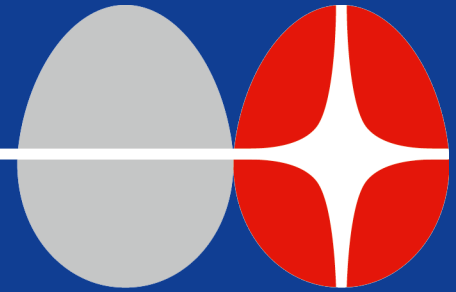


# JAMESWAY



The Incubator Company

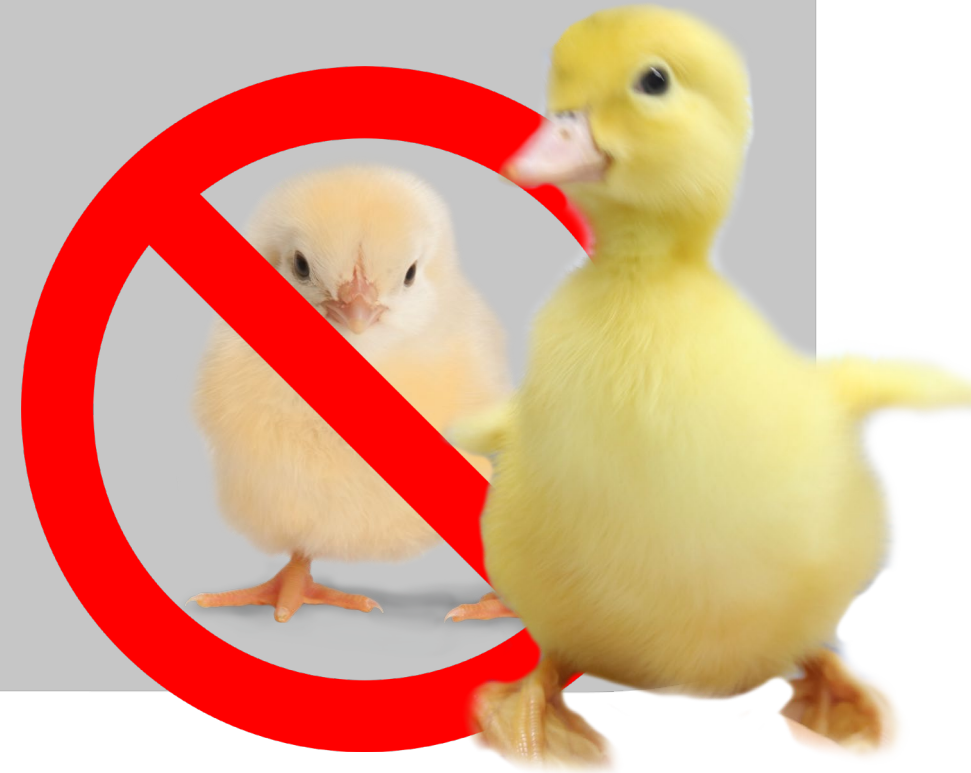
# About the Duck

**Henry Kohl**

Hatchery Consultant

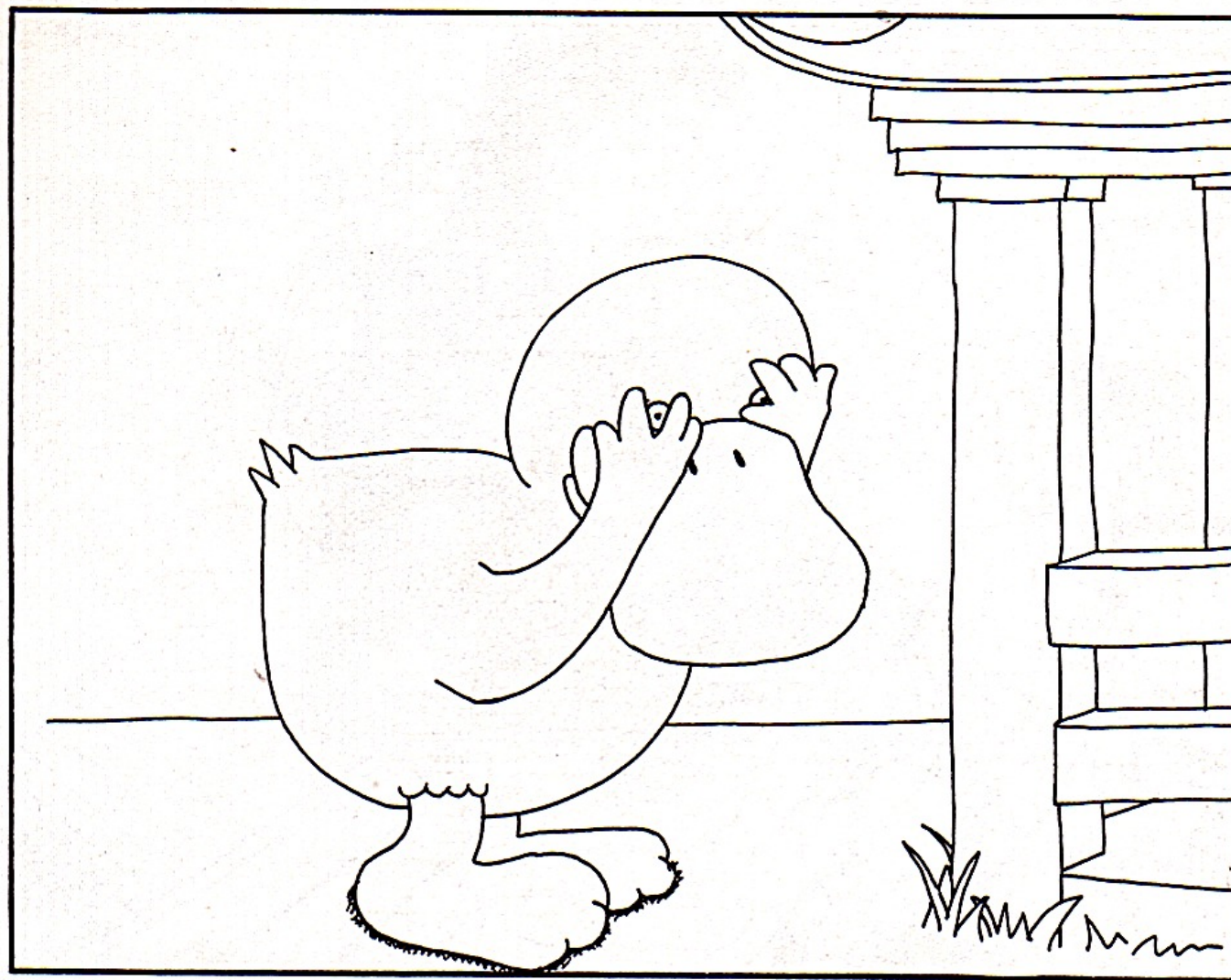
[henry.kohl@Jamesway.com](mailto:henry.kohl@Jamesway.com)

