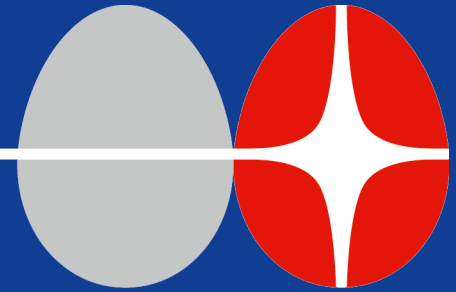


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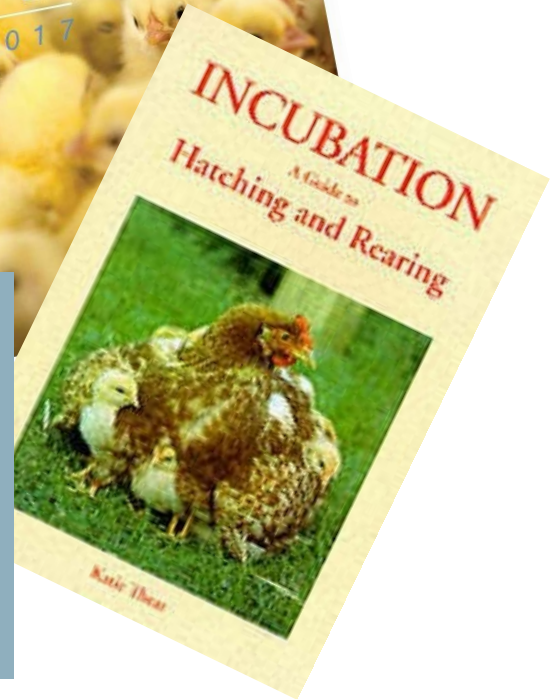
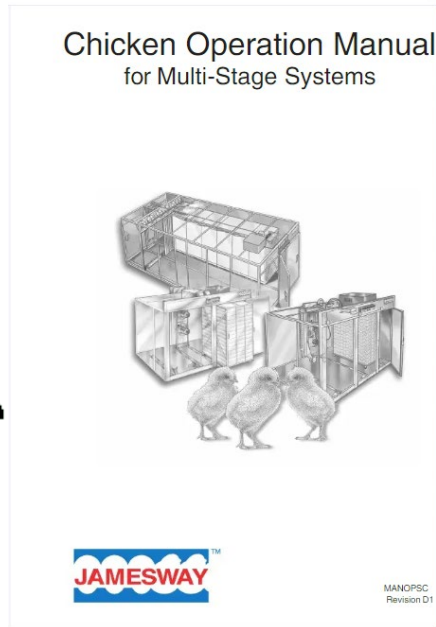
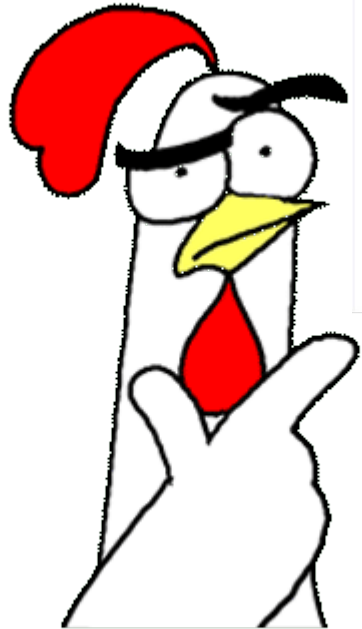
The Incubator Company

Hatch Residue Breakout: Finding Clues for a Better Hatch



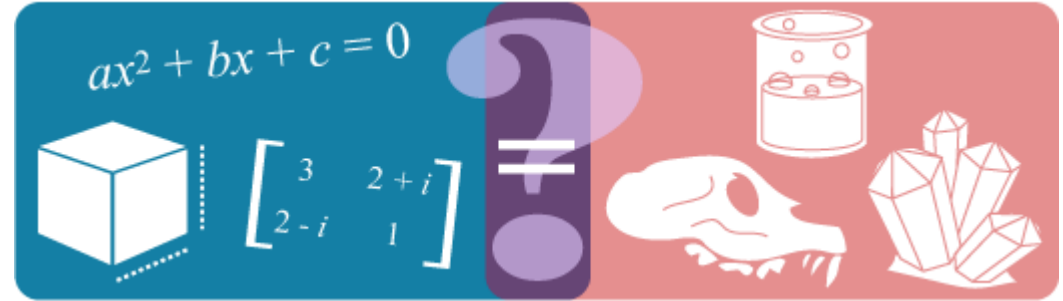
R. Keith Bramwell, MS, PhD
Hatchery Consultant Manager
Senior Technical Advisor
Jamesway Incubator Company
Keith.Bramwell@Jamesway.com





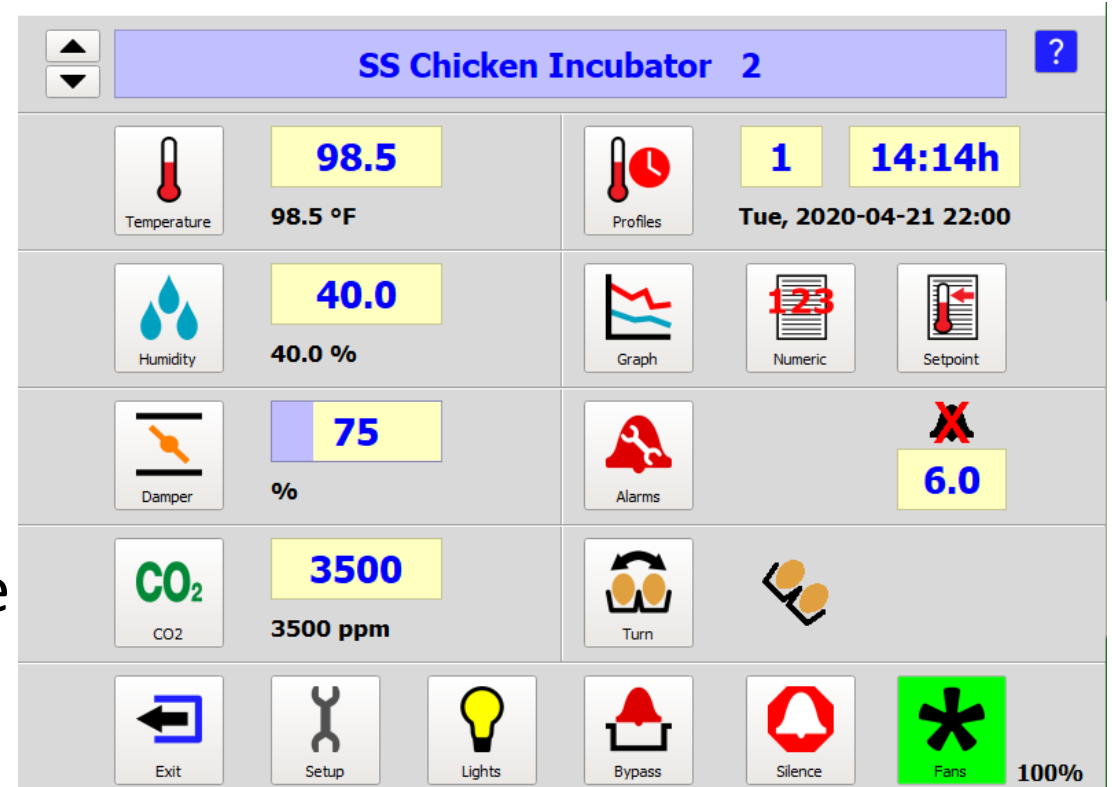
Hatchery Operation

- These are all “Guides”
- Incubation is a Science, but.....
- It is also an art, we have to be willing to adjust

