Hatchery breakouts for improving turkey hatch and poult quality

Turkey hatcheries provide a highly controlled environment which maximises the successful hatching of healthy poults. Constant monitoring of hatchability and breakouts of unhatched eggs helps hatchery managers maintain high levels of poult survival, welfare and quality.

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Egg breakout or hatch residue analysis is a powerful diagnostic tool for hatcheries. Breakouts can be used to aid troubleshooting, establishing trends, or optimise hatch results.

The egg tells a story of the timeline of events from when the egg is formed inside the hen and all the way through the hatching process. Egg breakouts do not substitute looking at the birds, but provide an important insight into breeder nutrition, health, egg handling, incubating, and hatching parameters. For example, close attention to egg breakouts can indicate toxin or nutritional deficiencies before clinical signs are seen in the breeder flock.

When used in conjunction with other hatchery tools, detailed breakouts can result in significant improvements. Nevertheless, they are often overlooked due to a lack of understanding of their importance, inability to interpret them, or lack of time and resources.

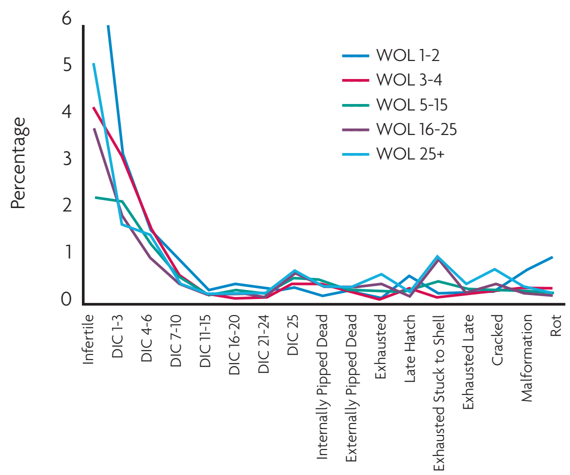
Establish the norms

Most hatcheries have some sort of hatch residue breakout process but it can be too simplistic.

The programme may only consist of looking at the 'poor hatches', only looking at one tray, or use generic breakout sheets. In order to establish trends, track embryonic changes, or identify potential areas to improve hatch, you must examine the breakouts thoroughly and frequently.

In order to understand the 'poor hatches', you must understand what embryonic mortality is in the 'good hatches' and have a base understanding as to what is 'normal' for specific lines and for specific weeks in lay.

Fig. 1. Embryonic mortality classes for a flock with a good hatch of fertile (HOF) of 93.4% The lines show the results of the hatch breakouts by week of lay (WOL) during the flock lifetime.



Flock Details	Embryonic mortality stage	Lesions	Tray Culls
Date:	Infertile	Aspergillus	Dead
Flock	DIC 1 to 3	Big Belly	Exhausted
Week of lay	DIC 4 to 6	Blue Legs	Late
Sample size	DIC 7 to 10	Deformed Legs	Cull/Legs
Breakout HOS	DIC 11 to 16	Infected Yolk	
Breakout HOF	DIC 16 to 20	Malpositions	
Breakout fertility	DIC 21 to 24	Mottled Yolk	
Sample location/position	DIC 25 Day Dead	Pipping Muscle	
	Internally Pipped Dead	Residual Albumen	
	Externally Pipped Dead	Ruptured Yolk	
	Pipped Alive Exhausted	Short Legs	
	Pipped Alive Late Hatch	Skin Necrosis	
	Exhausted Stuck to Shell	Thick Membrane	
	Exhausted Late	Thin Shell	
	Cracked	Urates	
	Malformations		
	Cull Egg		
	Rots		
	Transfer Crack		

Fig. 2. Components to be included in a detailed breakout analysis (Source: Aviagen Turkeys Management Guidelines for Turkey hatcheries), DIC = Day in cycle.

Once 'normal' has been established (Fig. 1) and expectations are set, slight variations between flocks and hatches can be readily seen. These variations help guide us how to optimise hatch and poult quality in each scenario.

Consider the variables

Examination of one tray is insufficient to give an accurate representation of what is happening in a machine or flock.

Breakouts will change based on location in the egg store, incubator, and or hatcher. One tray is not a large enough sample size to account for all inherent hatchery variables. For example, if you breakout one tray from the same location every hatch, you will miss the bigger picture. It may contain late hatches because this is a cool spot in the incubator.

Problems could be overlooked with the rest of the machine exhibiting classic signs of overheating, such as increased late dead and short deformed legs.

Breakout profiles change alongside genetic development of breeds. Over time, genetic progress can affect embryonic development and incubation requirements. These small changes will go unnoticed if routine breakouts are not being analysed and opportunities for optimising embryonic requirements will be missed.