Cell- 574-518-1426





A DUCK IS NOT A WATERPROOF CHICKEN

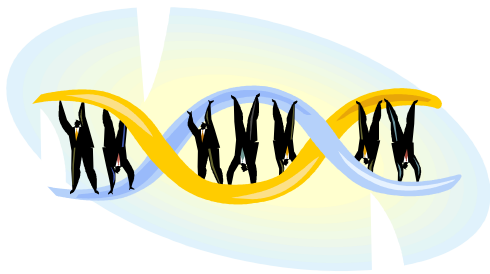


PEEKING DUCK

# Advancements in Genetics

- In 1978 ducks were processed at 49 days = 6.7lbs with breast % of 10%
- In 2007 ducks were processed at 38 days = 6.7lbs with breast % of 18%
- Currently processing at 35 days or less = 6.7lbs

Changing genetics impacting embryo development → incubation requirements.



Therefore:

Need to incubate to meet the changing needs of the embryo

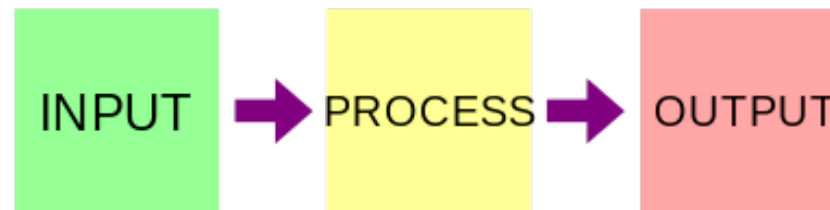




# Optimizing the Incubation Environment

**Starts with Four Basic Requirements**

- 1. Electricity**
- 2. Water**
- 3. Compressed Air**
- 4. Ventilation**



# Ventilation = Fuel for Machines

Maintains the machine temperature,  
humidity and airflow (pressure)

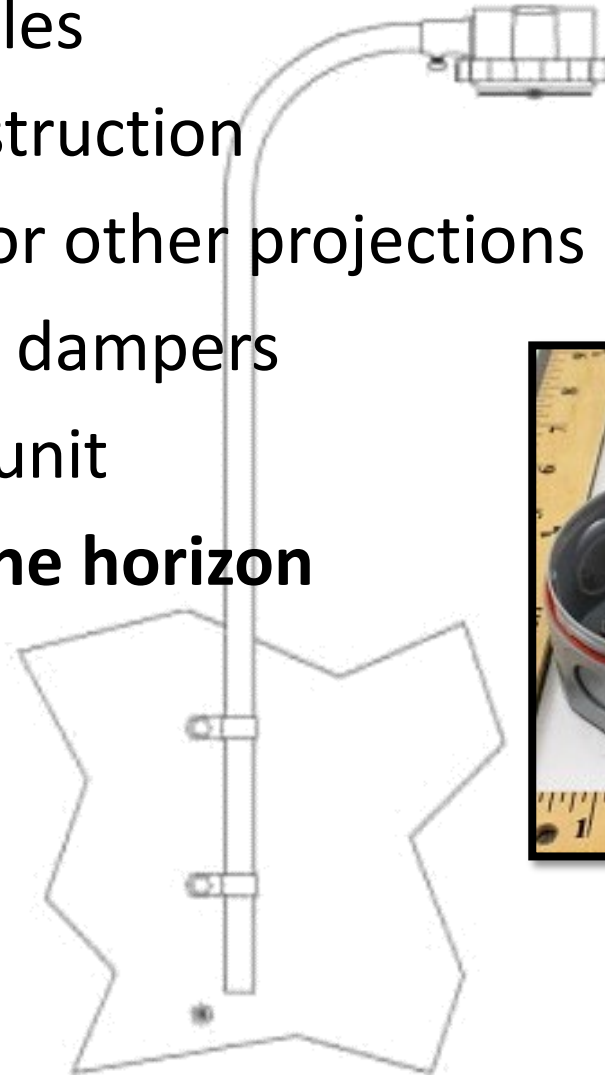
Always follow the  
recommended Temp,  
RH, pressure settings as  
provided by the  
manufacturer for

