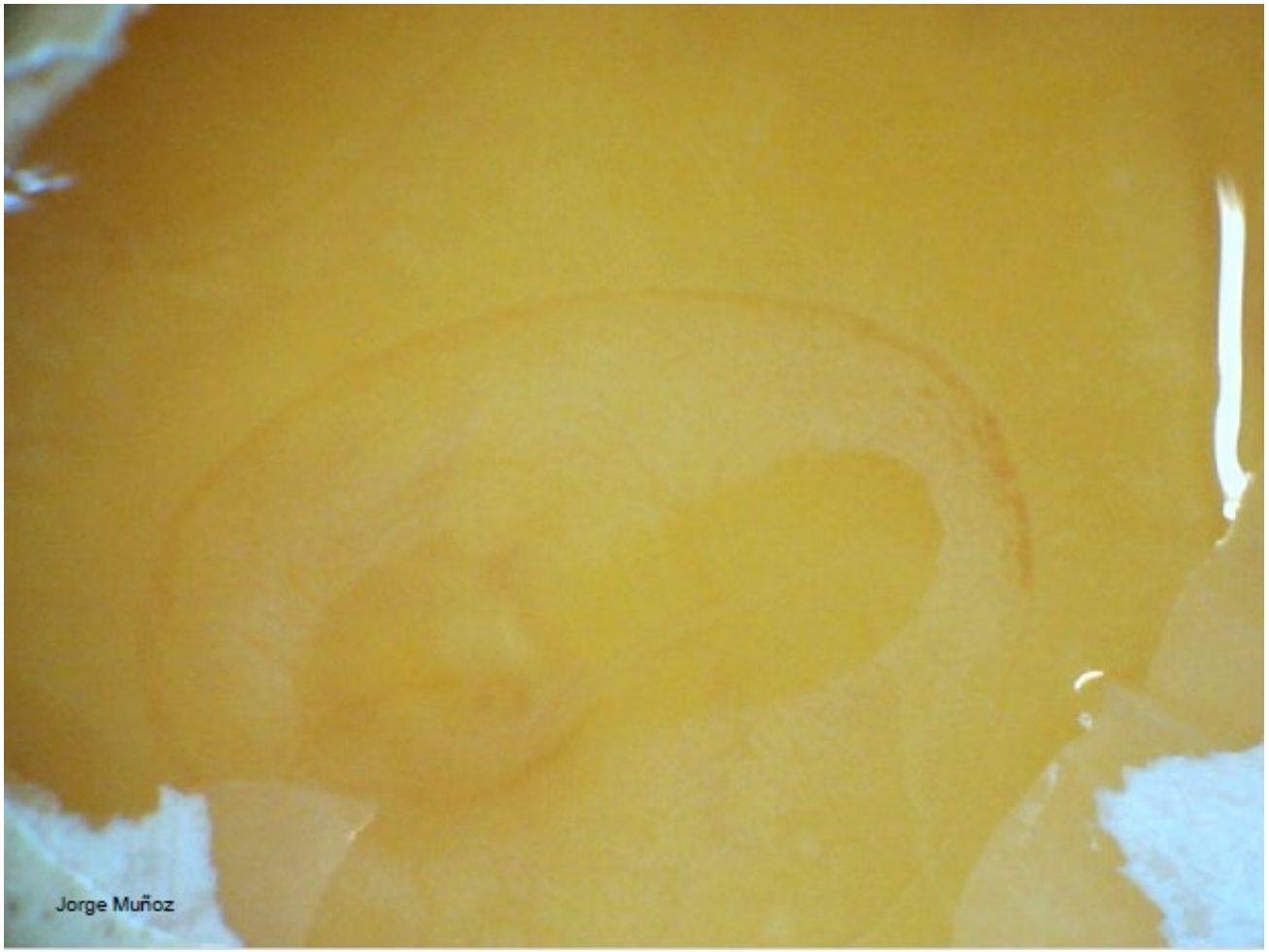
Eggs stored 14 Days
No SPIDES treatment
52 hours of Incubation



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Eggs stored 14 Days
1 SPIDES treatment
52 hours of Incubation

