The Incubator Company

Hatch Residue Breakout:
Finding Clues for a Better Hatch
Part 2

Keith Bramwell, MS, PhD
Phillip Perry
Henry Kohl
Hatchery Consultants
Jamesway Incubator Company
Keith.Bramwell@Jamesway.com

JAMESWAY

Methodology of Embryodiagnosis

Important for managers to have direct knowledge of breakout results

Managers should monitor candling and breakout procedure routinely and correlate with people doing breakout

Best if managers can assist on breakouts, especially when problems exist or decisions are to be made based on breakout

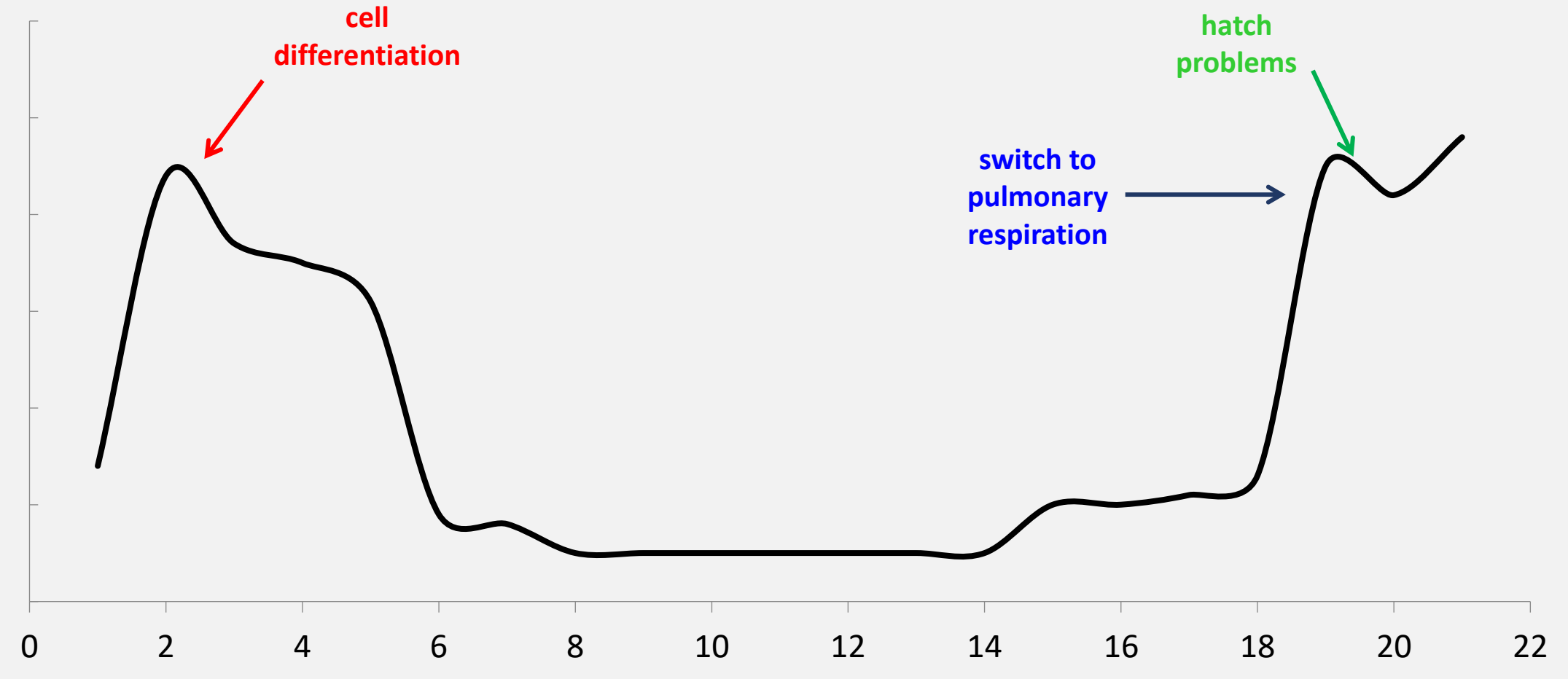
Action Plan

Accurate egg break-out	- Hatchery manager & supervisor involvement
Standard summary	
Analysis of data	
Action plan of correction	
Use information as a management tool	

What is Acceptable or 'Normal'?

- This is a ***biological system***, therefore:
- Expect mortality, losses are unavoidable
- Fertility? 1-2% infertile
  - Dependant on breed (strain), age of flock, health status of breeders, etc.
- Embryo mortality? 4-5% **total** embryo loss
  - Dependant on breed (strain), age of flock, fertility, egg age, egg storage conditions (transport), *and* of course incubation conditions

Percent Mortality of Fertile Eggs



Flock Examination & Record Keeping

- Breakout analysis of a sample of unhatched eggs and record incidences of:
  - Infertile eggs
  - Dead embryos in one of the 3 - 5 stages
  - Pips
  - Cull chicks and cull eggs
  - Farm & transfer cracks
  - Contamination
  - Misplaced eggs (small end up)

Hatch Residue Breakout Sheet

JAMESWAY The Incubator Company

R. Keith Bramwell, MS., PhD. Jamesway Incubator Company

Hatchery:			Incubator:			Hatch % :		Flock ID:		Set time:				
Break-out date:			Hatcher:			HOF % :		Flock age:		Transfer time:		Egg age:		
Set date:			Setter/hatcher type:			Fertility %:		# Eggs set:		Transfer age:		Moisture loss:		

Tray # Position	Eggs/tray	Chicks Hatched	Infertile	Fertility (%)	0 - 3 d	4 - 7 d	Total Early (%)	8 - 14 d	Total Mid (%)	15 - 18 d	19 - 21 d	Total Late (%)	Total Emb Loss	Cull Chick

Tray # Position	Live Pip	Dead Pip	Malposition	Exposed Brain	Anomally	Transfer Crack	Other Crack	Mold	Early Cont.	Late Cont.	Small End Up	Cull Egg	Misc.

JAMESWAY

Hatch Residue Breakout Sheet

R. Keith Bramwell, MS., PhD. Jamesway Incubator Company

JAMESWAY The Incubator Company

Hatchery:			Incubator:			Hatch % :		Flock ID:		Set time:					
Break-out date:			Hatcher:			HOF % :		Flock age:		Transfer time:		Egg age:			
Set date:			Setter/hatcher type:			Fertility %:		# Eggs set:		Transfer age:		Moisture loss:			

Tray # Position	Eggs/tray	Chicks Hatched	Infertile	Fertility (%)	0 - 3 d	4 - 7 d	Total Early (%)	8 - 14 d	Total Mid (%)	15 - 18 d	19 - 21 d	Total Late (%)	Total Emb Loss	Cull Chick

Tray # Position	Live Pip	Dead Pip	Malposi	Exp B	Anomally	fer k	Other Crack	d	Early Cont.		nd	Cull Egg	Misc.