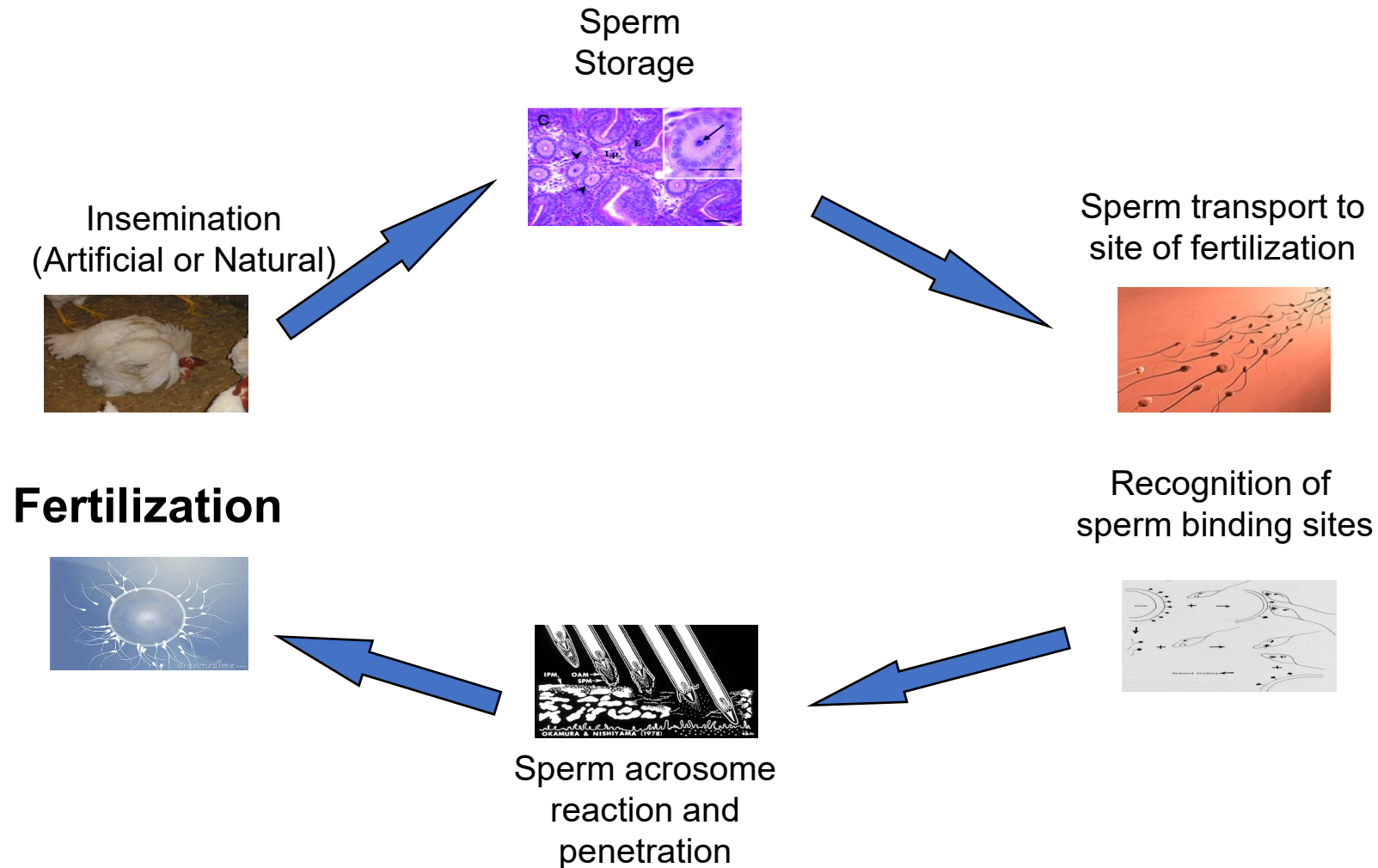


The Basics of Incubation

- Temperature
 - Controls embryo growth rate (faster or slower)
- Humidity
 - Controls moisture loss
- Ventilation (gas exchange)
 - Temperature & moisture exchange
- Turning
 - Embryo movement/development

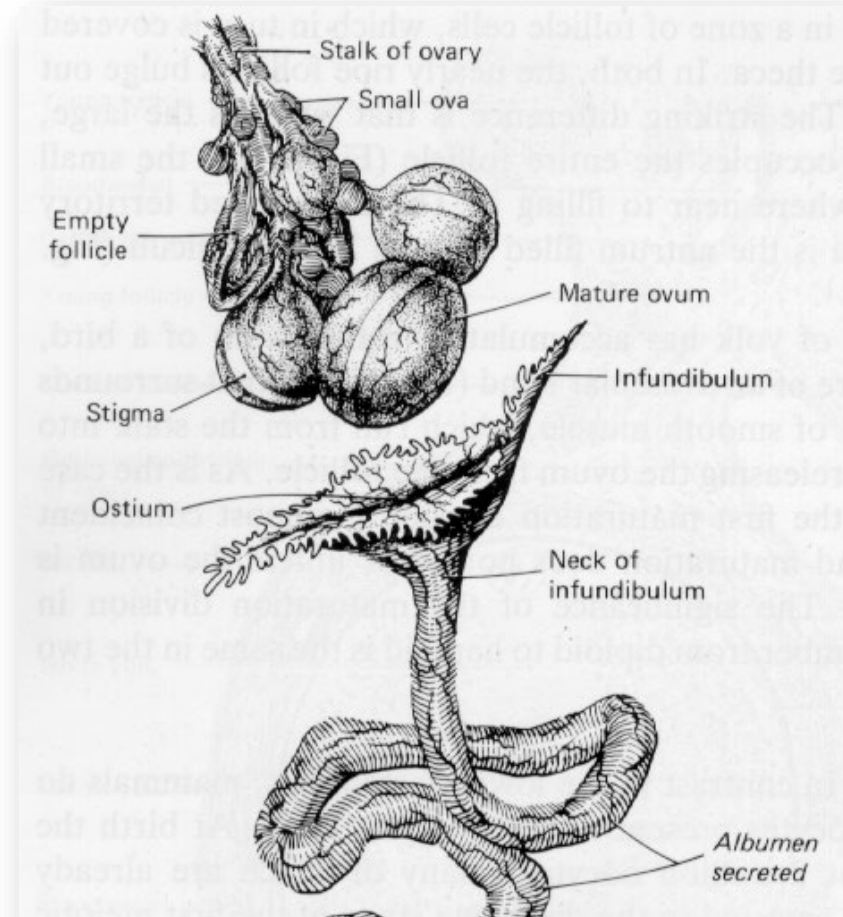


Fertilization Process



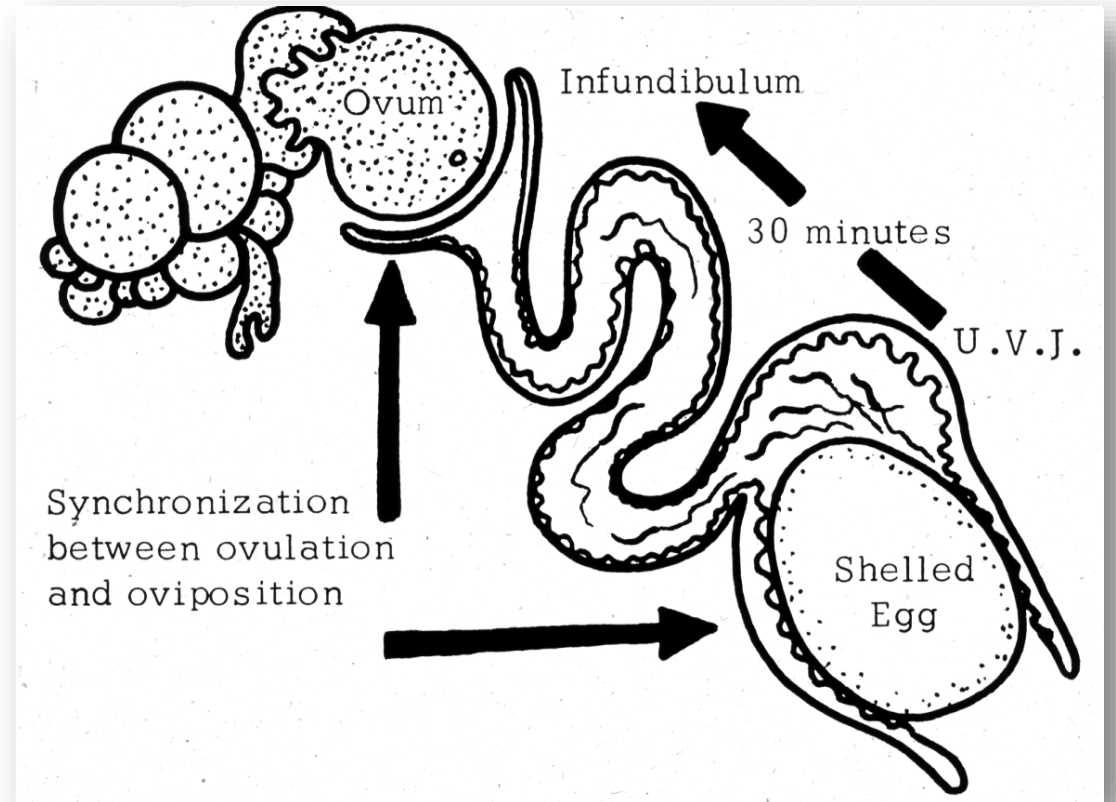
Fertilization Process

- Location - Infundibulum
- Funnel shaped – acts to engulf ovum



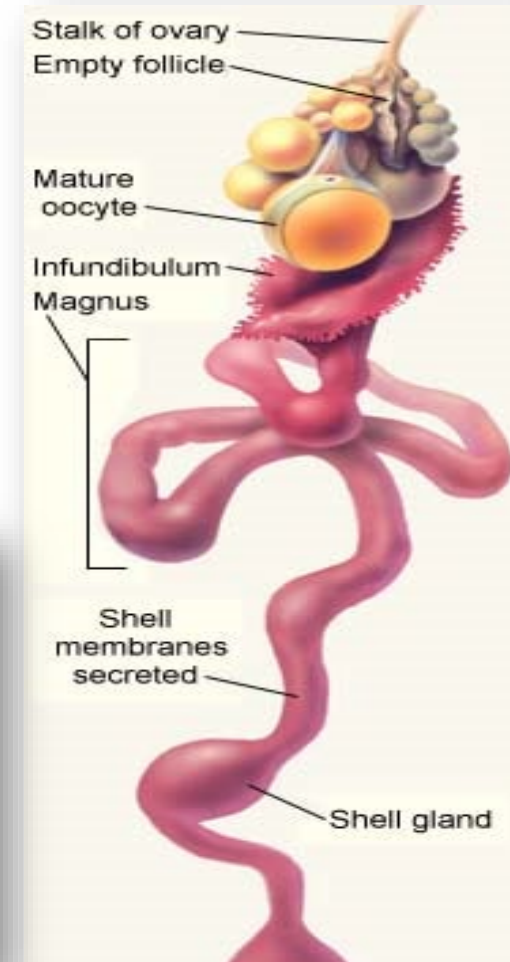
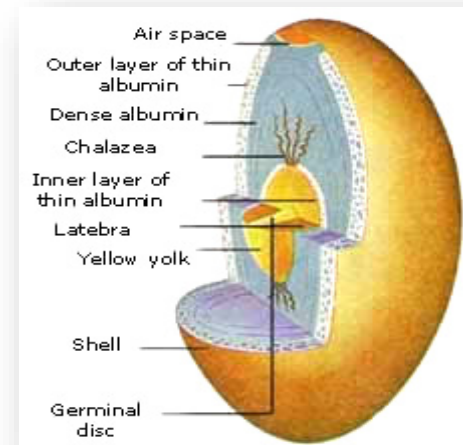
Fertilization Process