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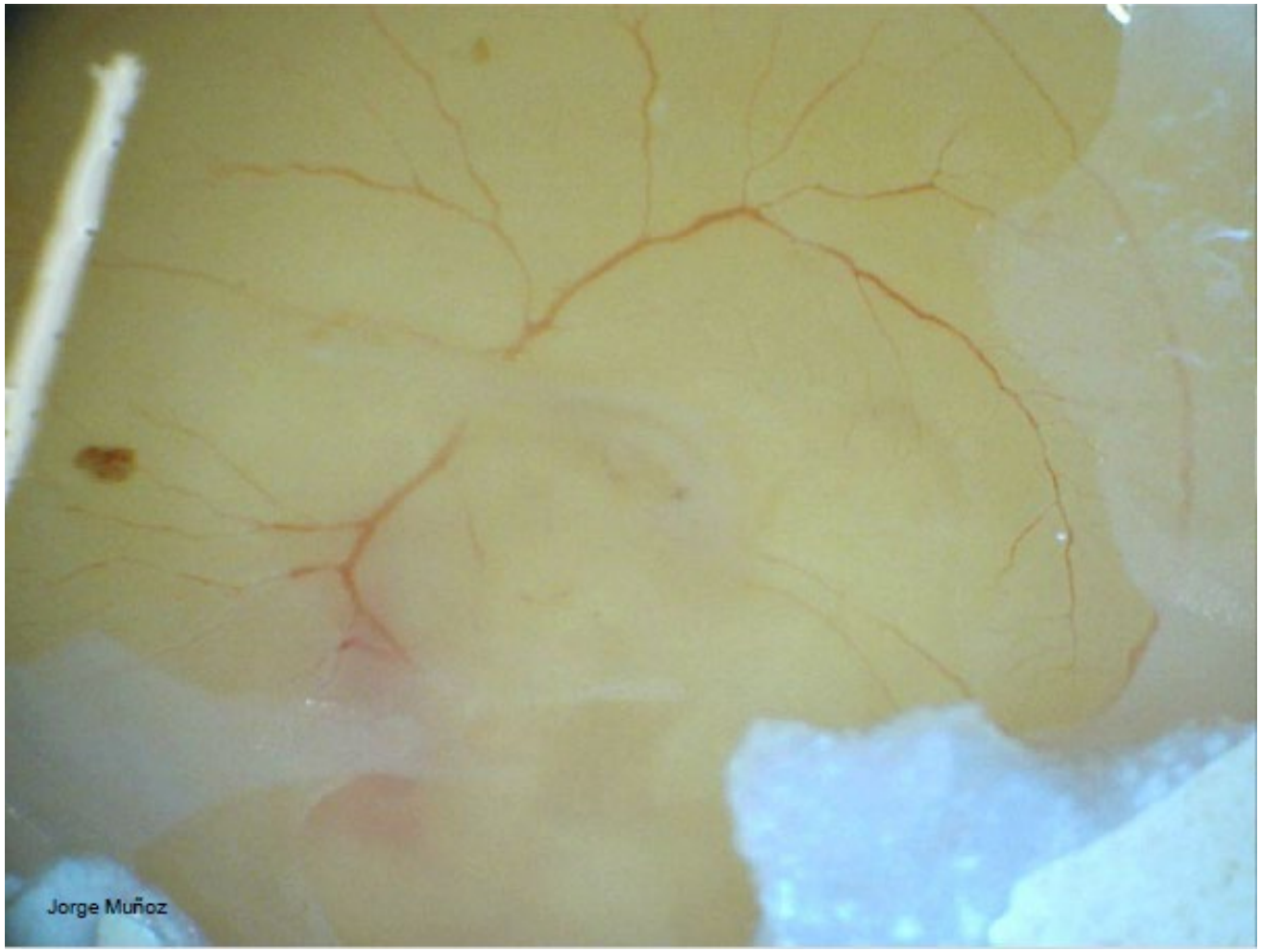
Eggs stored 14 Days
2 SPIDES treatment
52 hours of Incubation



