



Incubation Research Update

Poultry Research Centre

Factsheet #3

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Measuring Chick Quality: Does an Unhealed Navel Always Mean a Bad Broiler?

- Chick health at the time of hatching can affect broiler chick quality, growth and meat characteristics. To screen for poor quality chicks at hatching, chick health is currently judged by looking at chick alertness, any injuries or defects, and the condition of the navel.
- Unpublished research has shown that chicks with even small navel "buttons" at hatching don't perform as well as chicks with completely closed navels. This results in lower broiler body weights, caused by undetected yolk sac infections that were present when the broiler chicks were first placed.
- Currently, there is no objective, standardized method for measuring chick quality at hatching. Other than subjective visual observations by hatchery staff, or killing the chick to sample the yolk sac for the presence of bacteria, there are no quick, reliable, and non-invasive ways to diagnose yolk sac infections in newly hatched chicks.

A New Diagnostic Tool



Infrared thermography (IRT) measures the surface temperature of an object, and displays this information as a picture (see picture to the left showing a view of a chick laying on its back. The top is the navel, the legs are to either side, and the belly is in the middle.). Different colors represent different temperatures. The red, orange and yellow areas are hotter, and the blue and black areas are cooler. This technology has been used in cattle and horses for early diagnosis of

injuries and infections before other symptoms can be seen. By diagnosing infections as early as possible, effective treatment can be given. This early treatment reduces the costs associated with poor production efficiency and the potential for increased mortality.

The objective of this research was to evaluate IRT as a tool for the early detection of yolk sac infections in broiler chicks. If IRT is effective in detecting yolk sac infections, this could reduce unnecessary culling of chicks at hatching and improve broiler quality and production efficiency.

Ongoing Research Projects:

The influence of genetics on embryo metabolism

Managing genetic strains for differences in embryo growth and heat production.

Chick quality and egg size

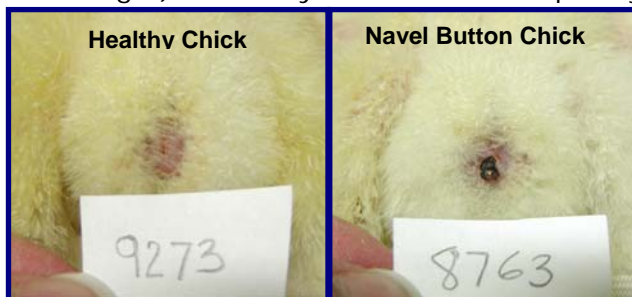
Is it flock age or simply egg size that affects chick quality?

Rooster age influence on chick quality

Investigating the role of the broiler breeder male in broiler hatchability and chick quality.

Navel Button vs. Healthy Chicks

What We Did: Chicks with minor navel buttons were collected at a local commercial hatchery. The chicks appeared to be healthy, except for the navel button (picture # 8763 on right). Healthy chicks with completely closed navels were also collected (picture # 9273 on left). Pictures were taken using an IRT camera at 0, 3, and 6 days of age. Using the pictures, the maximum surface temperature of the navel area of the chick was measured. On these days, the birds were also weighed and their general health was visually assessed. All the chicks were grown out for 6 weeks. Feed consumption and mortality were monitored throughout the grow-out period. At 6 weeks of age the birds were individually weighed, then shipped to a commercial processing plant.



What We Found: There was no difference in body weight between healthy and navel button chicks at day 0. By day 3, healthy chicks were heavier than navel button chicks, and at day 42 broilers from the healthy group were still heavier than broilers from the navel button group (See table below). There was no difference between the healthy and navel button groups in feed conversion ratio or mortality.

Treatment	Day 0 BW (g)	Day 3 BW (g)	Day 6 BW (g)	Day 42 BW (g)
Healthy	43.9 ^a	77.9 ^a	128.9 ^a	2575 ^a
Navel Button	44.6 ^a	74.2 ^b	119.5 ^b	2471 ^b

In the above table and all other tables in this report, values with the letter "a" are statistically different than values in the same column with the letter "b".

than average day 0 weights stayed lighter throughout production, and birds with heavier day 0 weights stayed heavier. Day 3 body weight and 42 day body weight were more strongly linked in navel button chicks than in healthy chicks. This means that the navel button chicks who are able to gain weight well early on are more likely to have higher body weights at the time of processing. A lot of previous research has shown that early body weight and shipping body weight are connected, but this relationship may be even stronger in navel button chicks than it is in the broiler flock as a whole.

Treatment	Day 0 Max. Temp. (°C)	Day 3 Max. Temp. (°C)	Day 6 Max. Temp. (°C)
Healthy	36.6 ^a	38.4 ^a	38.3 ^a
Navel Button	36.4 ^b	38.1 ^b	38.5 ^a

The maximum temperature of the navel area was hotter in healthy chicks than it was in navel button chicks at 0 and 3 days of age. By 6 days of age, there was no longer any difference in navel temperature between the groups (See table above). Day 0 navel temperature was positively correlated to day 6 navel temperature and day 6 and 42 body weight in navel button chicks but not in healthy chicks. This shows that in chicks that are already

In both healthy and navel button chicks, day 0 body weight was able to predict future body weights to some extent. Birds with lower

The maximum temperature of the navel area was hotter in healthy chicks than it was

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- Poultry Industry Council
- Lilydale Inc., Edmonton Hatchery

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stressed by infection (navel button chicks), day 0 temperature can predict chick quality and performance into the first week of life and beyond. Of the navel button chicks, the chicks that have lower maximum navel surface temperatures at hatch are more likely to continue to have lower navel temperatures and are also more likely to have lower body weights. There was also a correlation between day 3 and day 6 navel temperature and day 42 body weight in navel button chicks. This result means that IRT could help to determine which navel button chicks will fail to thrive and which will perform well and can be placed in broiler barns.

The Bottom Line: IRT may provide a tool for diagnosing which navel button chicks are actually poor quality chicks (that should be culled), and which chicks will go on to perform normally as broilers, and should be shipped to broiler producers.

Where do we go from here?

More research is needed to confirm the results discussed here and to see if IRT is an effective tool in screening for quality in chicks from:

- different genetic strains
- different breeder flock ages
- problem breeder flocks

If more data is gathered, guidelines could be developed for acceptable IRT navel temperatures to optimize good chick quality and broiler performance.

Industry Implications



Current methods for determining chick quality are not reliable or consistent. Two "free" chicks per hundred are currently shipped from hatcheries to broiler producers since it is accepted that up to 2% of broiler mortality may be due to poor chick quality (or other hatchery factors). If more objective methods for screening chick quality are developed, chick quality could be accurately judged

on the day of hatch, before chicks are shipped to broiler producers.

This technology has the potential to improve poultry health and diagnostics. Through the use of IRT, earlier and more accurate diagnosis of yolk sac infections may be possible. IRT could provide a valuable tool to hatcheries and the poultry value chain as a whole.

This research is part of a continuing embryology and chick quality research program at the University of Alberta.

This report has been produced in keeping with our goal to connect with industry on a continuous manner, both in the receiving of input and the transferring of knowledge.

This report was prepared by E. O'Dea