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Detailed breakout

Many hatcheries use a generic breakout sheet that typically characterises a week of embryonic death and a few other categories unrelated to incubation, such as cracked or rots. The key to unlocking the potential diagnostic tool of egg breakouts lies in the detail of the breakout results. Fig. 2 shows the components that should be included in a detailed breakout form.

The more detailed and descriptive the breakouts can be, the more useful the information becomes. For example, simple classification of embryonic mortality as late dead without further details could be attributed to a wide range of causes: incubator or hatcher issue, transfer process problem, poor egg handling, or it may even be 'normal' for this particular week of lay.

If you take the same set of breakouts, classify them as an internally pipped dead with residual albumen, deformed legs, and short legs, a clearer picture is revealed which can be used to tackle the root of the issue and progress can be made.

Similar to establishing normal patterns of embryonic mortality, patterns of normal embryonic lesions should also be determined. Breakout lesions will also vary based on flock and week of lay. The lesions provide additional information with on how to tackle the individual flock issues. Causes of abnormal breakouts are diverse, ranging from environmental factors through to breeder flock nutrition, fertility, and health, egg handling, as well as incubator and hatcher conditions.

It is not only enough to be able to identify the stage in embryonic mortality, lesions, and abnormal breakouts, you must be able to interpret what the data is telling you (Fig. 3).

Egg breakout return

Egg breakouts take time and resources but are an essential hatchery operation to identify normal and abnormal patterns of development. Whilst the benefit may not be initially obvious, it will pay significant dividends when problems emerge and they assist in a swift diagnosis and correction.

Therefore, a concerted effort must be made to ensure breakouts are being done frequently and thoroughly.

The opportunity is in the trends and details. Nowhere else can anyone find a record of events from embryo formation to hatch. Breakouts will tell you all that you need to know, you just need to listen. ■

Observation	Potential Causes
Infertile	Farm problem. Extreme overheating/chilling prior to or at set (early dead is not a true infertile).
DIC 1-3	Farm problem with egg handling, cooler conditions, semen quality. Too long pre-warm. Eggs Stored for a prolonged period of time.
DIC 4-6	Same as listed for DIC 1-3 but the insult was less severe.
DIC 7-10	Pre-incubation. Too high temp during week one. Lack of turning at set.
DIC 11-15	Not very common. All previous mentioned hatchery issues but to a lesser degree.
DIC 16-20	Common if eggs are overheated during the second week of incubation. More common in multi- stage systems.
DIC 21-24	Inadequate moisture loss. Lack of oxygen. Depends on accompanying lesions.
DIC 25	Common. Key is in accompanying lesions.
Externally Pipped Dead	Inadequate moisture loss. Hatcher temperature too high. Weak embryo.
Pipped Alive Exhausted	Can be similar to externally pipped dead but to a lesser degree. Larger hatch window – later hatching poults are not in sync with the hatcher profile.
Pipped Alive Late	Inadequate start time. Too long pre-warm. Too low of a temperature in incubator or hatcher. Humidity spray nozzle issues.
Exhausted Stuck to Shell	Moisture loss issues in incubation. Most common for overheating in hatchers. Low relative humidity in hatchers.
Exhausted Late	Lower than optimal temps in hatchers. Embryo out of sync with hatcher profile. Uneven hatch timing.
Short Shanks	Overheating in the second and beginning of third week. Inadequate moisture loss.
Deformed Legs	Slight overheating over a long period of time.
Malposition	Severe overheating at any stage of incubation. Lack of turning. Eggs stored for prolonged periods of time.
Residual Albumen	Inadequate moisture loss. Overheating in the second and third week. Lack of turning at set and during the second and third weeks. Egg handling. Eggs did not have enough time to 'breathe' prior to set. Eggs packed in paper.
No Visible Lesions	Depends on the level of mortality. Typically indicates a sudden severe problem.
Skin Necrosis	Overheating in hatchers with or without high humidity.
Urates	Cooling or overheating during the second half of incubation.
Ruptured Yolk	Overheating during the third and beginning of fourth week or too rough at transfer prior to or at set.
Malformations	Depends on the type of malformation: Eye abnormalities/ectopic viscera – High temps DIC 1-6. Brain abnormalities – High temp DIC 0-3. Parrot beak/Micromelia- Nutritional. Extra limbs – rough handling or jarring of the eggs during collection/transport prior to or at set.

Fig. 3. Hatch residue troubleshooting guide. (Source: Aviagen Turkeys Management Guidelines for Turkey hatcheries).