- Fertilization occurs < 5 minutes after ovulation
- Capture of ova is not necessarily a result of ovulation
- Ova present ~ 15 minutes (in chickens)



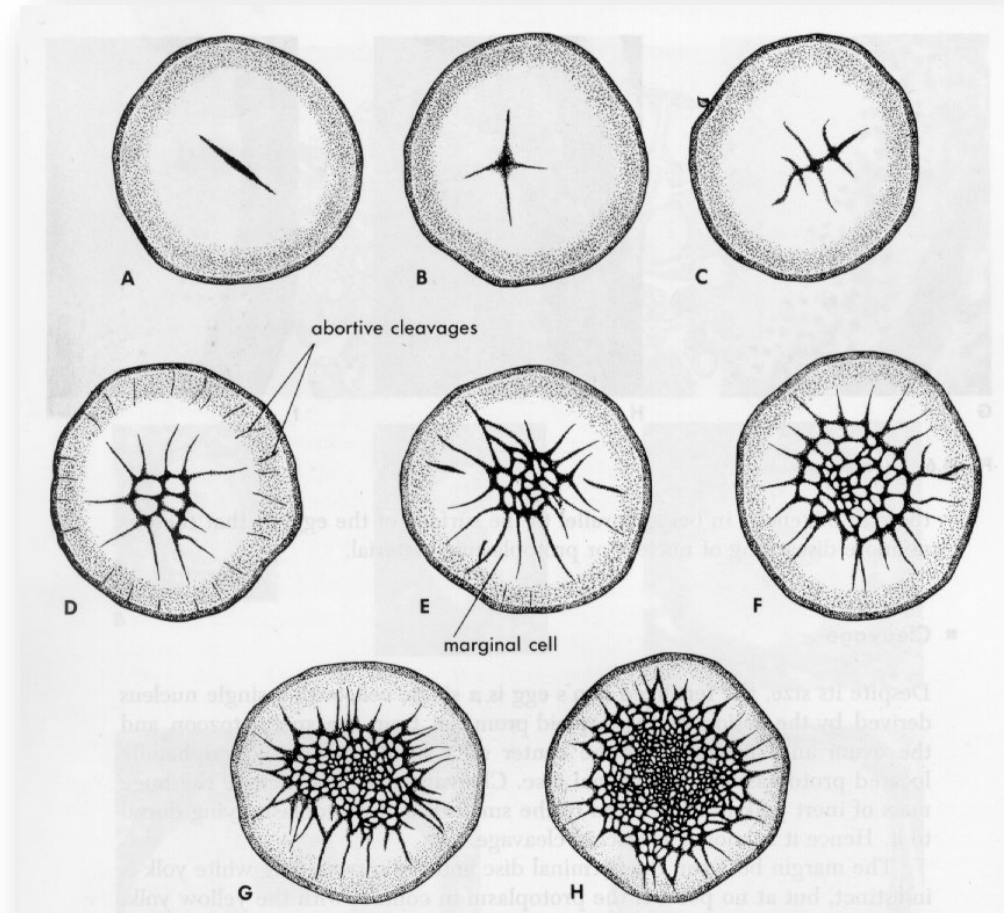
Fertilization Process

- Shell formation:
24-26 hours to complete
- Hen's body temperature:
40 - 41° C (104 – 105 F)



Fertilization Process

- Fertilization occurs within 5 minutes after ovulation
- Shell formation takes 24-26 hours to complete
- Hen's body temperature 40 - 41° C (104 - 105 F)
- Laid egg represents 1 days embryonic growth (up to 80,000 cells)