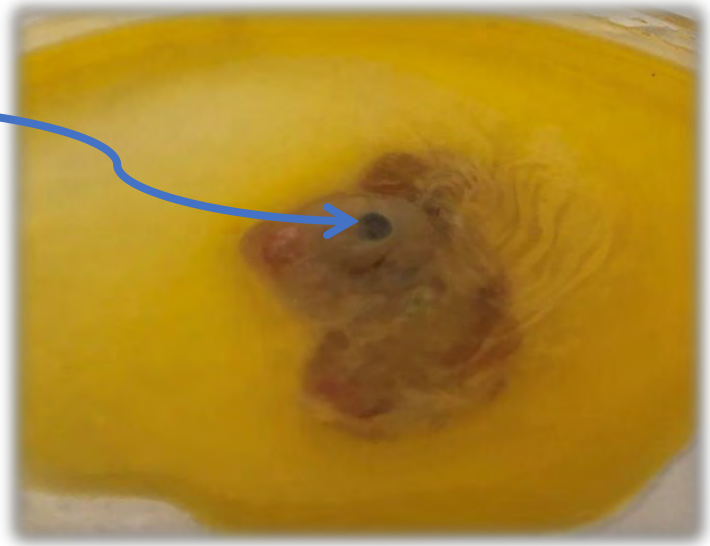
- Fertile egg – Donut shaped germinal disc
- Day 4 – Eye pigmentation ***Prominent***
- Day 8 – Egg tooth present and ***Prominent***
- Day 15 – Chick down ***Prominent***
- Day 19 – Yolk sac withdrawn into body

Key Factors in Embryo Development

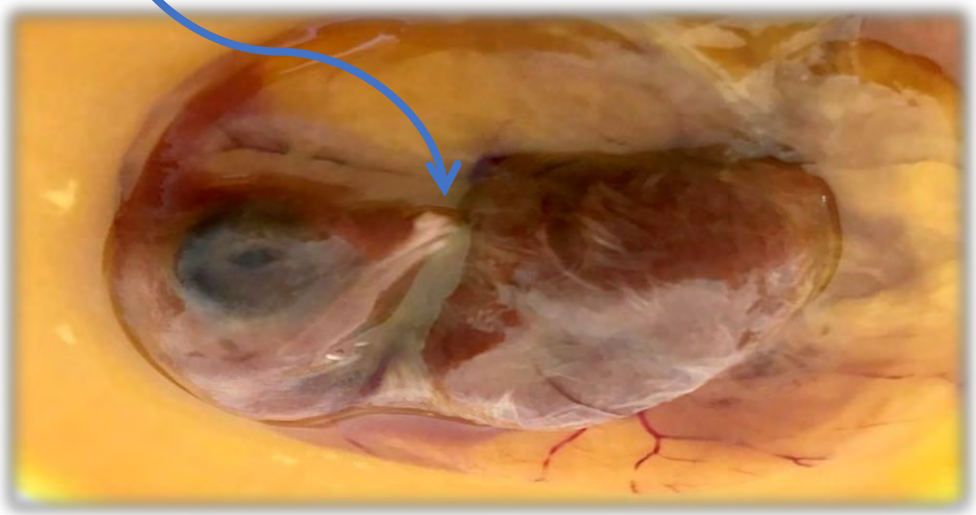
- Fertile egg – Donut shaped germinal disc
- Day 4 – Eye pigmentation ***Prominent***
- Day 8 – Egg tooth present and ***Prominent***
- Day 15 – Chick down ***Prominent***
- Day 19 – Yolk sac withdrawn into body

Infertile vs Fertile Eggs

Pigmented Eye

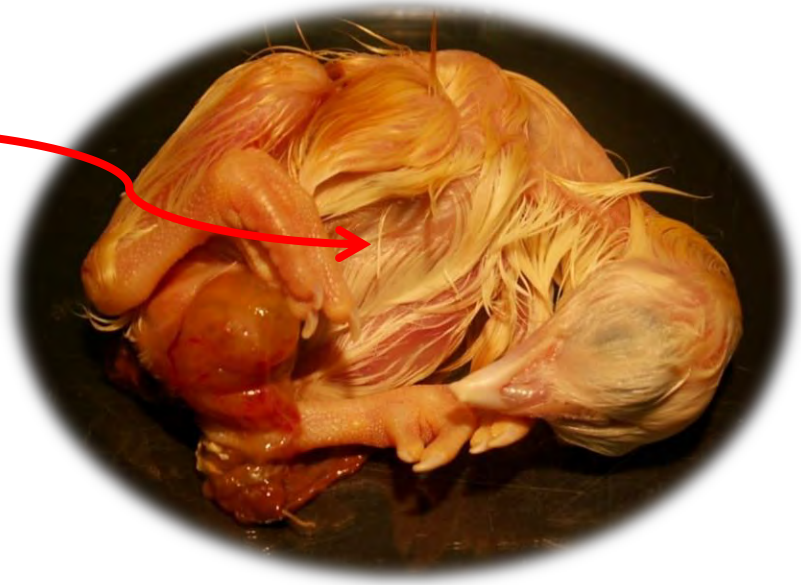


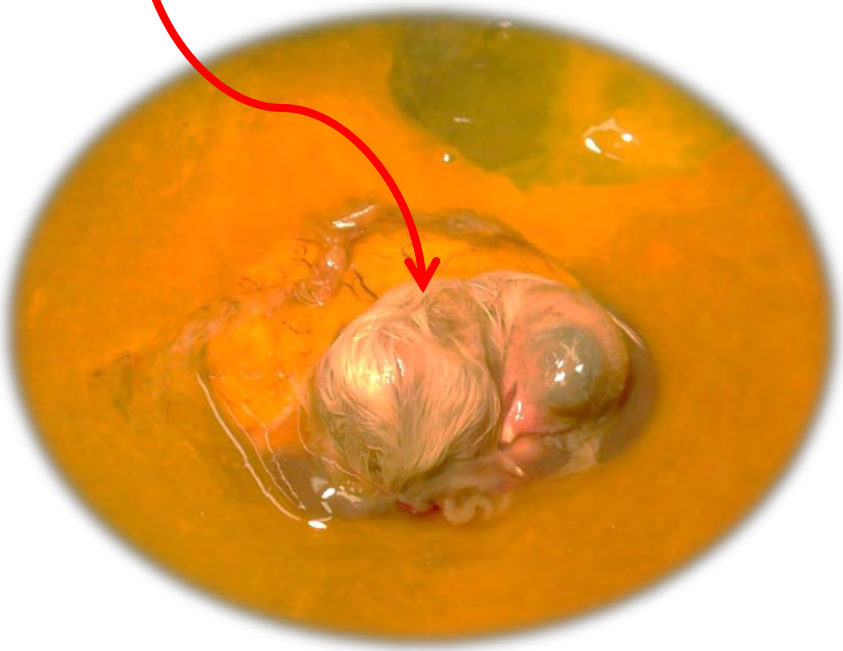
Egg Tooth



Yolk withdrawn

Down covering





Embryonic Mortality Pattern

- 1-7 days (1 - 3 days)
  - ~ 2.5 %
  - Blood & circulation system developing

    Cell differentiation
- Potential causes
  - Poor egg handling (gathering & storage)
  - Aged flocks (infrequent mating)
  - Incubator problems?