- Plenums
- Rooms
- Hallways
- Etc



# Outside Air Reference (OAR) Location

- 12" above surrounding obstacles
- No physical or mechanical obstruction
- Not mounted under awnings or other projections within 15'
- Away from economizers, fans, dampers
- Often mounted on a roof top unit
- **Ideal: unobstructed view of the horizon**

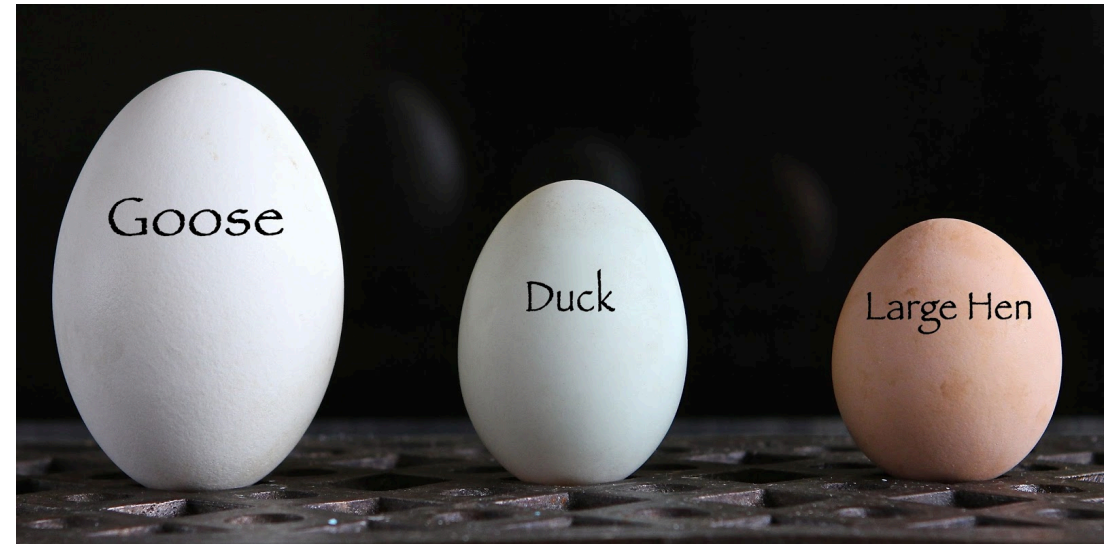




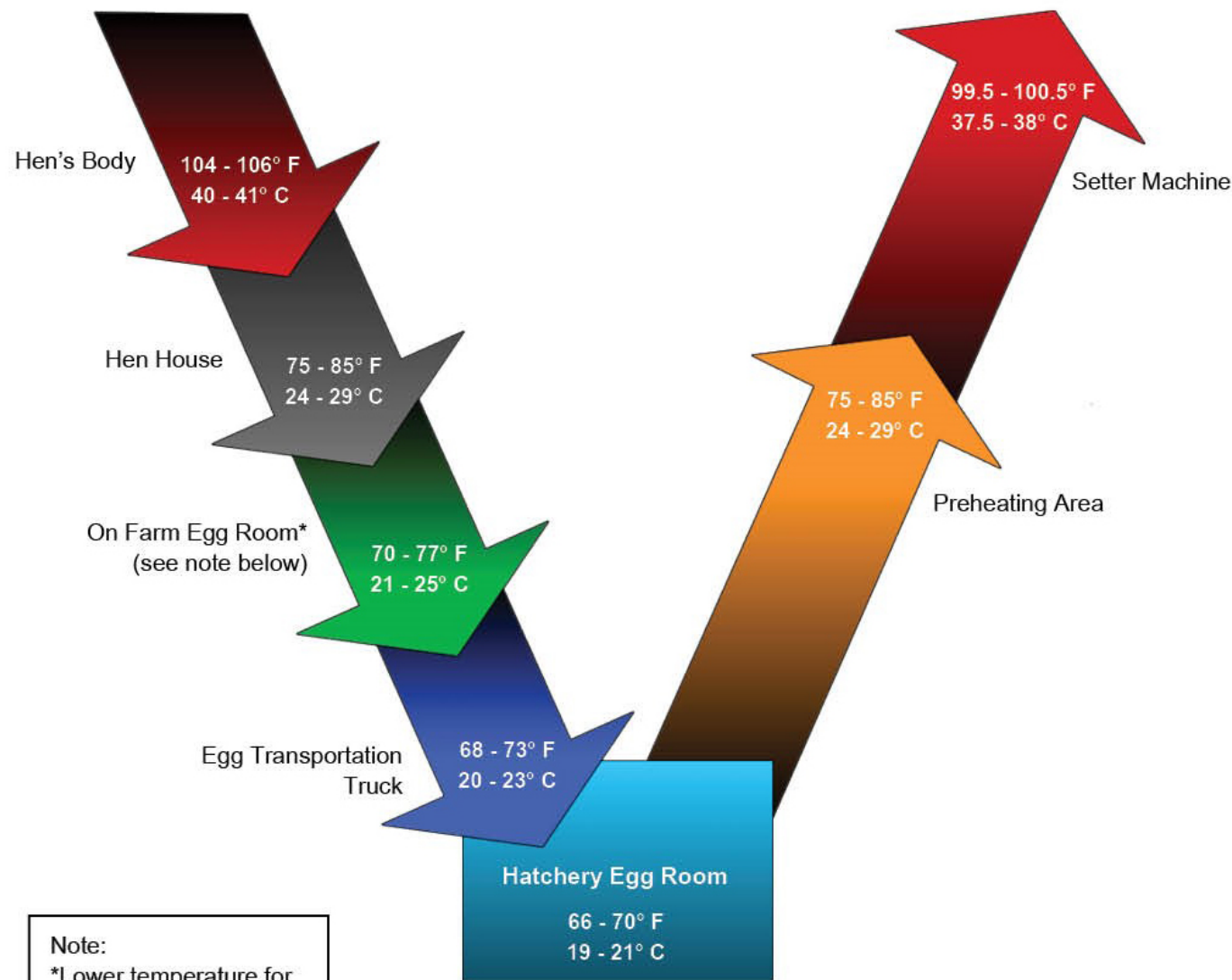
# Egg Handling and Storage

Proper egg handling and storage procedures are necessary to ensure hatching eggs are of the highest quality possible.

No hatchery can ever improve the hatching potential of it's eggs it can only maintain or make them worse.