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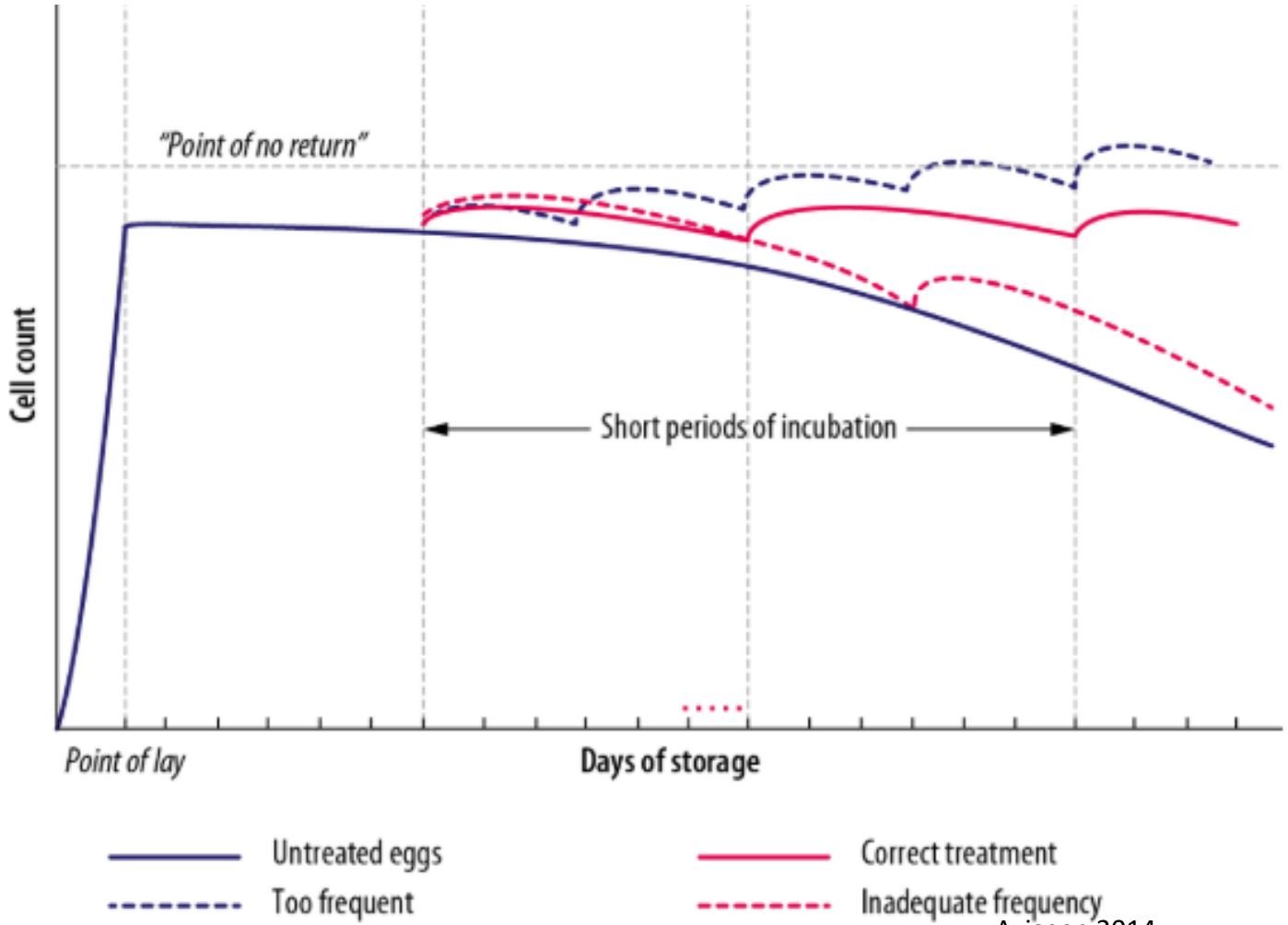
Effects on frequency of SPIDES to cell counts



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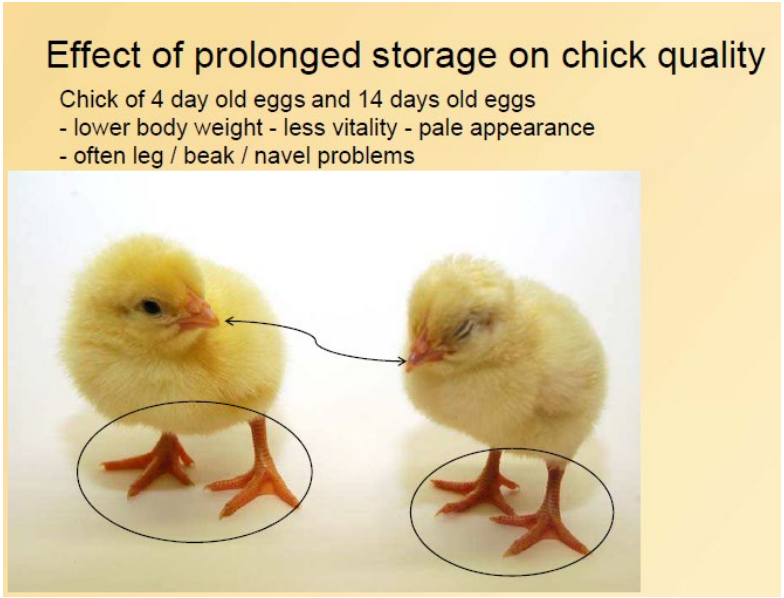
Advantages and Disadvantages of SPIDES