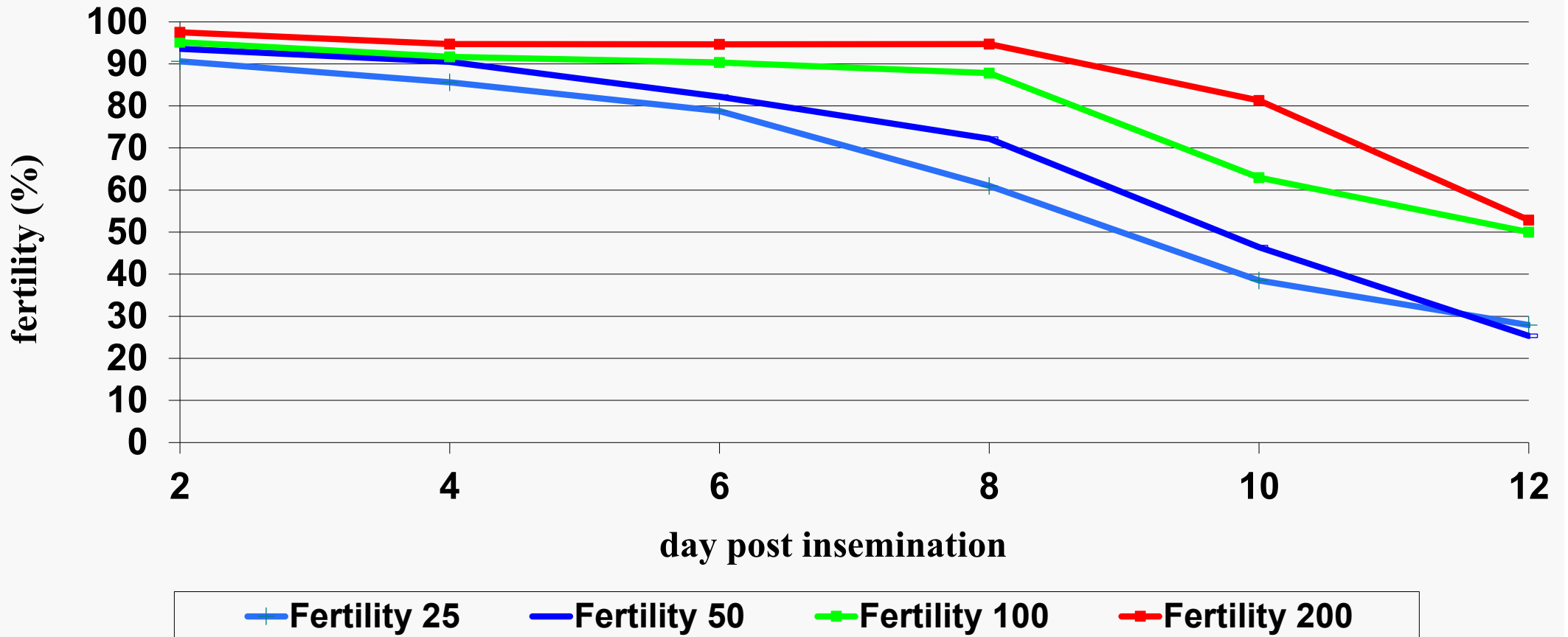
Infertile vs Fertile Eggs



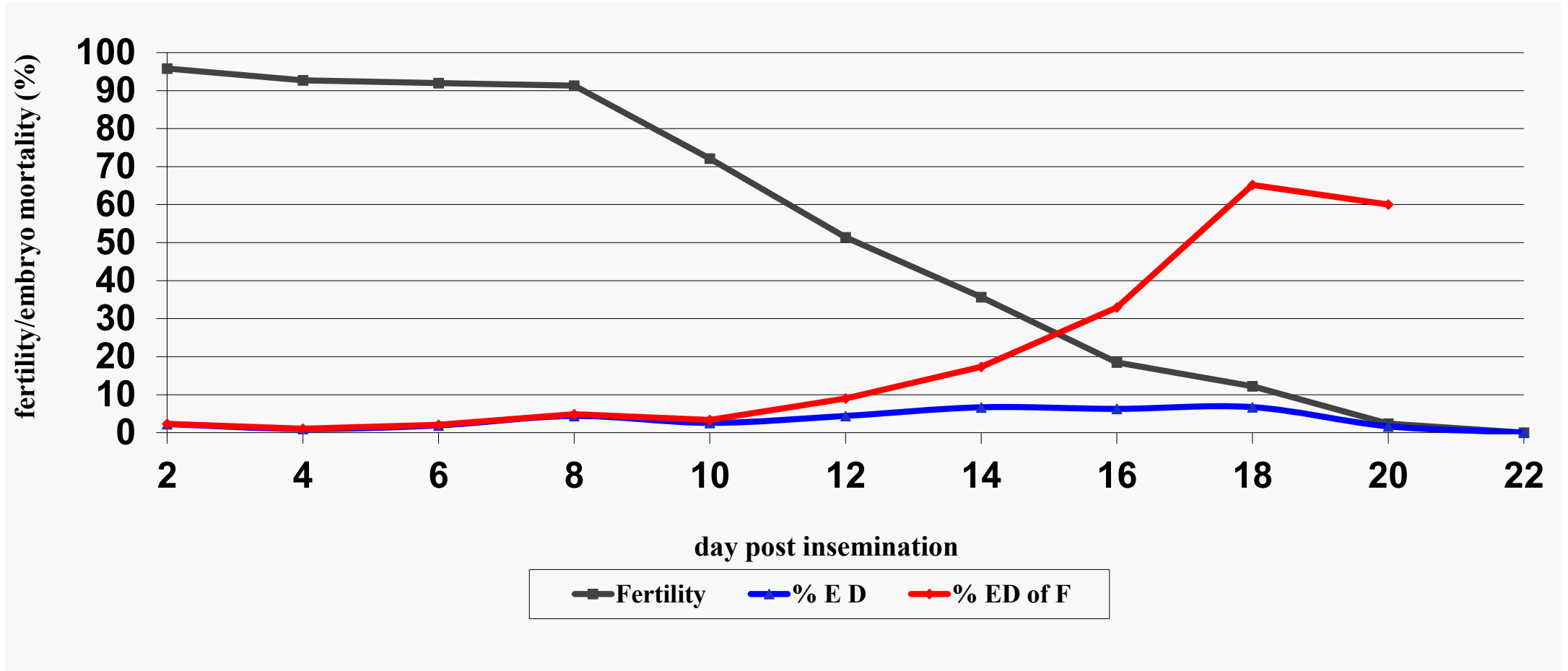
Infertile egg

Fertile egg

Fertility & Embryonic Mortality



Fertility & Embryonic Mortality



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





Trouble Shooting Hatchery Problems

Can the problem be identified with:

- Specific flocks or flock ages?
- Specific setters, hatchers or other equipment?
- Any unusual weather patterns?
- Seasonal changes?
- Recent changes in management practices or personnel?





Trouble Shooting Hatchery Problems

- Does the problem persist?
- Do you know what is *normal*, or what should be expected?
- How has this same bird or combination performed in the past?





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





Embryology Staging and Development

- A Series of Normal Stages in the Development of the Chick Embryo.
 - **V. Hamburger & H.L. Hamilton**, *Journal of Morphology*, (1951)
- The Avian Embryo. Structural and Functional Development.
 - A.L. Romanoff, New York (& London), (1960)





What is Acceptable or 'Normal'?

- This is a ***biological system***, therefore:
- Fertility? 100% is NOT possible!
- Hatch of Fertile? 100% is NOT possible!
- Hatchability? 100% is NOT possible!
- Chick Quality? 100% perfect is NOT possible!





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
- 

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[illegible][illegible]

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Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set: _____	Transfer Age: _____	Moisture Loss: _____	

Transfer

[illegible]



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

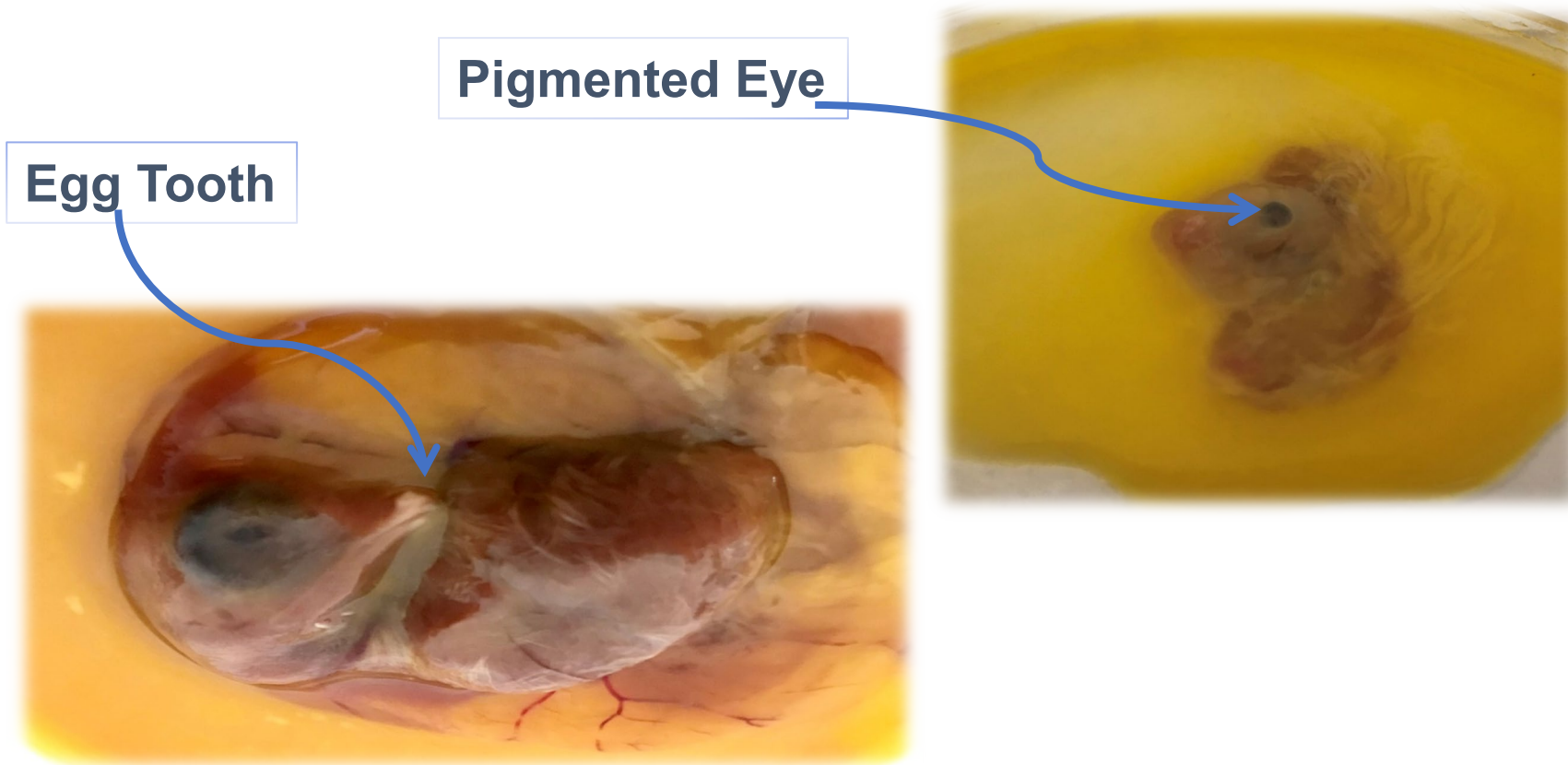


Infertile vs Fertile Eggs

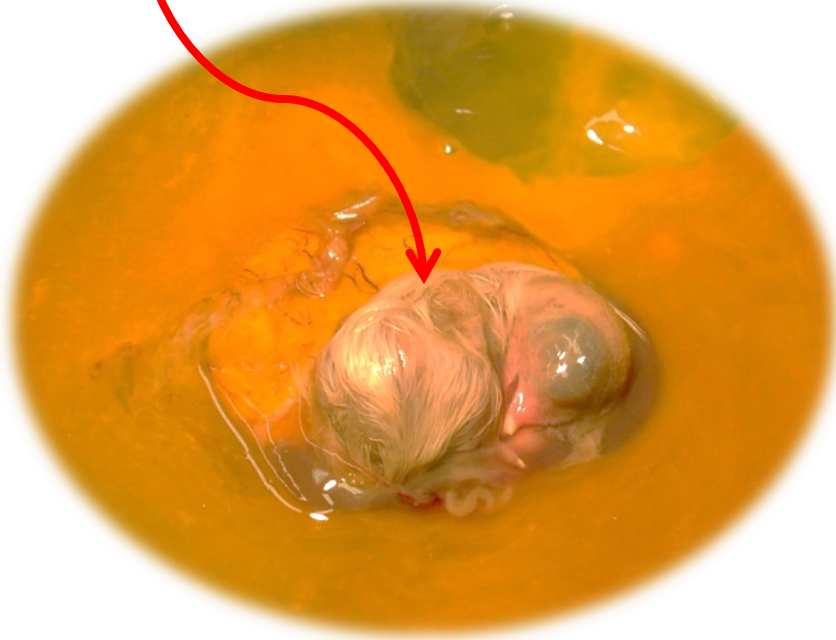


Infertile egg

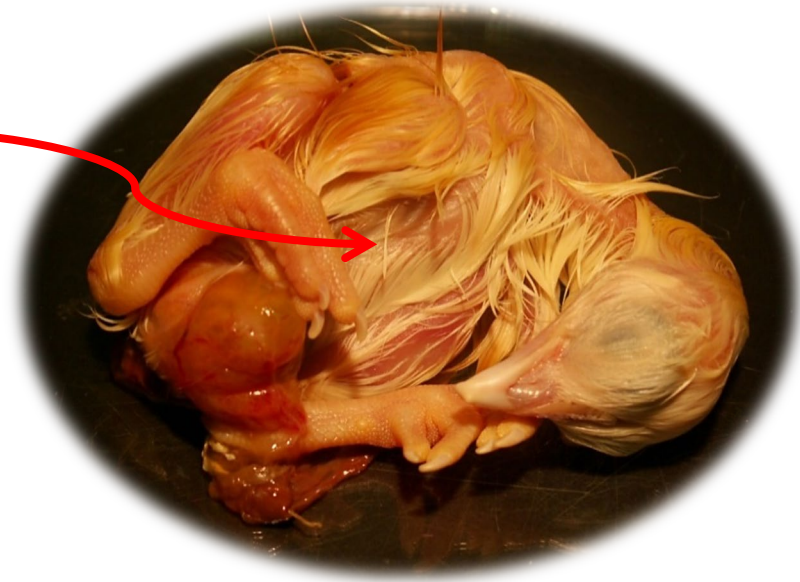
Fertile egg



Down covering



Yolk withdrawn



Hatch Residue Breakout Sheet

Keith Bramwell MS, PhD. Jamesway Incubator Company



The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____	
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____	Moisture Loss: _____

Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes

Tray # position	Live pip	- 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										Cull egg	Misc.