# 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

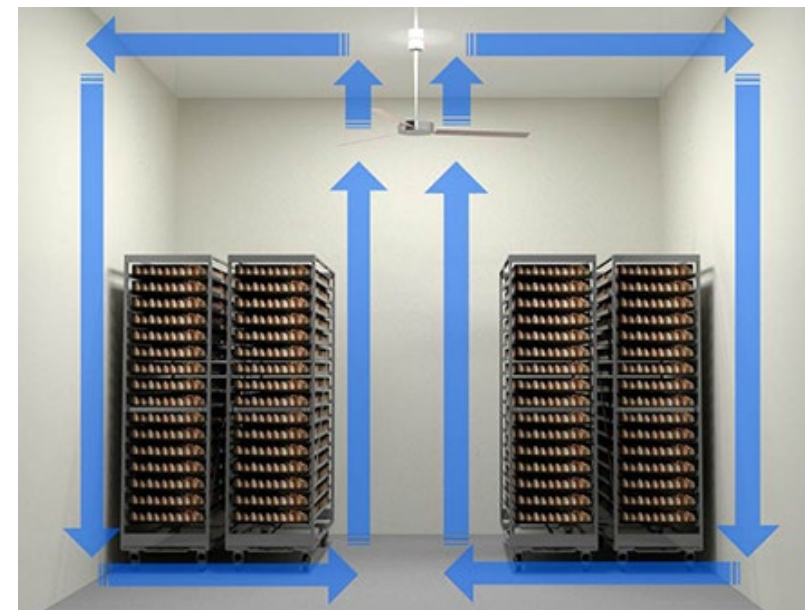


# Hatching Egg Storage

## Typical short-term storage

### Single stage or Multi-Stage

- Optimum temperature, dry bulb 59 - 64 °F (15 - 18 °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.
- Avoid egg sweating.
- If eggs are to be held longer than 7 days lower temperatures are recommended (54- 59 °F minimum or 12 - 15 °C).





# Traditional Storage Temperatures

Days	Temperature (F)	Temperature (C)	Humidity (%)
1 - 7	59 - 64	15 – 18	75 - 80
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.