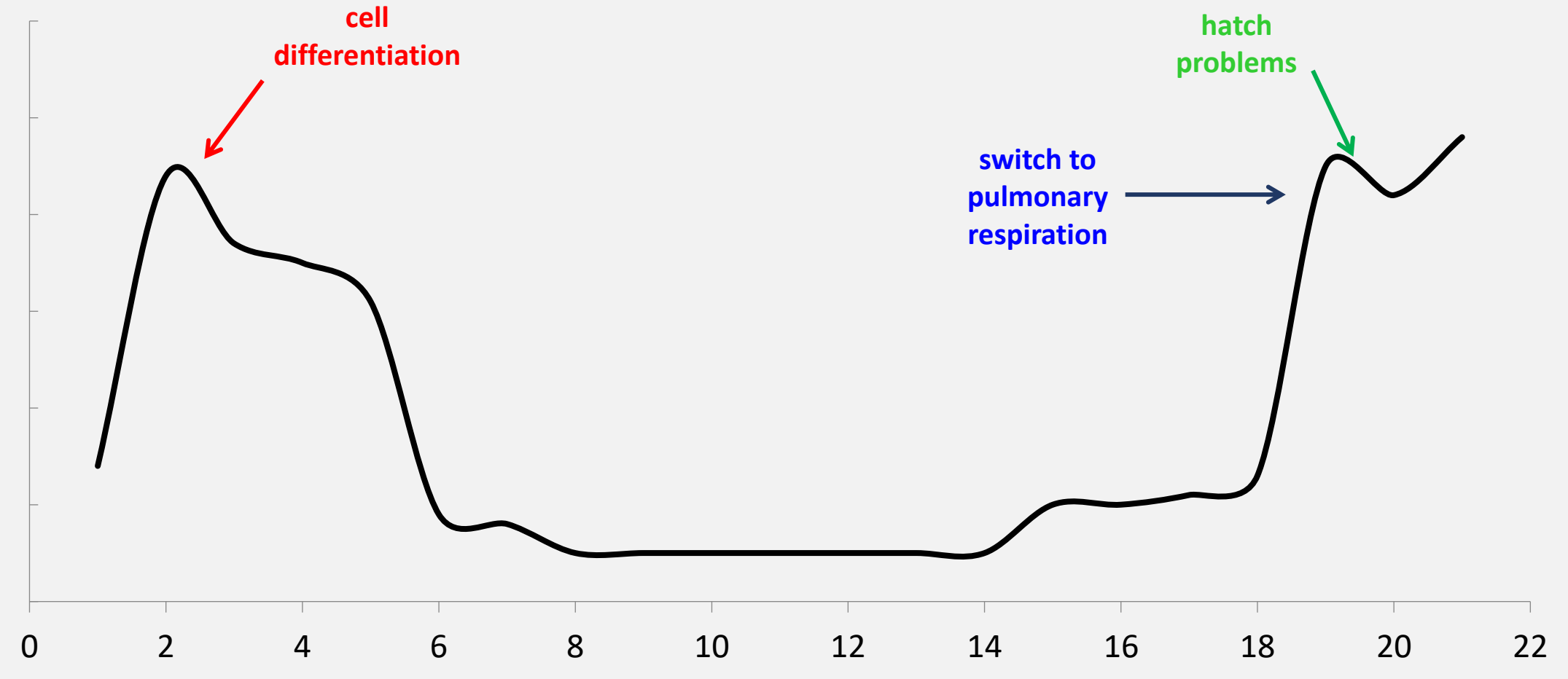
Embryonic Mortality Pattern

- 8 -14 days
  - ~ 0.5%
- Potential causes
  - Breeder nutrition
    - Riboflavin
    - Vitamin B12
    - Manganese
    - Pantothenic acid
  - Incubator problems

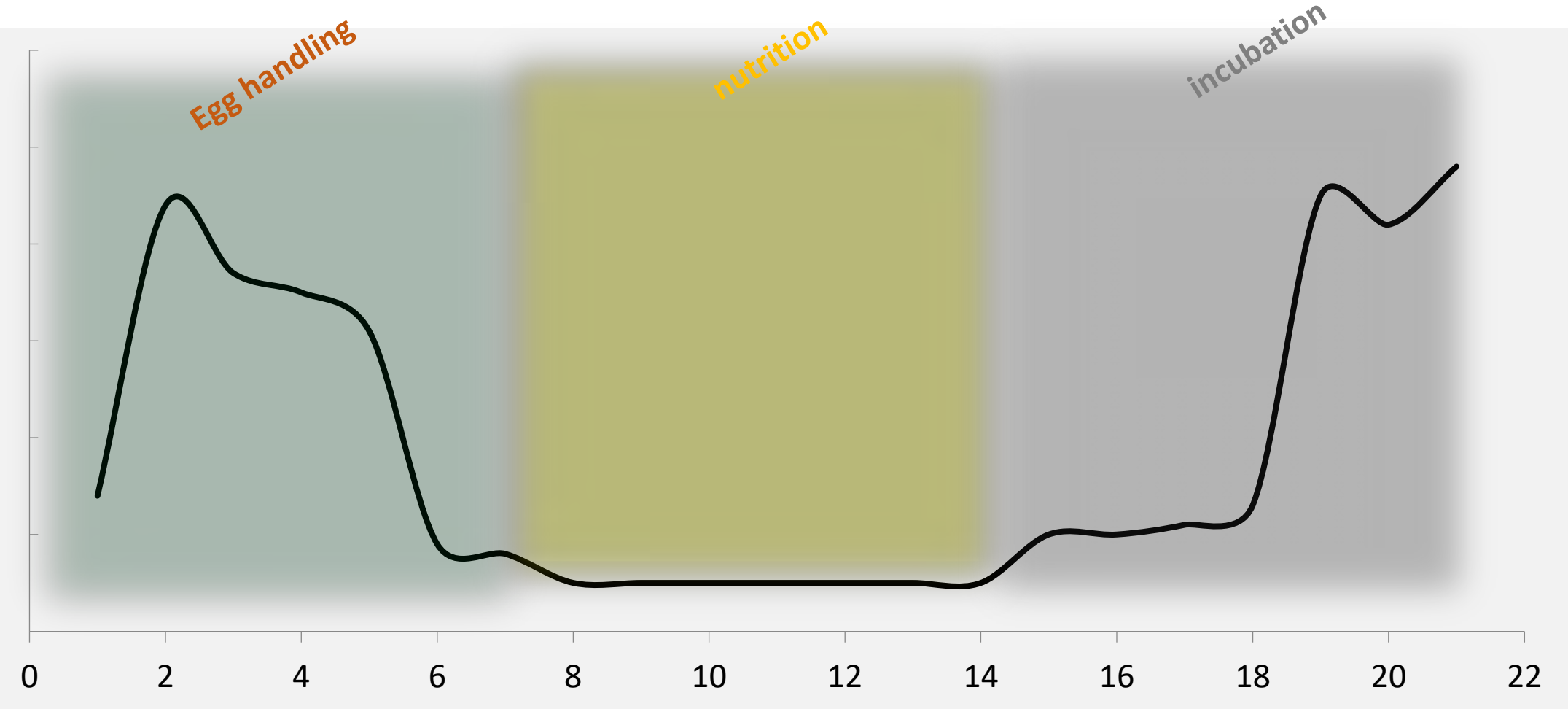
Embryonic Mortality Pattern

- 15-21 days
  - ~ 2.5 %
  - **Switch to pulmonary respiration**
- Potential causes
  - Incubation problems
    - Temperature, humidity, turning, pull time
  - Aged flocks (shell quality, etc)
  - Contamination
  - Egg orientation