Hatch Residue Breakout Sheet

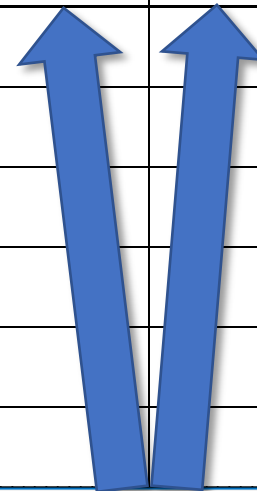
Keith Bramwell MS, PhD. Jamesway Incubator Company



The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____	Moisture Loss: _____	

Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes



Tray # position	Live pip	Fertile egg – Donut shaped germinal disc										Cull egg	Misc.



Hatch Residue Breakout Sheet

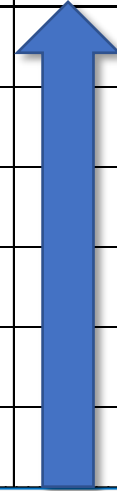
Keith Bramwell MS, PhD. Jamesway Incubator Company



The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
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Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes



Tray # position	Live pip	Day 4 – Eye pigmentation Prominent										Cull egg	Misc.



Hatch Residue Breakout Sheet

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The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
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Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____	Moisture Loss: _____	

Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes



Tray # position	Live pip	Day 8 – Egg tooth present and Prominent										Cull egg	Misc.



Hatch Residue Breakout Sheet

Keith Bramwell MS, PhD. Jamesway Incubator Company



The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____
				Moisture Loss: _____

Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes



Tray # position	Live pip	Day 15 – Chick down Prominent										Cull egg	Misc.



Hatch Residue Breakout Sheet

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The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____	Moisture Loss: _____	

Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes



Tray # position	Live pip	Day 19 – Yolk sac withdrawn into body										Cull egg	Misc.



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Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____	Egg age: _____	Moisture Loss: _____
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	Moisture Loss: _____
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____	Egg age: _____	Moisture Loss: _____

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Hatch Residue Breakout Sheet

Keith Bramwell MS, PhD. Jamesway Incubator Company



The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set _____	Transfer Age: _____	Moisture Loss: _____	

Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes
Top	168	153	5	3	1	2.38%	1	1	4	2.98%	5.95%		
168 = 153 + 5 + 3 + 1 + 1 + 1 + 4													
Every egg needs to be accounted for here													





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



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Hatch Residue Breakout Sheet

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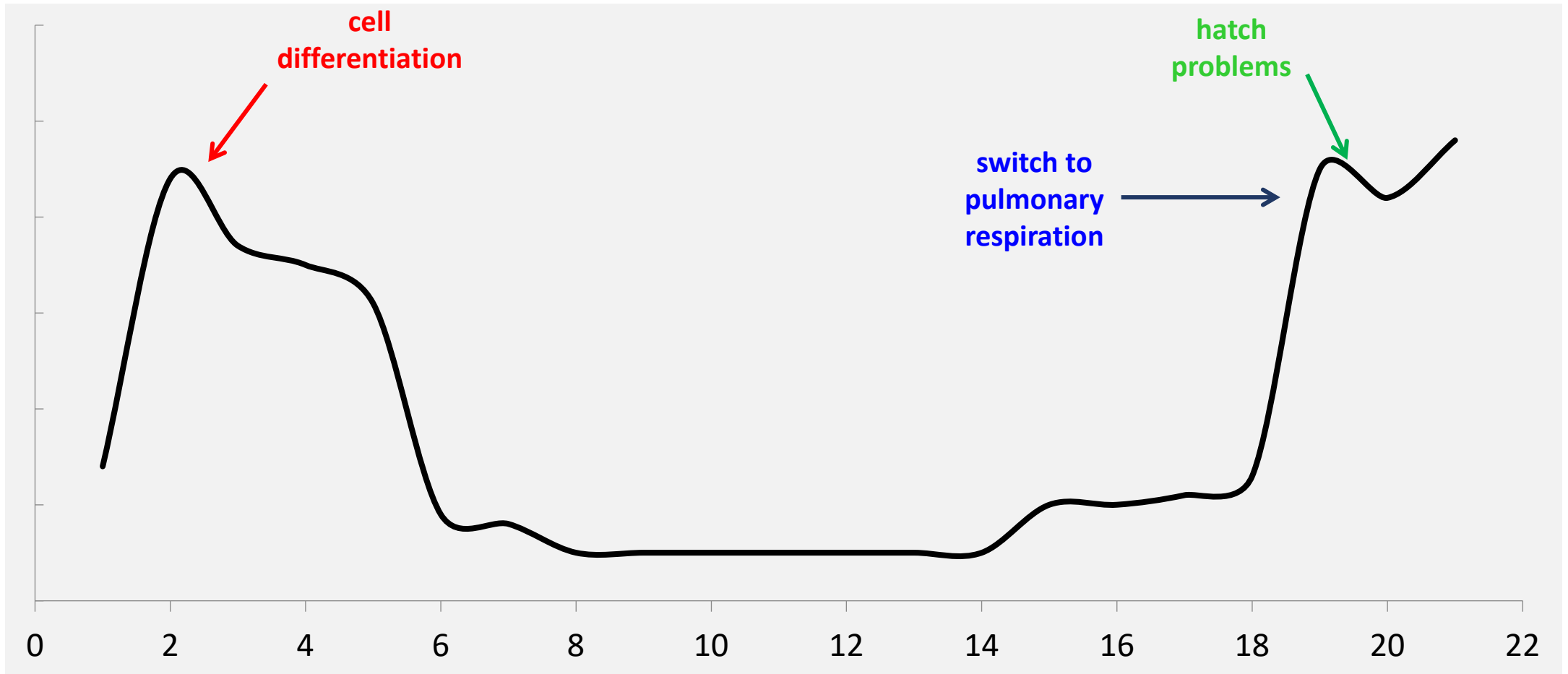
The Incubator Company

Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set: _____	Transfer Age: _____	Moisture Loss: _____	