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

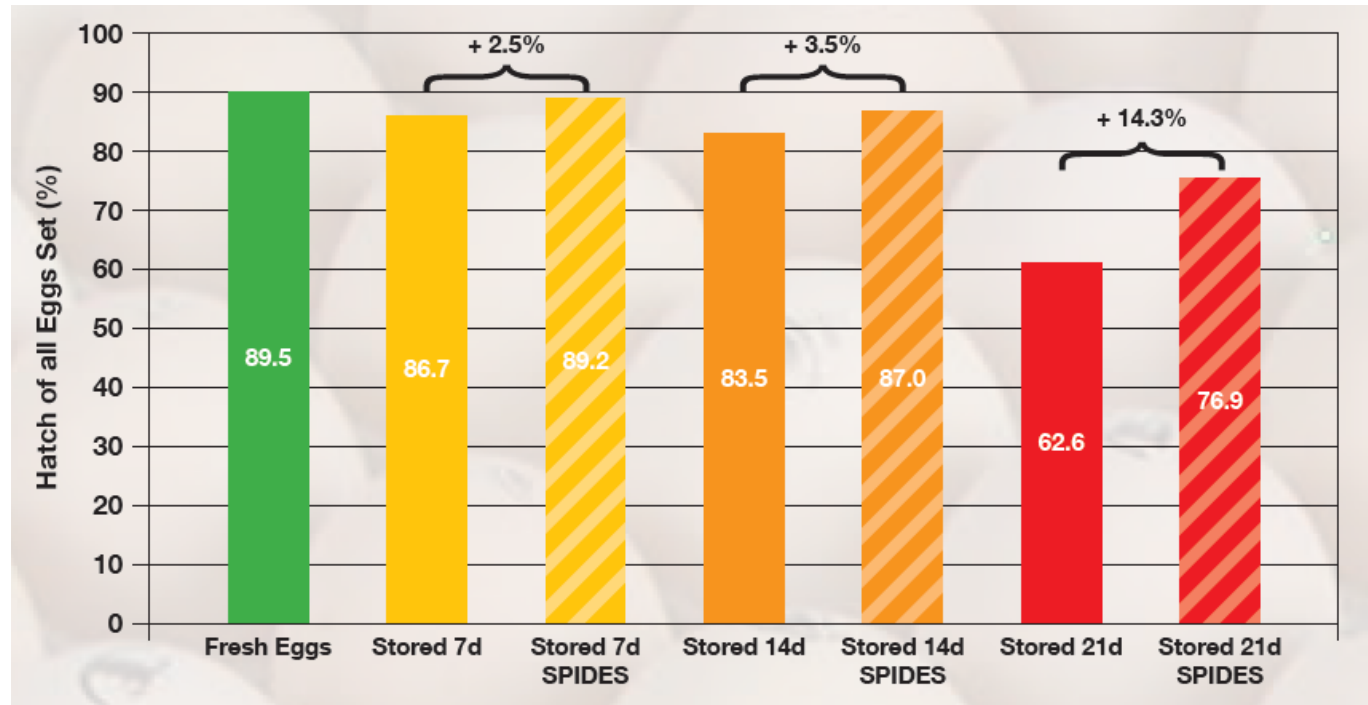
- What does S.P.I.D.E.S stand for?
- **S**hort **P**eriods of **I**ncubation **D**uring **E**gg **S**torage.





# 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.





# Advantages and Disadvantages of SPIDES

## Advantages

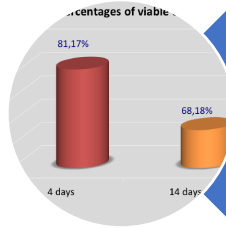
- Allows for long term storage with acceptable hatchability
- Allows for long term storage with quality ducklings
- Narrows your hatch window
- Lowers embryo mortality
- Allows for large orders with a smaller amount of breeders

## Disadvantages

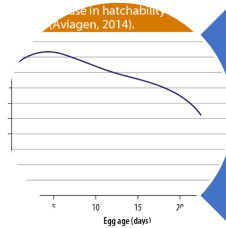
- Increased labor/man hours to handle eggs
- Complicates the egg flow in egg storage room



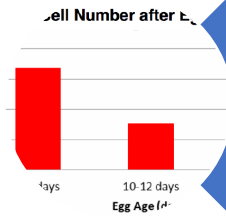
# SPIDES Summary



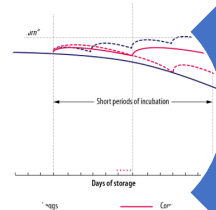
As storage days increase so does the destruction of embryonic cells



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



# 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





# General Guidelines

- Every hatchery may vary slightly from these recommendations, these are given as a guide so please check your eggshell temps to develop your own SPIDES program.
- SS Temperature set point = 100.0 °F (37.8 °C).
  - Once at set point hold for 6 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.





# Platinum Calibration

- One of the most important procedures with the Platinum or any incubation equipment is the calibration.
- Jamesway recommends temperature, humidity and CO2 be checked for each incubation cycle.
- Hatchers require once a month calibration checks.

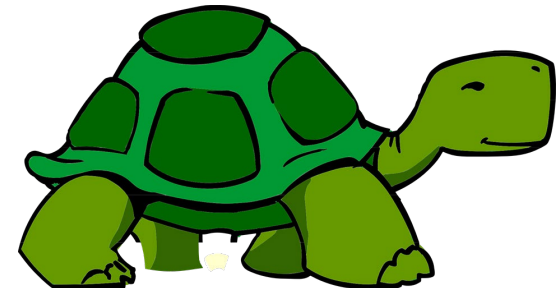
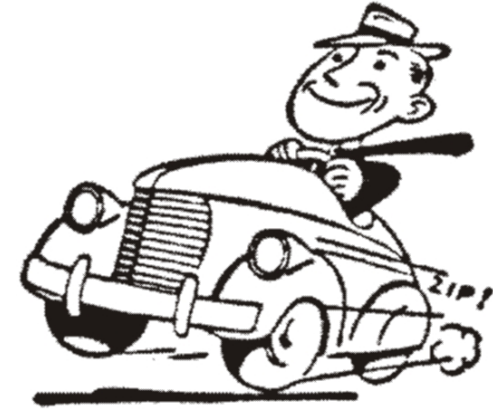