Percent Mortality of Fertile Eggs



Percent Mortality of Fertile Eggs



Hatch Residue Breakout Sheet

R. Keith Bramwell, MS., PhD. Jamesway Incubator Company

JAMESWAY
The Incubator Company

Hatchery:		Incubator:		Hatch % :		Flock ID:		Set time:	
Break-out date:		Hatcher:		HOF % :		Flock age:		Transfer time:	Egg age:
Set date:		Setter/hatcher type:		Fertility %:		# Eggs set:		Transfer age:	Moisture loss:

Tray # Position	Eggs/tray	Chicks Hatched	Infertile	Fertility (%)	0 - 3 d	4 - 7 d	Total Early (%)	8 - 14 d	Total Mid (%)	15 - 18 d	19 - 21 d	Total Late (%)	Total Emb Loss	Cull Chick

Cell differentiation

Hatch problems

Egg handling

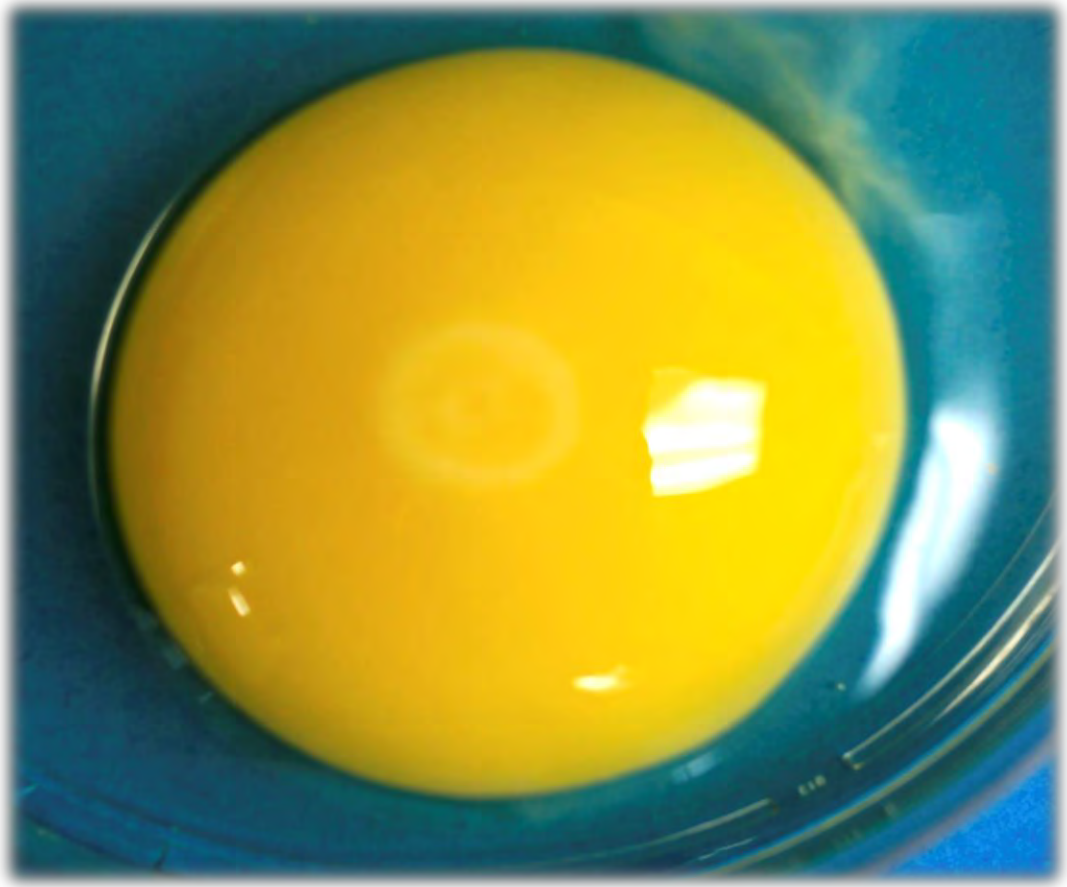
nutrition

incubation

Tray # Position	Live Pip	Dead Pip	Malposition	Exposed Brain	Anomally	Transfer Crack	Other Crack	Mold	Early Cont.	Late Cont.	Small End Up	Cull Egg	Misc.

Fertile Eggs

- Fertile germinal disc
  - Shows some pre-incubation, or pre-development
- 12 hours of development