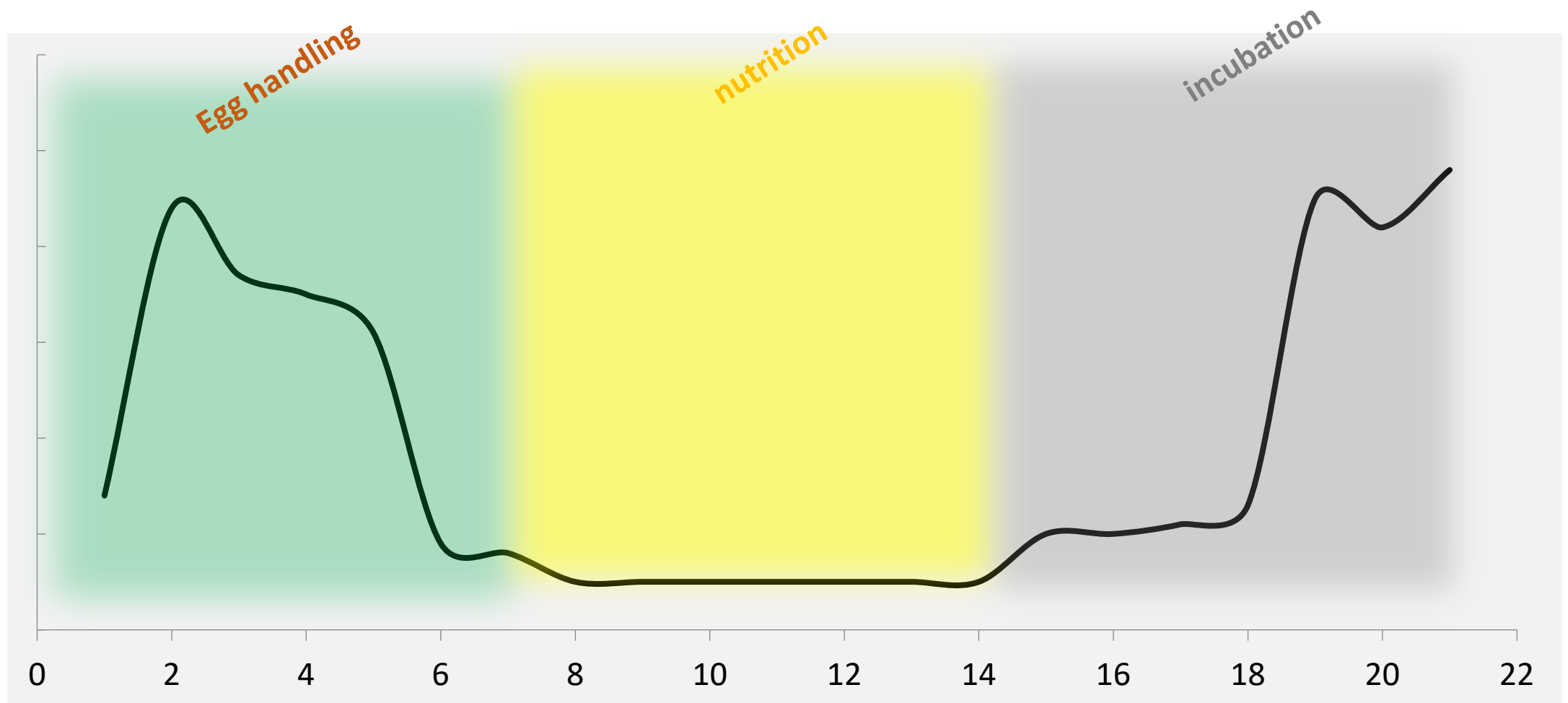
Tray # position	Eggs/tray	Chicks hatched	Infertile	0 - 3 d	4 - 7 d	Total early	8 - 14 d	15 - 18 d	19 - 21 d	Total late	Total Emb Loss	Cull Chick	Notes
Top	168	153	5	3	1	2.38%	1	1	4	2.98%	5.95%		
				3 + 1 + 1 + 1 + 4 = 10; 10/168 = 5.95%									
						2.38% + 0.60% + 2.98% = 5.96%							
Tray # position	153 / 168 = 91.1% total hatch					Transfer crack	Other crack	Mold	Early Cont.	Late Cont.	Small end up	Cull egg	Misc.
	153 / 163 = 93.9% hatch of fertile												
	5.95% embryo loss + 93.9% HoF = 99.9%												