# Essentials of Incubation

- The four main essentials of incubation of good quality fertile eggs are:
- Correct and even **temperature** controlled by a thermometer or thermocouple.
- Correct **humidity** controlled by ventilation rate and water application.
- Correct oxygen and carbon dioxide concentrations controlled by **ventilation**.
- **Turning** of the fertile eggs by approximately 45 degrees several times per day by manual or automatic means.

# Temperature

- Embryonic development is controlled by temperature. It is one of the most important parameters in determining the incubation conditions.
- Temperature drives the incubation process.
- Too fast – duckling quality issues.
- Too slow – duckling quality issues.





# Humidity

- Humidity is important along with the damper opening to control proper moisture loss.
- In Multi-Stage machines the humidity also is part of the cooling.
- In Single Stage machines during the first week high humidity is needed to uniformly transfer heat to the eggs.



# Humidity

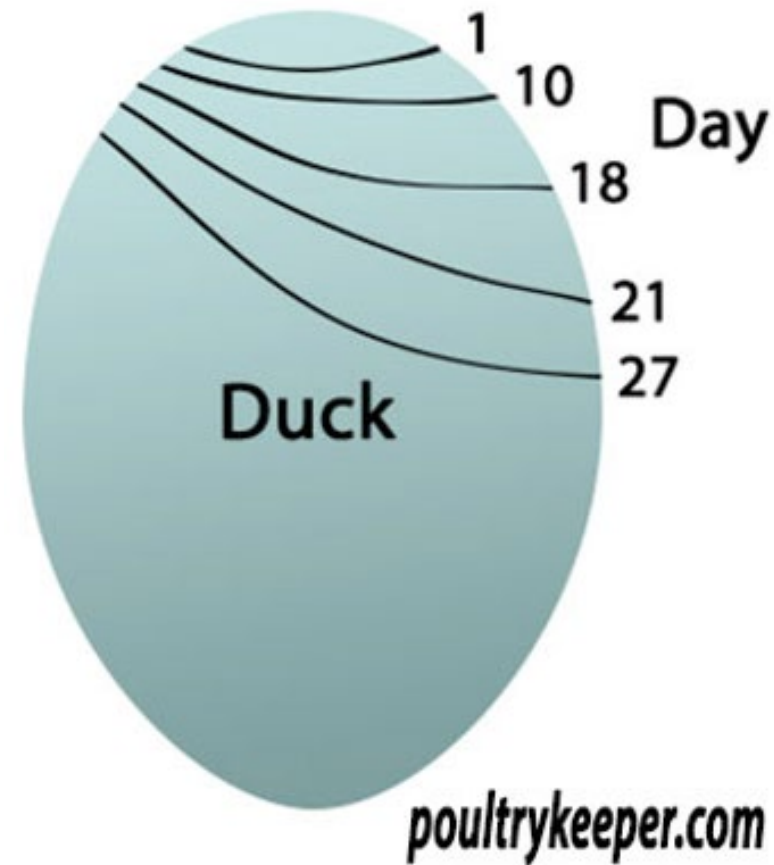
- Need to reduced humidity levels to release water from egg to allow for the formation of an air space sufficient to engage pulmonary respiration.
- When moisture loss before internal pipping is less than 6.5%, the resulting air cell size is insufficient to initiate pulmonary respiration.
- When moisture losses are more than 18%, the risks of dehydration increases.



# Moisture Loss

Moisture loss by 25 days.

- Single Stage - 10-12%
- Multi-Stage - 12-14%
- Optimal moisture loss is 0.5%/day of incubation.
- *If the embryo is developing normally, the air cell should occupy about one-third of the space inside the egg at 25 days of incubation.*
- *Duck eggs should lose between 10-14% of their weight by 25 days.*