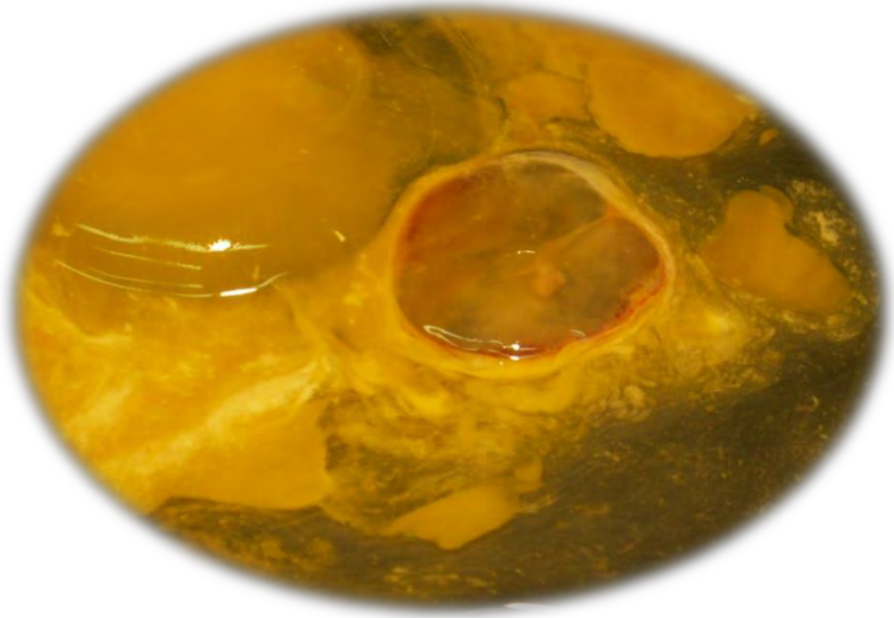


JAMESWAY

Day 3

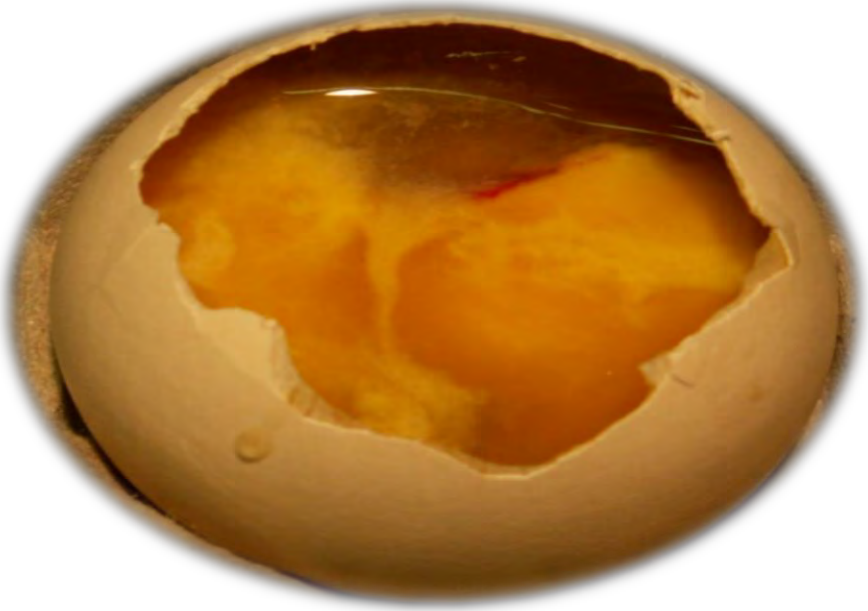
Embryonic Development

- Heart beats
- Blood vessels very visible



Troubleshooting Guide

- Low fertility
- Pre-incubation, poor egg storage
- Improper egg holding time
- Rough setting of eggs

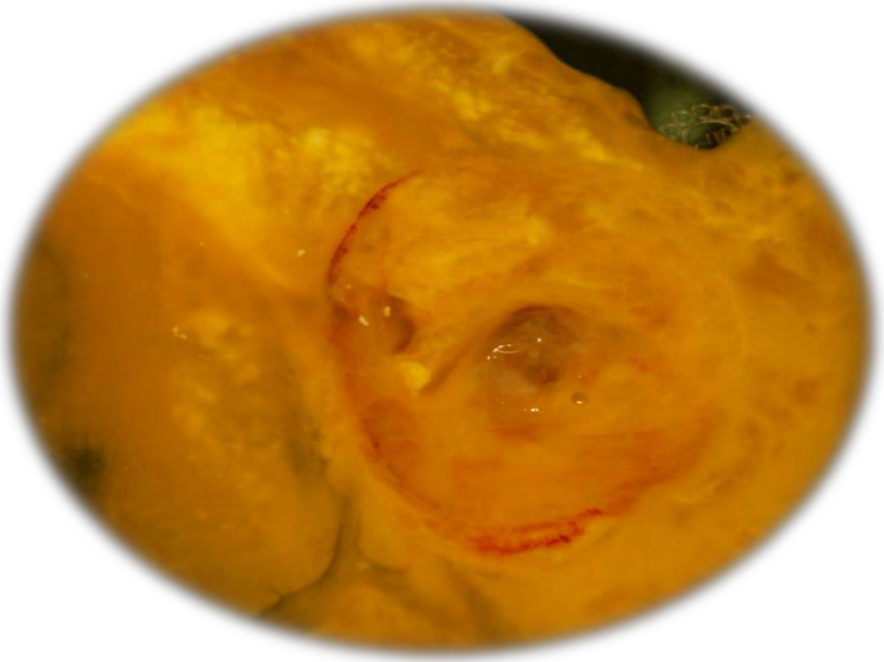


JAMESWAY

Day 4

Embryonic Development

- **Eye pigmentation easily visible**



Troubleshooting Guide

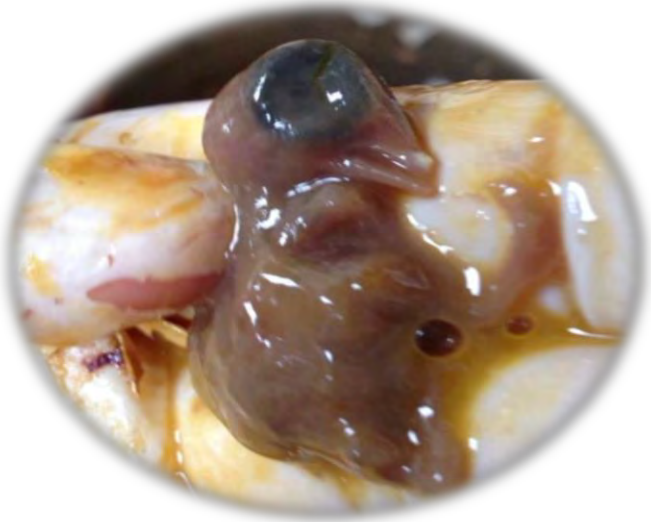
- Pre-incubation, poor egg storage
- Improper egg holding time
- Rough setting of eggs
- Contaminated eggs
- Drugs-toxins

JAMESWAY

Day 8

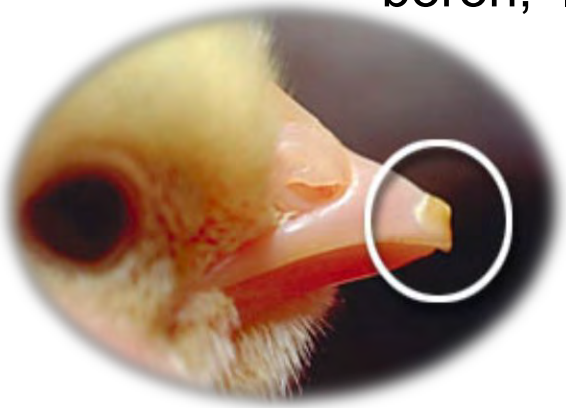
Embryonic Development

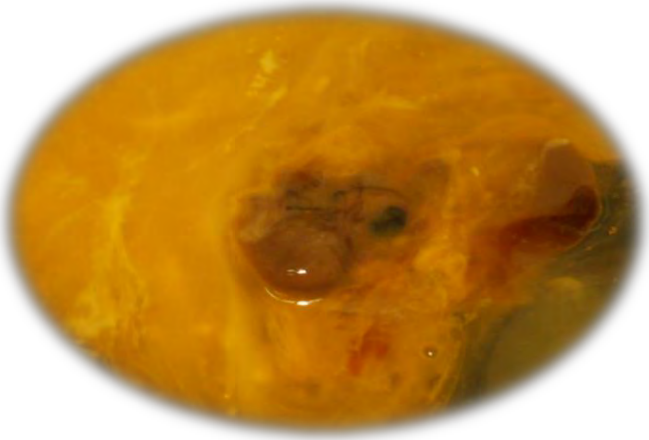
- Feather tracts seen
- Upper & lower beak equal in length
- **Egg tooth easily visible**