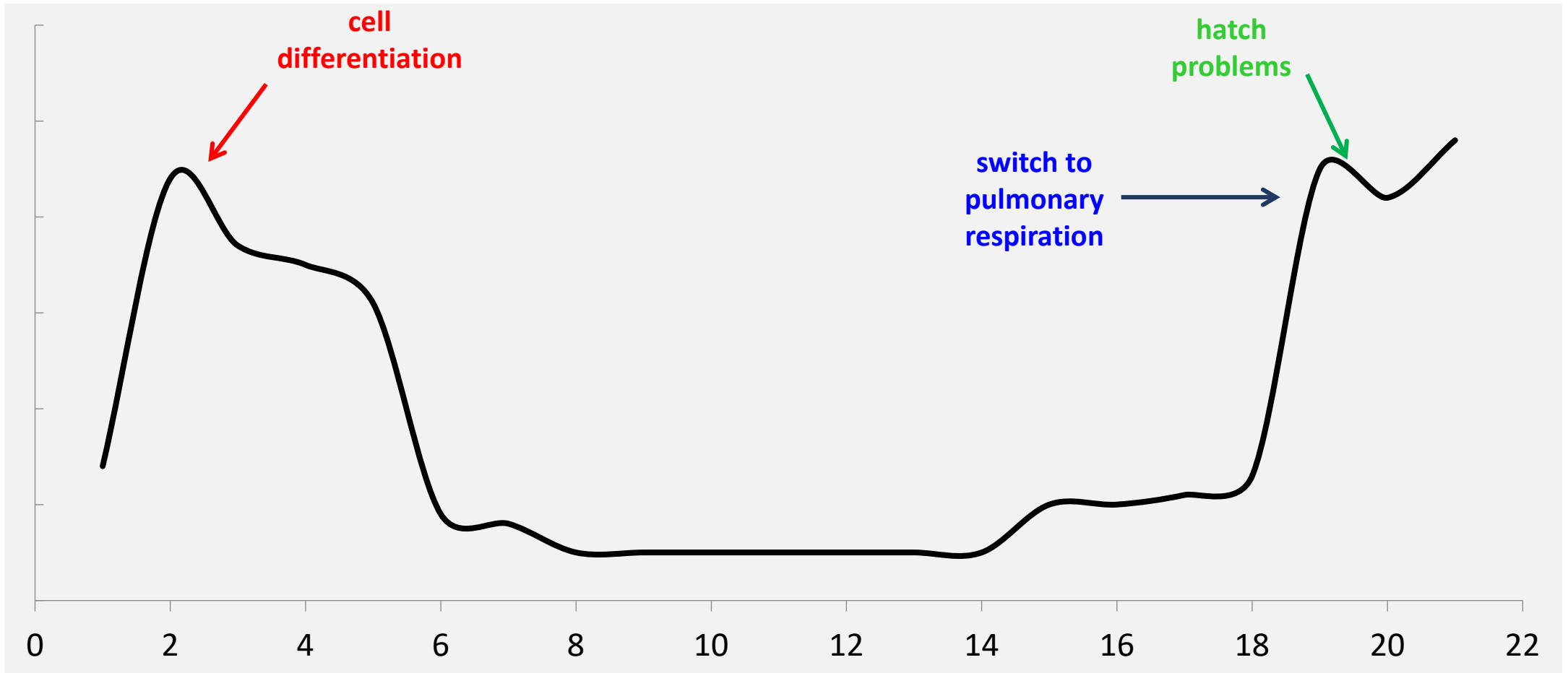
Percent Mortality of Fertile Eggs



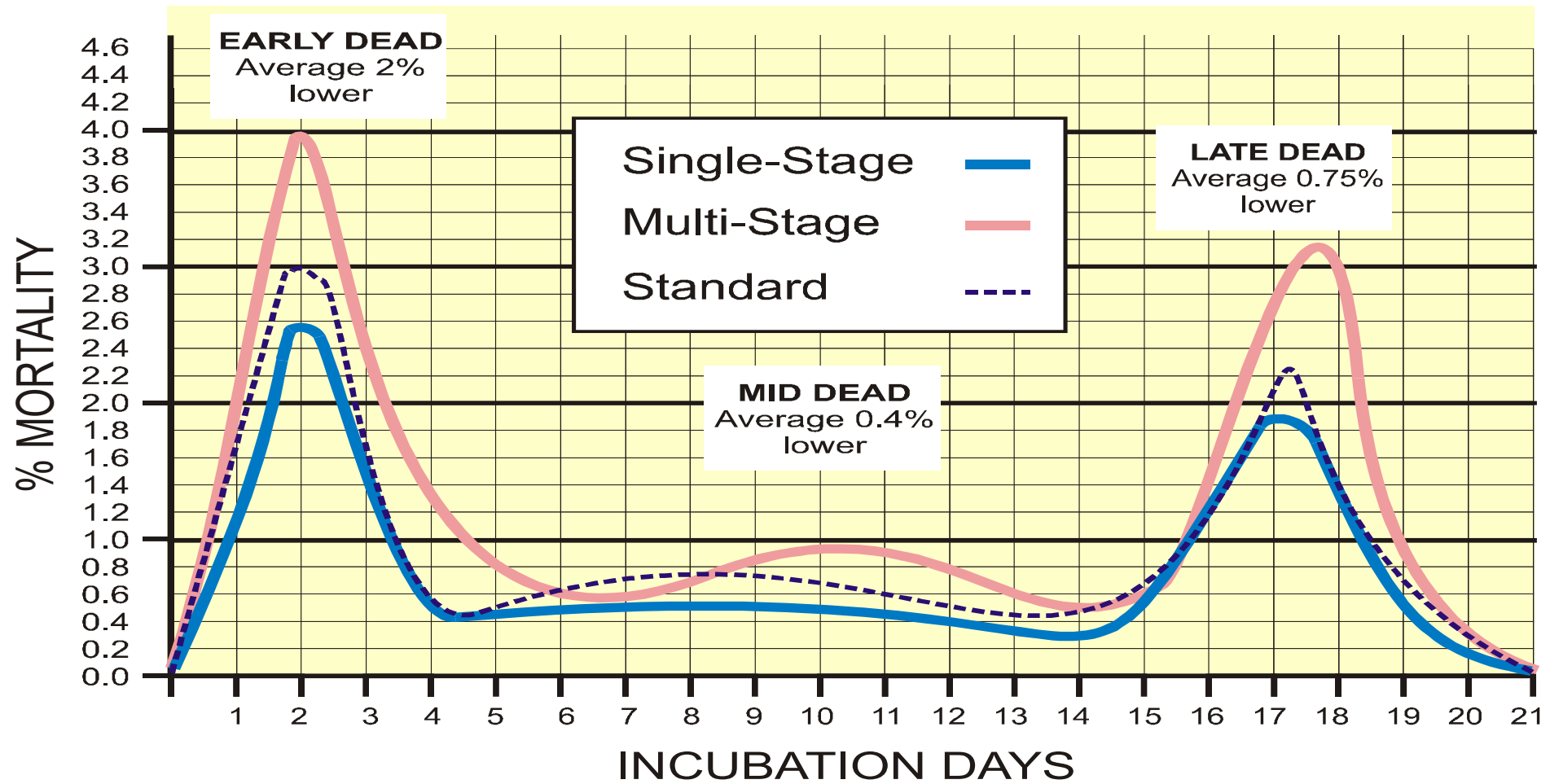
Percent Mortality of Fertile Eggs



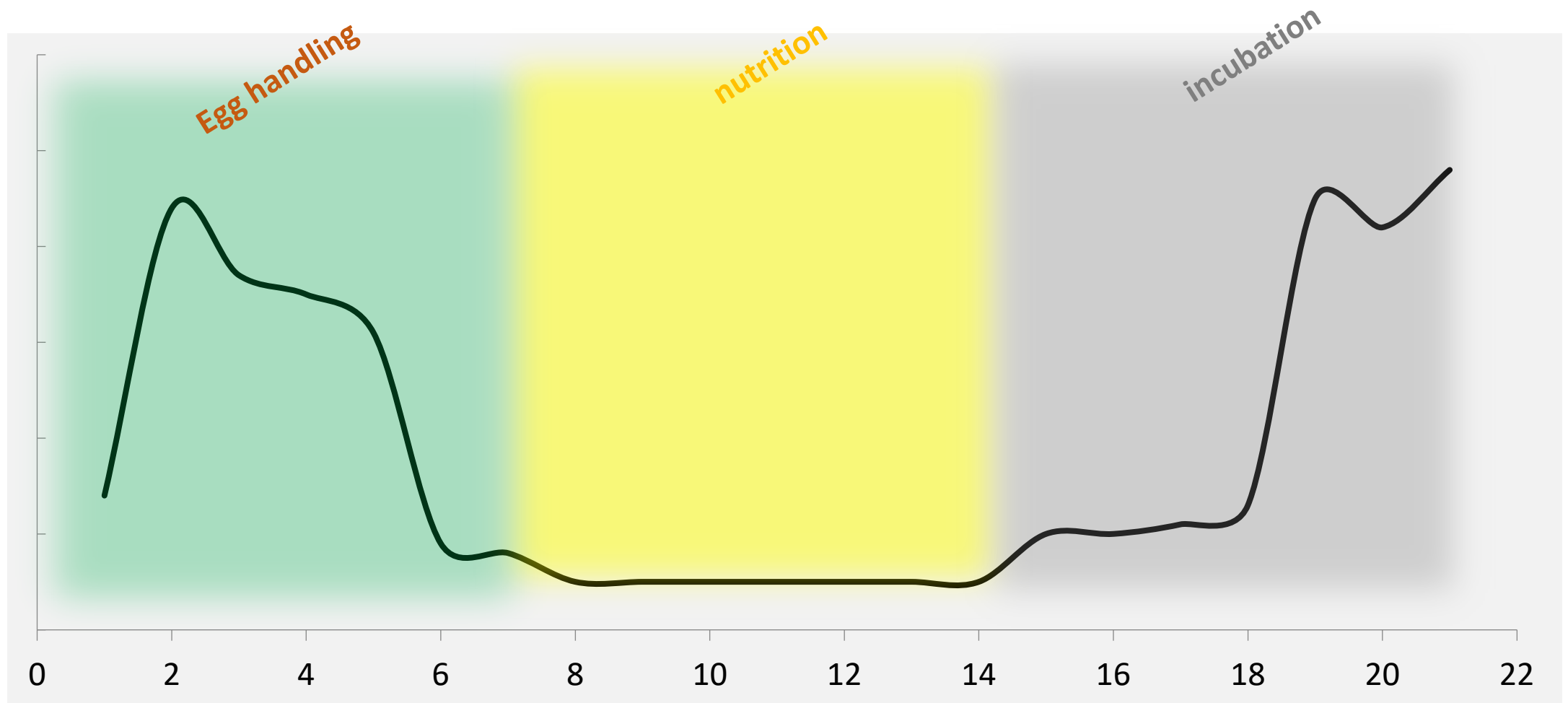
Percent Mortality of Fertile Eggs



Typical Embryo Mortality Trend



Percent Mortality of Fertile Eggs

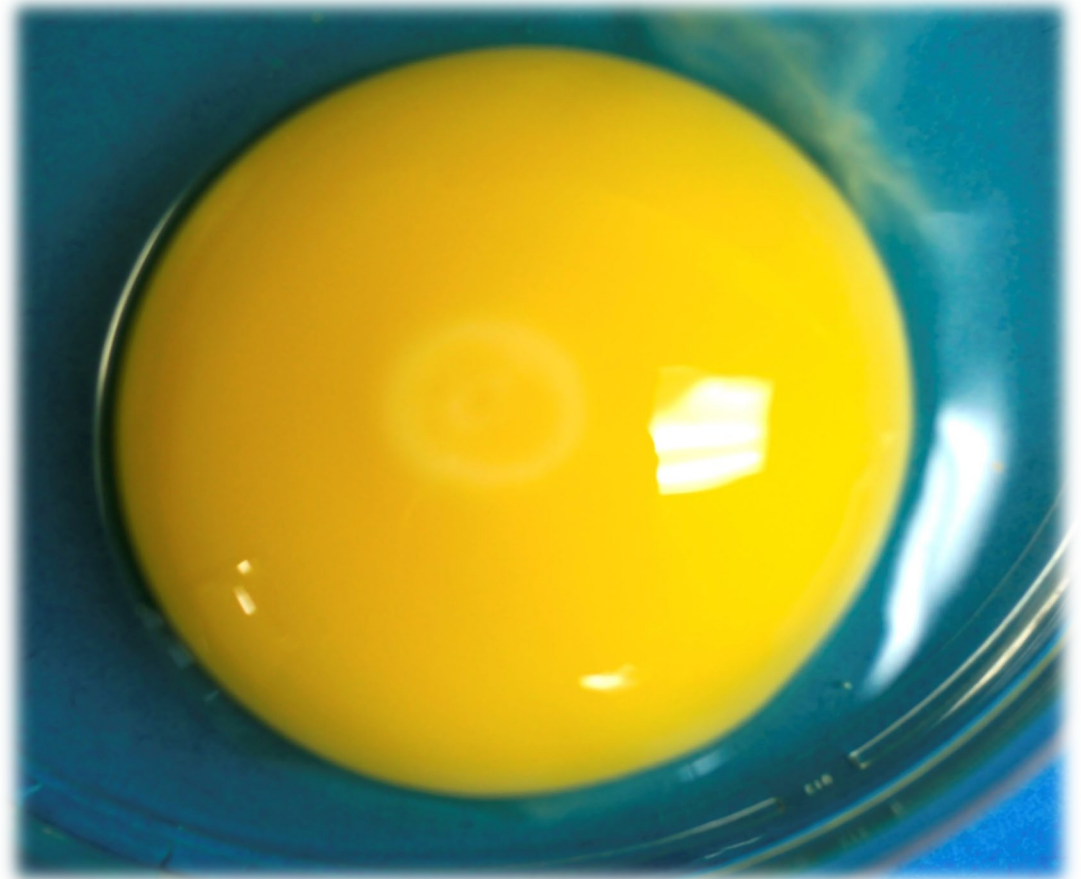


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Fertile Eggs

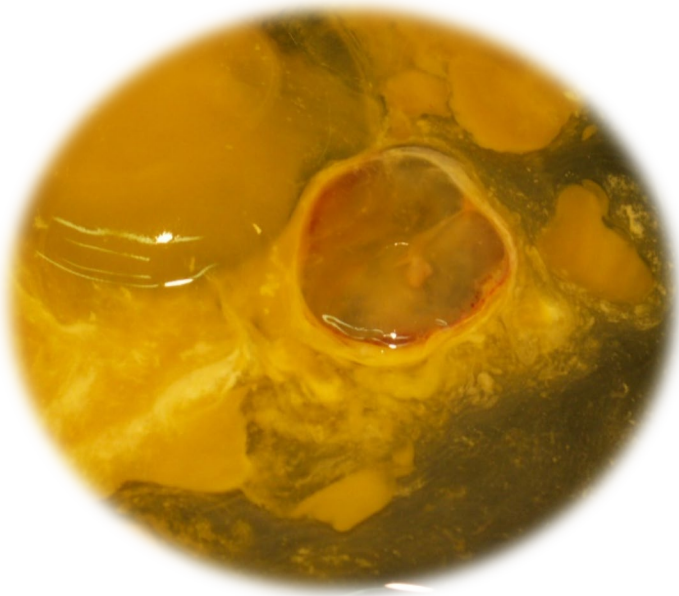
- Fertile germinal disc
 - Shows some pre-incubation, or pre-development
- 12 hours of development



