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The 'Hole' Story: *In Ovo* Injection In Turkey Eggs

The Hole Background

In ovo injection is the practice of injecting substances such as vaccines or nutritional supplements into a hatching egg before hatching. The injection is usually done at the time when eggs are transferred from the incubator to the hatcher, since this is a time when the eggs must be handled anyway. This means that the poults have the opportunity to get the desired substance into its system before it hatches. This also reduces stress on the poults created by handling and vaccination on the day of hatch.

During *in ovo* injection, a small hole is poked in the (large) end of the egg using a needle. What is not known right now is whether just poking the hole makes a difference in embryo survival or hatchability. A turkey hatchery in the U.S.A. has increased hatchability by simply poking a hole in the shell. Why might this improve hatchability? When the hole is made, this allows more oxygen to flow into the egg from outside the shell. During the hatching process the embryo needs more oxygen than can be provided through the tiny holes (pores) in the shell. Making the injection hole allows oxygen to flow freely into the egg.

There are no turkey hatcheries in Canada that use *in ovo* injection, so it is important to make sure that there is no negative effect on hatchability when the hole is poked. Some researchers have suggested that a build up of carbon dioxide gas inside the egg (produced as the embryo "breathes") is needed to trigger the embryo to start the hatching process. By poking a hole in the shell this build up of carbon dioxide escapes.

The Goal of This Research: Through conducting this research we wanted to see if poking the hole would improve hatchability. We also wanted to make sure that poking the hole would not delay the hatching process.

The Experiment

We collected 1,185 Hybrid turkey hatching eggs and divided them into 3 groups:

- Control = no hole (normal hatching egg)
- D24 = hole poked on day 24 of incubation
- D25 = hole poked on day 25 of incubation

All eggs were incubated together, and on day 24 (D24 group) or day 25 (D25 group) eggs were removed from the incubator, poked with the *in ovo* injection needle, then returned to the incubator. The injections were done using an Intellilab® machine, a small scale laboratory version of the Intelliject® machine produced by Avitech (this \$15,000 machine was donated to Dr. Fasenko's lab by Avitech). No substance was injected into any of the eggs. The needle was injected 0.5cm into the egg and the hole created by this needle was 1.3 mm in diameter.



Figure 1. The Intellilab® machine. This model injects one egg at a time, and is a small scale version of Avitech's Intelliject® commercial machine.



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In This Issue

- Does the hole from *in ovo* injection affect hatchability of turkey eggs?
- Where do we go from here?



More information
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On day 25, all eggs were transferred to a hatcher and incubated for another 3 days. From day 24 until hatching, a sample of eggs from each of the groups was monitored for internal and external pipping. Internal pipping is when the embryo breaks through a membrane into the air space at the blunt end of the egg (Figure 2). External pipping is when the poult breaks through the shell (Figure 3).

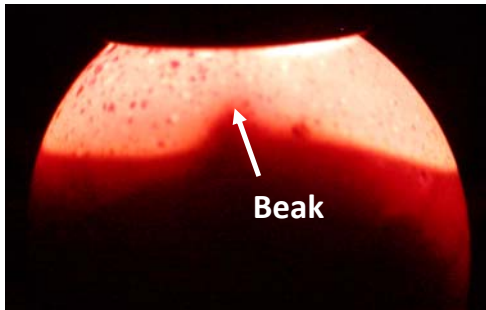


Figure 2. Internal pipping. The beak breaks through a membrane into the air space at the blunt end of the egg.

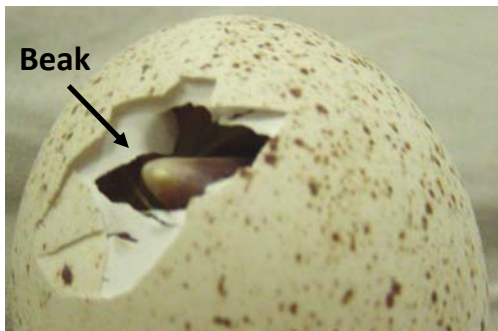


Figure 3. External pipping. The beak breaks through the eggshell.

At hatching, all poults were weighed, and a sample of poults from each group also had their body length measured (another measure of poult quality). The poults were euthanized (culled) and the heart, liver, duodenum (part of the intestine) and yolk sac were removed and weighed.

Did the hole make a difference?

Our research showed that the hole had no effect on hatchability, embryo survival, or the percentage of saleable poults at the time of hatching (Table 1).

Our research showed different results than the observations made by the turkey

hatchery in the U.S.A., who showed that poking the hole increases hatchability. We are currently talking to this hatchery to try to find out why our results are different.

The eggs from all three groups also pipped and hatched at the same time. This means that poking the hole, and letting more oxygen into the egg and more carbon dioxide out does not delay pipping or hatching. There were also no differences in heart, liver, duodenum, or yolk sac weights between the three groups.

	Control	D24	D25
Fertility (%)	98.1	98.1	98.4
Hatchability (%)	84.5	85.8	83.7
Embryo Mortality (%)	7.6	5.4	6.5
Poults Culled at Hatching (%)	6.8	6.6	7.9

Table 1. Fertility, hatchability, embryo mortality and cull rates for hatching eggs from each of the groups.

What does this mean for the poultry industry?

Even though we did not find that poking the hole increased the number of hatched poults, the good news is that creating the hole in the turkey hatching egg did not hurt hatchability.

This means that we can start research to look at the effects of injecting beneficial substances into turkey eggs. Mr. Josue Romao (a Ph.D. candidate in Dr. Fasenko's research group) will be starting research to see if injection of Hy-D® (a vitamin D metabolite marketed by DSM) will improve hatchability of broiler and turkey eggs ("In ovo delivery of Hy-D in poultry to improve hatchling health"). This upcoming research is funded by the Alberta Livestock and Meat Agency Ltd. (ALMA) and the Saskatchewan Chicken Industry Development Fund (SCIDF) as of April, 2009. This will now allow us to proceed to evaluate the effects of substances that commercial hatcheries may be interested in injecting.



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Quick Facts

- Poking the hole did not affect hatchability, embryo mortality, or poult quality.
- Now that we have confirmed that the hole does not have an effect, we can start testing the effects of injecting other substances *in ovo*.

Research Team

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Research Sponsors

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