Troubleshooting Guide

- Improper temperature
- Insufficient egg holding time
- Rough setting of eggs
- Contaminated
- Nutritional
  - Riboflavin, vitamin B12, biotin, niacin, pyridoxine, pantothenic acid, phosphorous, boron, linoleic acid





JAMESWAY

Day 15

Embryonic Development

- Gut is drawn into abdominal cavity

Troubleshooting Guide

- Improper turning
- Improper temperature
- Improper ventilation
- Contaminated
- Nutritional
  - Riboflavin, vitamin B12, biotin, niacin, pyridoxine, pantothenic acid, phosphorous, boron, linoleic acid

JAMESWAY

Day 19

- **Embryonic Development**
- Yolk sac draws into body cavity
- Amniotic fluid gone
- Embryo occupies most of space within egg(not in the air cell)

Troubleshooting Guide

- Rough transfer
  - Transfer cracks, delays
- Vaccination
- Wet trays and hatchers
- Inconsistent transfer
- Improper turning
- Improper temperature
- Improper humidity
- Improper ventilation
- Inverted eggs

Hatch Residue Breakout Sheet

R. Keith Bramwell, MS., PhD. Jamesway Incubator Company

JAMESWAY
The Incubator Company

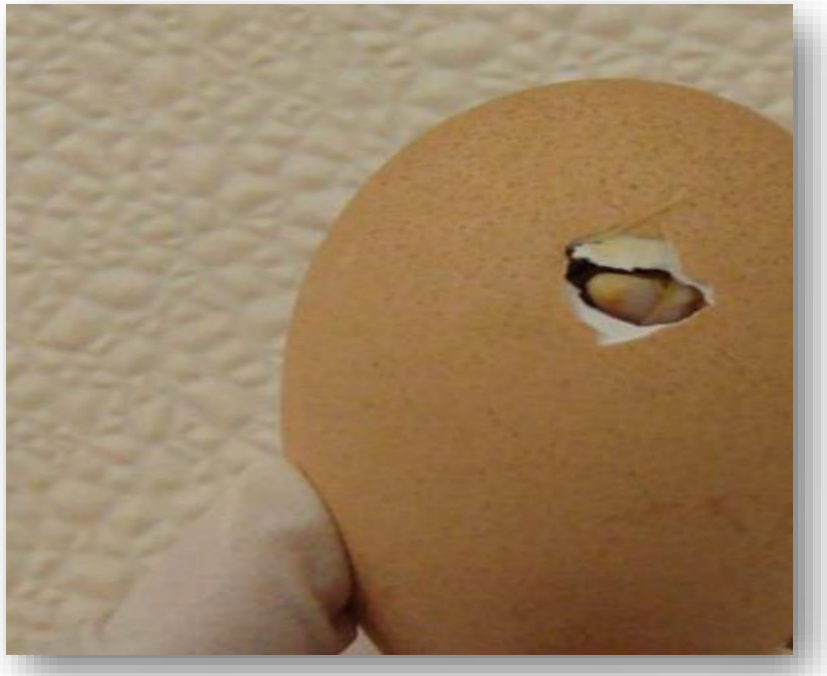
Hatchery:			Incubator:			Hatch % :		Flock ID:		Set time:				
Break-out date:			Hatcher:			HOF % :		Flock age:		Transfer time:		Egg age:		
Set date:			Setter/hatcher type:			Fertility %:		# Eggs set:		Transfer age:		Moisture loss:		

Tray # Position	Eggs/tray	Chicks Hatched	Infertile	Fertility (%)	0 - 3 d	4 - 7 d	Total Early (%)	8 - 14 d	Total Mid (%)	15 - 18 d	19 - 21 d	Total Late (%)	Total Emb Loss	Cull Chick

Tray # Position	Live Pip	Dead Pip	Malposition	Exposed Brain	Anomally	Transfer Crack	Other Crack	Mold	Early Cont.	Late Cont.	Small End Up	Cull Egg	Misc.

Pipped (Dead or Live)

- **Signs**
  - Dead in shell
  - Full-term embryo



- **Causes**
  - **Low humidity or temperature for long periods**
  - **Hatcher humidity low**
  - **High temperatures during hatching**
  - Poor ventilation
  - Prolonged egg storage
  - Inadequate turning (day 1-12)
  - Injury during transfer

JAMESWAY

Not Pipped

- **Signs**
  - Dead in shell
  - Full term embryo
  - Large yolk sac
  - Yolk sac may not be fully engulfed by abdominal wall
  - May have residual albumen

- **Causes**
  - **Setter temperature low (slow)**
  - **High temperature (setter or hatcher)**
  - **Humidity high**
  - Poor ventilation
  - Prolonged egg storage
  - Eggs chilled (transfer)
  - Inadequate turning
  - Nutritional deficiencies
  - Biology? (embryo development)
  - Breeder disease

JAMESWAY

Partially Pipped

- **Signs**
  - Embryo alive
  - Embryo dead

- **Causes**
  - **Same as for pipped, full-term embryos**
  - **High CO2**
  - Excessive fumigation during hatching
  - Egg set small end up

JAMESWAY

Chicks Hatching Early

- **Signs**
  - Excessively noisy chicks
  - Thin chicks
  - Dry skin around legs and feet
  - Increased 7-day field mortality
- **Causes**
  - Breed differences
  - Setter temperature too high
  - Setter humidity too low
  - Small eggs

JAMESWAY

Chicks Hatching Late

- **Signs**
  - Called ‘green chicks’
  - Swollen abdomen
  - Un-healed navels
  - Wet chicks

- **Causes**
  - Large eggs
  - Old breeders
  - Eggs stored too long
  - Setter temperature too low
  - Setter humidity too high
  - Weak embryos
  - Inbreeding (genetics)

JAMESWAY

Slow Hatch (Large Hatch Window)

- **Signs**
  - Protracted or ‘drawn- out’ hatch
  - Mixture of early and late hatched chicks
  - Chicks begin hatching early but slow to finish

- **Causes**
  - Mixture of eggs stored too long and too short
  - Mixture of eggs from young and old breeders
  - Mix of large and small eggs
  - Improper egg handling
  - Hot or cold spots in setters or hatchers
  - High or low temperatures in setters or hatchers
  - Poor ventilation in machines and rooms & hallways`

Malpositioned Chicks

- Signs
  - Head in small end of egg
  - Head to the left or not under right wing
  - Beak towards small end
  - Oriented upside down
- Causes
  - Eggs set small end up
  - Improper egg turning
  - Old breeders
  - Round shaped eggs or very large eggs
  - Setter temperature too high or too low
  - Humidity too high