Day 3

Embryonic Development

- Heart beats
- Blood vessels very visible



Troubleshooting Guide

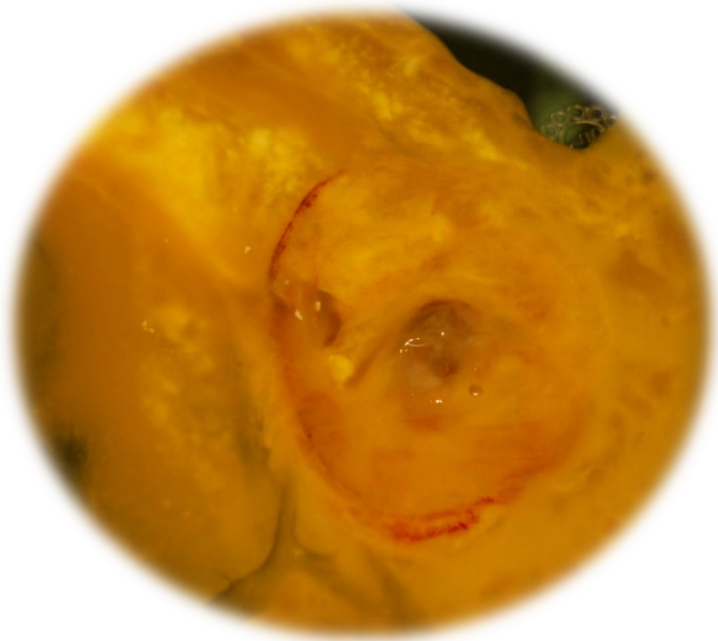
- Low fertility
- Pre-incubation, poor egg storage
- Improper egg holding time
- Rough setting of eggs



Day 4

Embryonic Development

- Eye pigmentation easily visible



Troubleshooting Guide

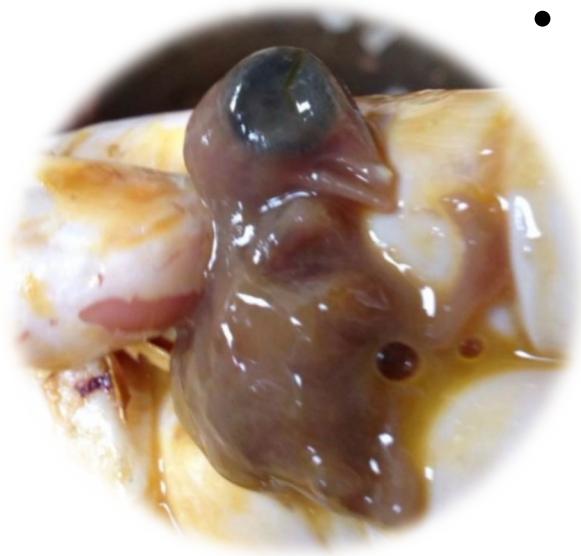
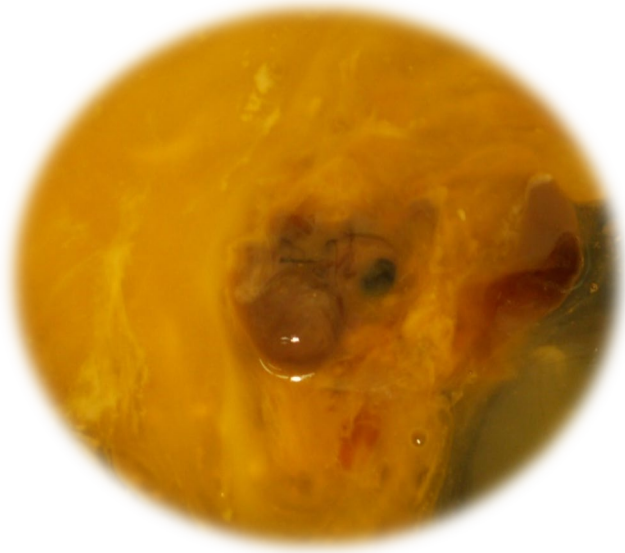
- Pre-incubation, poor egg storage
- Improper egg holding time
- Rough setting of eggs
- Contaminated eggs
- Drugs-toxins



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



Day 15

Embryonic Development

- Gut is drawn into abdominal cavity
- **Chick down covering Prominent**



Troubleshooting Guide

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



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

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



Day 20

Embryonic Development

- Yolk sac drawn completely into body
- Embryo becomes a chick(breathing in air cell)
- Internal & external pip



Troubleshooting Guide

- Hatcher ventilation
- Hatcher temperature
- Rough transfer
- Wet trays and hatcher
- Improper turning
- Improper temperature
- Improper humidity
- Improper ventilation
- Inverted eggs
- Vaccination



Day 20

Embryonic Development

- Yolk sac drawn completely into body
- Embryo becomes a chick(breathing in air cell)
- Internal & external pip



Troubleshooting Guide

- Breeder disease
- Poor shell quality
- Hatcher temperature
- Hatcher ventilation
- Time of transfer



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Hatchery: _____	Incubator: _____	Hatch % : _____	Flock ID: _____	Set Time: _____		
Break-out date: _____	Hatcher: _____	HOF % : _____	Flock age: _____	Transfer Time: _____	Egg age: _____	
Set Date: _____	Setter Type: _____	Fertility %: _____	# Eggs set: _____	Transfer Age: _____	Moisture Loss: _____	

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Pipped

- Signs
 - Dead in shell
 - Full-term embryo



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





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
- Setter temperature too high or too low
- Humidity too high
- Old breeders
- Round shaped eggs or very large eggs





Slow Hatch

- 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`



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



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
 - Vitamin deficiency



Brain Hernia (Exposed Brain)

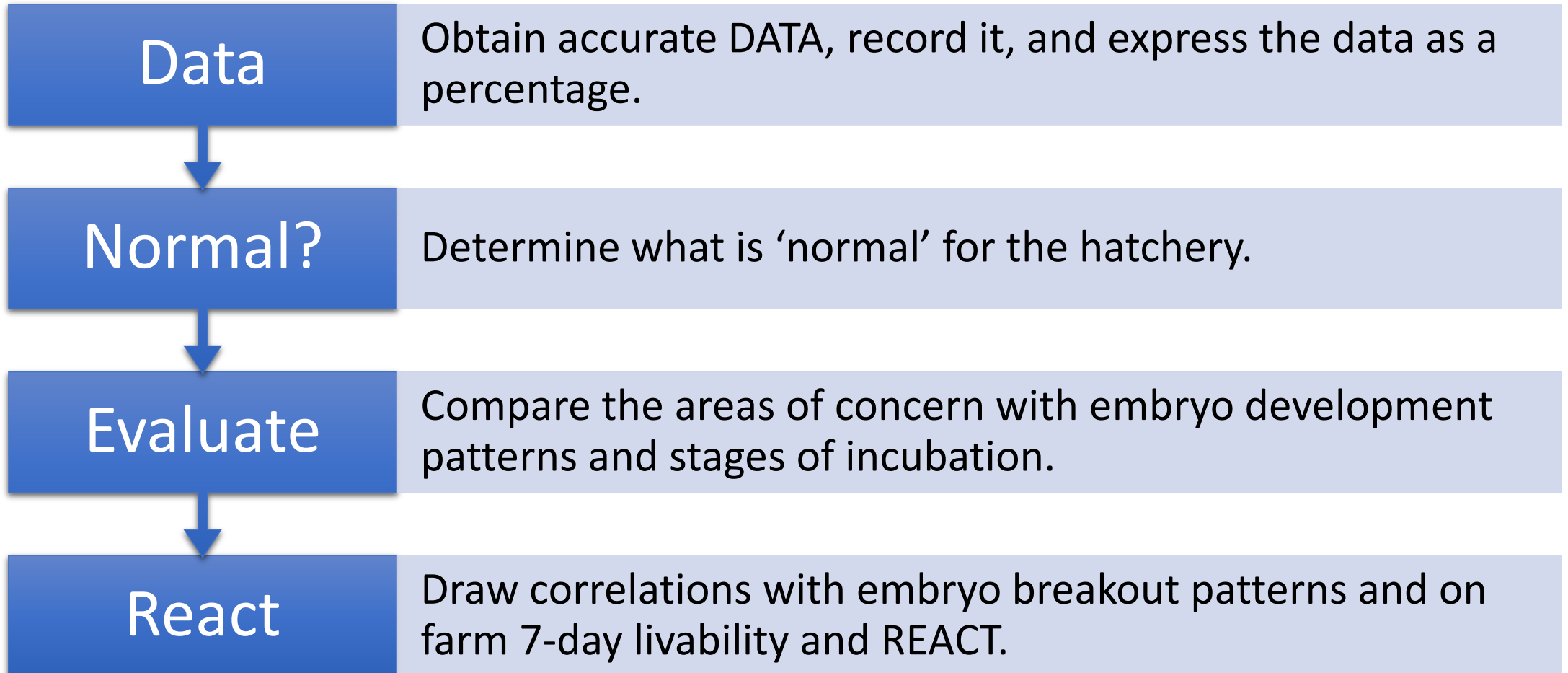
Causes

- Temperature too high (early)
- Egg turning problems
- High CO₂ level
- Equipment malfunction





Summary



A background image showing a group of yellow chicks in a basket. The chicks are fluffy and yellow, with some looking towards the camera. The basket has a light-colored, possibly wooden or plastic, slatted structure.

Questions?

Webinars@Jamesway.com

-or-

Keith.Bramwell@Jamesway.com



YOUR PARTNER FOR A WORRY FREE HATCHERY