Advantages

- Allows for long term storage with acceptable hatchability
- Allows for long term storage with quality chicks
- Narrows your hatch window
- Lower embryo mortality
- Allows for large orders with a smaller amount of breeders

Disadvantages

- Increased labor/man hours to handle eggs
- Complicates the egg flow in egg storage room



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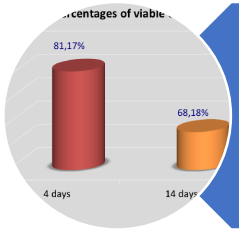
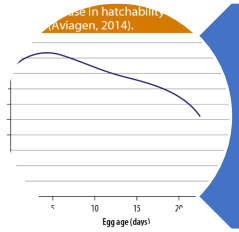
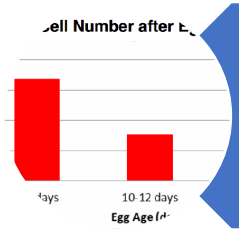
SPIDES Summary



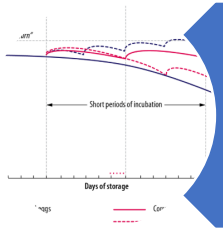
As storage days increase so does the destruction of embryonic cells



Hatchability decrease as storage time increase – due to the destruction of cells



With storage times over 17 days 70% of the embryo's cell have died



Applying SPIDES for eggs held during long term storage helps overcome the cell mortality

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Practical advice

Hatching Eggs over 10 days

One SPIDES treatment

- Treatment given between 5-6 days of egg storage

Hatching Eggs over 15 days

Two SPIDES treatments

- First Treatment given between 5-6 days of egg storage
- Second Treatment given between 10-12 days of storage

Hatching Eggs over 21 days

Two or Three SPIDES treatments

- First Treatment given between 5-6 days of egg storage
- Second Treatment given between 10-12 days of storage
- Third treatment ,if given, between 15-18 days of storage

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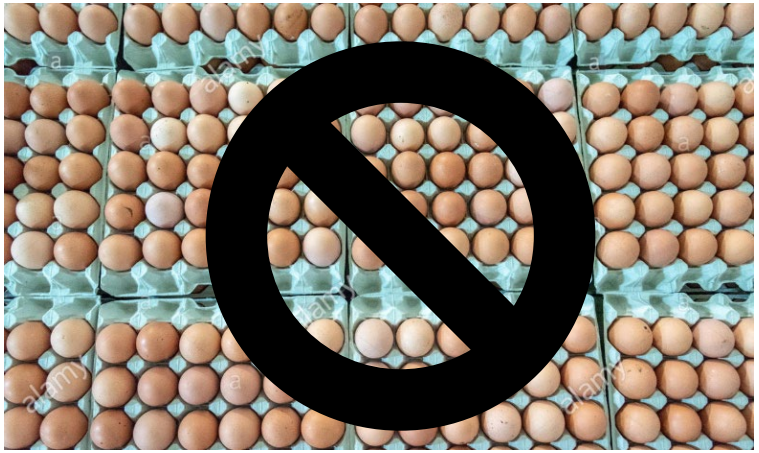
Procedure

1. Eggs placed on setter egg trays. These egg trays placed on setter racks or farm racks.

2. Eggs on plastics or fiber flats on skids is not advisable.



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Procedure

3. Eggs can be treated in SS (Best), or MS incubators Caution when using MS that you do not overload heating capacity or disrupt air flow.

4. Eggs must be given enough time to reach a minimum of 90 °F (32 °C). Use our Pilot eggs or data loggers to measure shell temperature.

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Procedure

5. Give first treatment 5 - 6 days of egg age. Additional treatments, every 5 - 6 days there after.
6. Once eggshell has reached 90 °F (32 °C) begin to cool the eggs as quickly and evenly as possible to egg storage temperature.
7. With SS, cool in the machine, if possible. With MS remove eggs and place in egg storage room. Keep in mind not to place them next to other eggs that are not SPIDES. Also, **VERY IMPORTANT** space out the racks so eggs can cool evenly and quickly.

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General guidelines

- Every hatchery may vary slightly from these recommendations these are given as a guide please check your eggshell temps to develop your own SPIDES program.

- SS Temperature set point = 99.0 °F (37.2 °C)
  - Once at set point hold for 2 - 4 hours
  - Then begin the cooling process as quickly and evenly as possible

- MS machines will vary greatly.

- Turning is not necessary, Humidity not really a concern.

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