JAMESWAY

Open or Unhealed Navel

- **Signs**
  - Open and unhealed navels
  - Dry, rough down feathers

- **Causes**
  - Setter temperature too high or variation in temperature
  - Hatcher temperature low
  - Hatcher humidity too high, or not lowered at hatch completion
  - Poor breeder nutrition

JAMESWAY

Unhealed Navel, Infection

- **Signs**
  - Wet, odorous chicks
  - Large, mushy
  - Soft bodied, lethargic
- **Causes**
  - Omphalitis, navel infection and contamination
    - Egg contamination from breeder farm, egg transport, hatchery
    - Unsanitary trays, machines, etc
    - Wet trays at transfer
  - Setter temperature too low
  - Setter or hatcher humidity too high
  - Poor ventilation

JAMESWAY

Stringy Navel

- **Signs**
  - Dry, rough down
  - Unhealed navel
  - ‘string’ attached to navel
- **Causes**
  - **Hatcher temperature and humidity too high**
  - **Wide fluctuations in temperature**
  - Setter temperature too high or too low
  - Inadequate breeder nutrition

JAMESWAY

Other Navel Issues

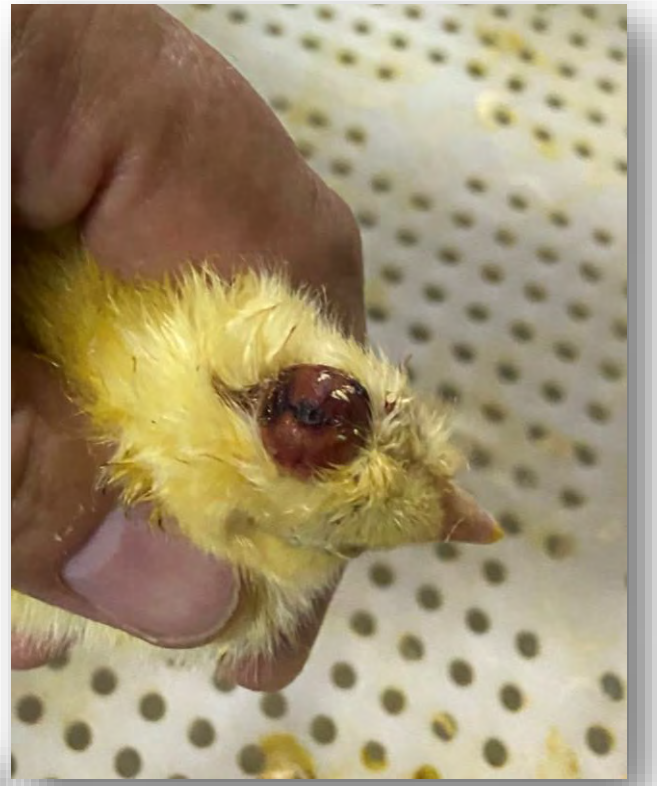
Red Hocks

- **Signs**
  - Red hocks
    - hatched chicks
    - unhatched chicks
  - Red abrasion on upper beak
- **Causes**
  - **Difficulty during hatching and pipping**
    - Thick shells (pullet flocks)
    - High setter humidity
    - Low setter temperature
  - Hatching egg sanitation?

JAMESWAY

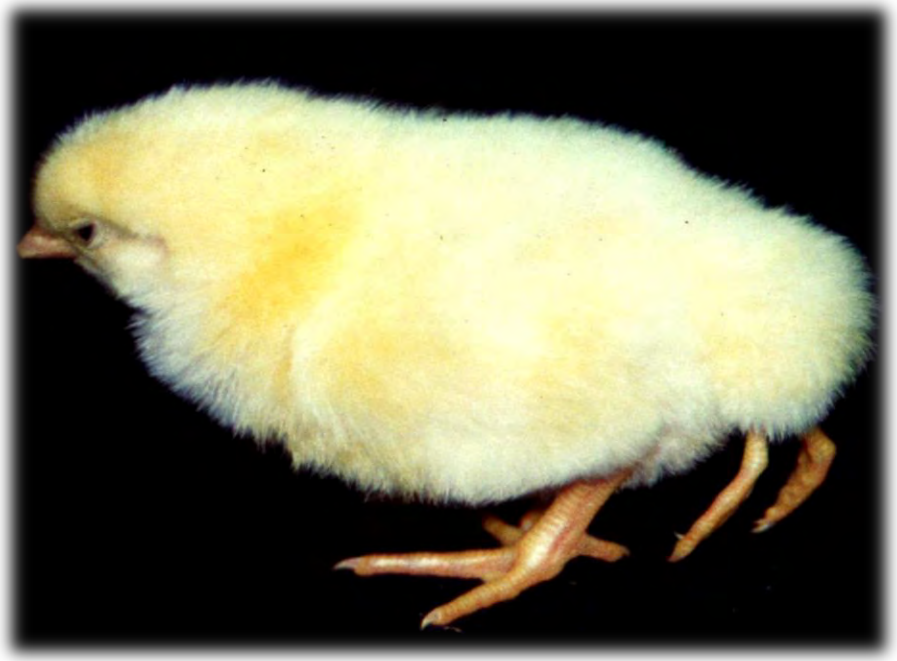
Brain Hernia (Exposed Brain)

- **Causes**
  - **Temperature too high in early incubation**
  - High CO2 level (low oxygen)
  - Equipment malfunction



JAMESWAY

Skeletal Malformations



- **Signs**
  - Posterior duplication
  - Any multiple truncated development
- **Causes**
  - **Poor egg storage and handling**
  - Inadequate turning
  - Setter temperature too high or too low
  - Improper egg orientation (small end up)
  - Breeder disease

JAMESWAY

Cross Beak & Missing Eye

- **Causes**
  - **Egg turning problems early**
  - **Temperature too high early**