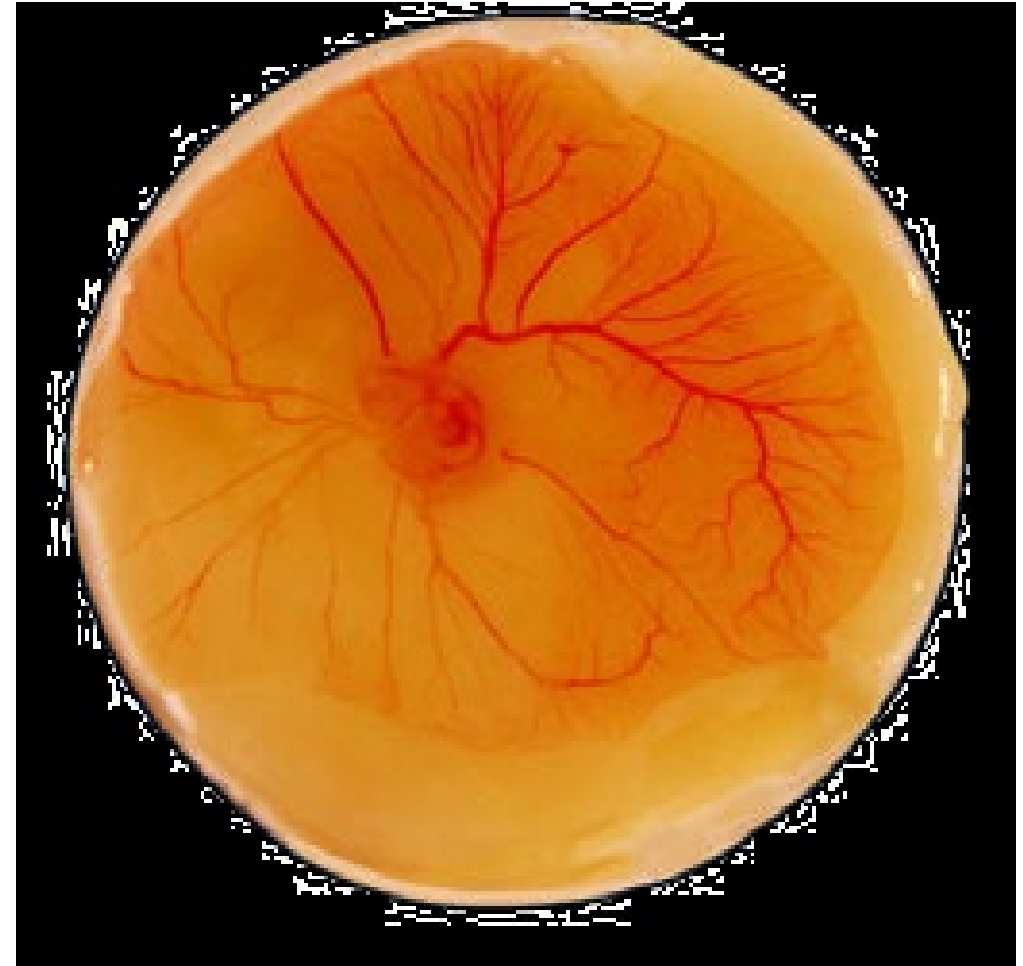
# Ventilation

- The damper opening controls the amount of ventilation.
- Controls O<sub>2</sub>, CO<sub>2</sub>, and humidity.
- Early parts of Incubation - Progressive increase of CO<sub>2</sub> is beneficial to the development of the *area vasculosa* and the embryo itself.
- Later parts of Incubation – progressive decrease in CO<sub>2</sub> allows more O<sub>2</sub> for the developing needs of the embryo.



# Turning

- Turning eggs plays a role in preventing the yolk from becoming stuck to the shell membrane.
- It allows for the development of the *area vasculosa* and the chorioallantoic membrane.



# Turning

- Turning can be stopped after 20 - 22 days.
- However, turning all the way through the incubation process will help with air flow, depending on the incubation equipment you are using.





# Waterfowl - What makes them unique?

- Increased incubation time (Turkeys 28 days).
  - Ducks – Pekin – 28 days
  - Muscovy – 35 days
  - Goose – 28-35 days (Breed dependent)
- Bigger eggs (Turkeys).
- **Much thicker cuticle** – creates issues with proper moisture loss.
- Dirtier eggs – increased floor eggs. Biosecurity Risk.
- Thicker egg shells.



# What is the Cuticle?



- Is a waxy protein coating - offers a natural protective layer on the outer surface of the egg.
- Creates a barrier that protects the egg from bacteria, fungal and other contamination from entering the egg through the pores.
- The cuticle of duck eggs is thicker compared to the cuticle of chicken eggs, which makes the gas exchange between the embryo and the environment much more difficult.
- **The main problem when incubating waterfowl eggs is managing the cuticle.** The cuticle can be gradually destroyed by spraying, creating specific microclimate conditions, or removed by using a chemical wash.
- Therefore, the cuticle of waterfowl eggs need to be removed before or during incubation to allow sufficient gas exchange.



# Cuticle

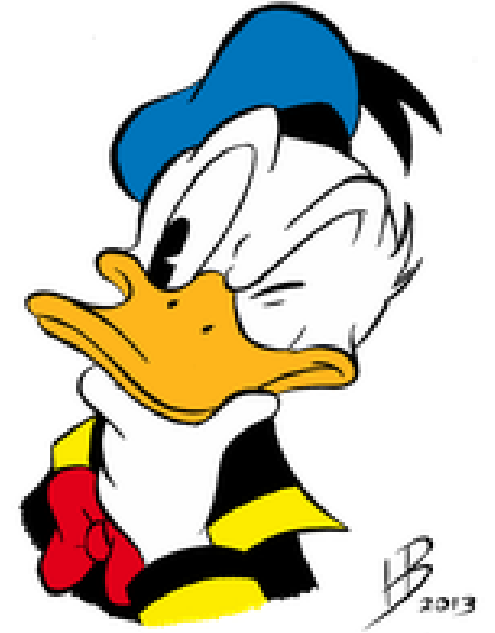
- It's like incubating eggs which are sealed in a bag.