JAMESWAY

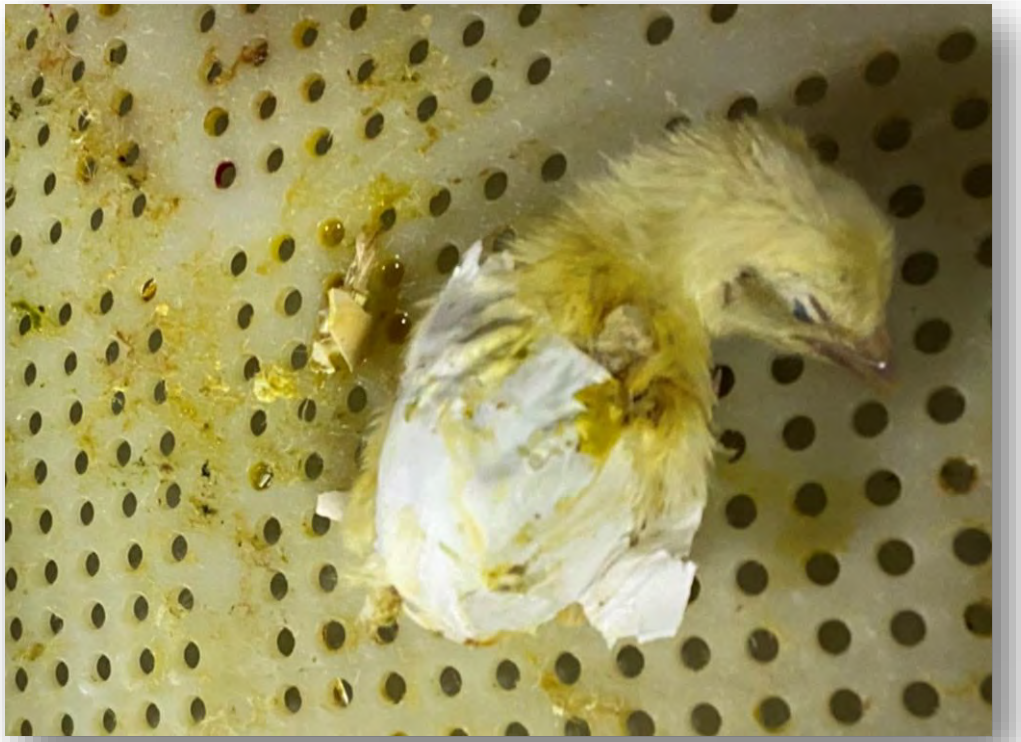
Poor Chick Quality

- **Signs**
  - Hatching trays not hatching uniformly throughout machine

- **Causes**
  - **Setter or hatcher ventilation and temperature not uniform**
  - Mix of eggs from young and old breeders
  - Mix of eggs from different strains (breeds)
  - Variation in egg storage
  - Mix of large and small eggs
  - Variation in on farm egg storage procedures
  - Disease or stress in some breeder flocks

Chicks Stuck in Shell

- **Signs**
  - Some chicks stuck in shell
  - Chicks dry
  - Shell fragments stuck to down



- **Causes**
  - **Humidity too low during incubation and/or hatching**
  - **Transfer cracks**
  - **Cracked eggs or poor shell quality**
  - Improper egg turning

JAMESWAY

Stubby Down

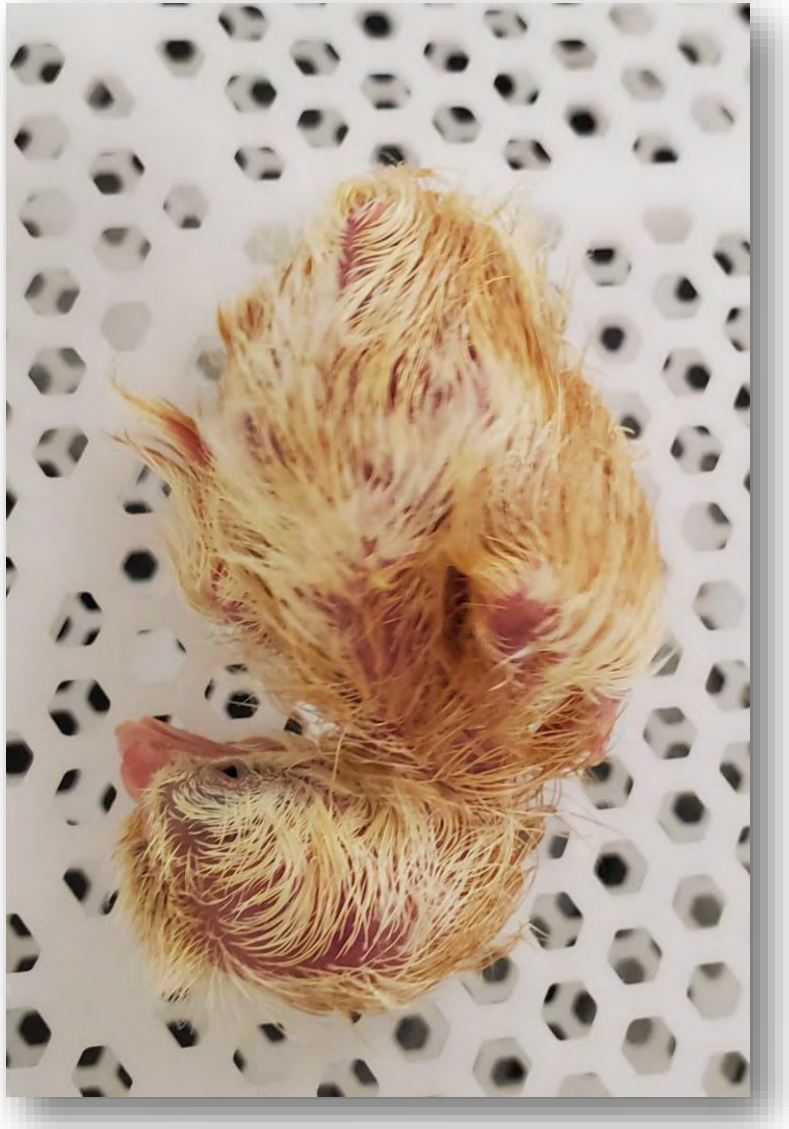
- **Signs**
  - Short chick down
  - Wiry chick down
- **Causes**

  Incubation temperature too high (day 1-14)
  - Nutritional deficiencies
    - Riboflavin
  - Mycotoxins or other inhibitory toxins

JAMESWAY

Sticky Chicks

- **Signs**
  - Wet chicks
  - Chicks smeared with albumen
- **Causes**
  - **Setter temperature too low**
  - **Setter humidity too high**
  - **Improper turning**
  - Old eggs
  - Very large eggs



JAMESWAY

Weak Chicks

- **Signs**
  - Lethargy
  - Poor livability at 7-days
  - Small and ruffled
- **Causes**
  - Hatcher temperature too high
  - Poor hatcher ventilation
    - CO_2, O_2
  - Excessive fumigation
  - Contamination

JAMESWAY

Small Chicks

- **Signs**
  - Chicks too small

- **Causes**
  - **Small eggs**
  - **Setter temperature too high**
  - Humidity too low during storage or incubation
  - Hatchery at high altitude
  - Thin, porous eggshells

JAMESWAY

Star Gazers

- **Causes**
  - **Biology?**
  - Temperature too high
  - Egg turning problems
  - Genetically related

JAMESWAY

Spraddled Legs

- **Signs**
  - Spraddled legs
  - Crooked toes
- **Causes**
  - **Hatchery basket floor too smooth**
  - Setter temperature too high or too low
  - Inadequate nutrition

JAMESWAY

Summary

Data	Obtain accurate DATA, record it, and express the data as a percentage.
Normal?	Determine what is ‘normal’ for the hatchery.
Evaluate	Compare the areas of concern with embryo development patterns and stages of incubation.
React	Draw correlations with embryo breakout patterns and on farm 7-day livability and REACT.

Questions?

Webinars@Jamesway.com

-or-

Keith.Bramwell@Jamesway.com

-or-

Phillip.Perry@Jamesway.com

-or-

Henry.Kohl@Jamesway.com

YOUR PARTNER
FOR A
WORRY FREE HATCHERY

JAMESWAY