# Cuticle Management

**To remove or not to remove that is the question?**

- Actually either will work.
- If you remove the cuticle – run higher humidity profile so your moisture loss stays in range.
- If you leave the cuticle on – run your humidity lower later in the incubation cycle. Run your CO2 higher (9000 to 10000ppm) and run a higher humidity early in incubation. This increased humidity along with the natural bacterial microflora on the eggs will help break down the cuticle.



# Cuticle Removal

- To remove cuticle by washing
  - Egg washing with chlorine (sodium hypochlorite) need high enough concentration to remove the cuticle.
  - Once the cuticle has been removed it is extremely important not to get the eggs wet again.
  - Hydrogen Peroxide spray will also help breakdown the cuticle (3% solution).
  - **Words of caution- If you are removing the cuticle you can not get these eggs wet during the incubation process.**





# Spray Eggs

- Spray hatching eggs during the incubation process. (very labor intensive process)
  - Spraying eggs daily (start after 10 days and stop by 25 days ) helps breakdown the cuticle.
  - Helps cool the embryo.
  - Helps with increased humidity in the machine to help break down the cuticle, to aid in moisture loss.
  - Help stimulate the inner shell membranes to help aid in moisture loss.

**The process of spraying eggs is not necessary with single stage incubation.**





# Egg Shell

- Egg shells are thicker than that of chickens.
- As the breeder flock age increases the shell thickness decreases.
- Same is true of the cuticle on the egg shell, it thins as the breeder flock age increases.

Know your moisture loss levels!



# Profile Basics

## What is a profile?

- A set of steps made of different setpoints that progress the egg through incubation to hatch
- Each adjustment is made to tailor the incubation conditions to the precise stage of embryo growth and that embryo's specific needs
- Up to 20 profiles can be stored on an individual incubator or hatcher

## What can you control?

- Temperature
  - Air temperature
  - Eggshell temperature (Pilot)
- Humidity (optional)
- Ventilation through damper opening
  - Control based on CO2
  - Control based on setpoint % open
  - Allow humidity to effect it



# CO2 Control

- 0 to 10,000 ppm by 11 and 12 days of incubation.
- Day 13 bring CO2 level to 6000ppm.
- Day 20 – 3500ppm.



# Fan Setup

Fan Setup

	0-1	1-13	13-19	19-23	23+
▲	▲	▲	▲	▲	▲
40	90	60	80	90	100
▼	▼	▼	▼	▼	▼
Cancel	OK	Global	Select Days	Delay Start	Delta Drive





# Troubleshooting Hatchability

- Troubleshooting hatchability can at times be very difficult.
- Lots of factors involved
  - Breeder flocks, age, breeds, nutrition, egg collection, etc....
  - Environmental conditions - seasonal changes, room and plenum conditions, etc....
  - Egg handling practices – everything from the time the egg is laid to set.



# Analyzing Hatch Residue

- Analyzing hatch residue is a useful management tool that will provide valuable information in isolating problems in both the breeder and the hatchery programs.
- The following is a list of problems that may be observed and their possible cause(s).



# Fully Developed Embryo with Bill Not in Air Cell

Possible causes:

- Improper incubator temperature, **humidity**, turning, ventilation
- Improper hatcher temperature, humidity, ventilation
- Eggs chilled at transfer





# Fully Developed Embryo with Bill in Air Cell

Possible causes:

- Incubator air circulation poor
- Temperature too low incubator
- Temperature too high, in hatcher
- Humidity too high, incubator / hatcher
- Eggs chilled at transfer
- Inadequate turning
- Shell quality





# Duck Dead after Pipping Shell

Possible causes:

- Eggs incubated small end up
- Thin-shelled eggs
- Turning issues
- Eggs transferred too late
- Inadequate air circulation, in hatcher
- CO2 content of air too high, in hatcher
- Incorrect temperature, in incubator
- Temperature too high, in hatcher
- Humidity too low, in hatcher

# Exposed Brain

- Temperature too high (days 1-5)



# Red Hocks or Red on Bill

- Temperature too high in Hatcher
- High humidity in hatcher
- High CO2 –low ventilation
- Or anything that will force the ducks to hatch sooner than normal





# Troubleshooting Steps

- Take appropriate steps to solve the problem



DATA



KNOWLEDGE



ACTION



# Practical Advice



Prewarm eggs at least 12 hours.



Set clean settable eggs, if possible.



Stop turning 20 – 22 days in the left position with Jamesway Single Stage machines.



If possible, allow CO2 to build up to 9000 – 10,000ppm during the first 11 – 12 days of incubation.



Duck eggs should loose about 10-14% of their weight by 25 days.





# Practical Advice



Cuticle management - need to break down before or during incubation.



With cuticle – run your incubation humidity levels lower to attain the correct moisture loss.



Without cuticle – run your incubation humidity levels higher to attain the correct moisture loss.



Egg shell temperature should be maintained around 100 – 100.1F (37.7 – 37.8C) during incubation.



# The Jamesway Advantage





Questions

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