

Celebrating a major advancement for the poultry industry & science

PART 1

This year marks a 30-year milestone in commercialised in ovo vaccination technology, first introduced by Embrex in 1992. While in ovo vaccination is standard practice for many hatcheries today, this important process was considered an impossibility not too long ago.

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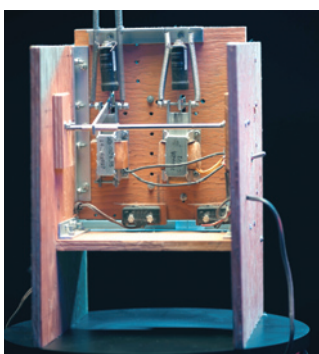
Modern in ovo vaccination with Embrex Inovoject NXT.

In its simplest terms, in ovo vaccination delivers vaccine to the chick before hatching to stimulate an immune response that helps protect them from disease at hatch. The technology was originally developed to help combat early Marek's disease challenges in flocks.

Marek's disease posed a major threat to the poultry industry. "It was not uncommon for farmers to lose 40, 60, 80% of their birds to Marek's disease," Jagdev Sharma, BVSc, PhD, the inventor and patent holder of in ovo technology told International Hatchery Practice. For hatcheries using this technology, it may be difficult to remember a time without in ovo vaccination, and they may not have experienced the devastation of a Marek's outbreak.

"Marek's disease is one of the worst diseases any species can have," added Isabel Gimeno, DVM, PhD, a virologist at North Carolina State

Embrex in ovo vaccination prototype.



University. Marek's is a viral disease that transmits easily through the environment. "It affects almost anything you can think of. It can affect your eyes, the brain, blood vessels, and it produces tumours. You cannot grow a flock if you do not have Marek's disease under control."

While a vaccine was developed and adopted for Marek's disease by the early 1970s, issues remained.

Chicks were vaccinated subcutaneously (SC) for this disease, one bird at a time. Machines supported SC vaccination, but each bird was picked up by hand for a neck injection – a labour-intensive and time-consuming process susceptible to human error and stressful for the chicks.

Once vaccinated, birds were shipped to grow-out houses. "They were immediately exposed to virulent Marek's disease," Sharma says. Applied after hatch, the vaccine did not have adequate time to stimulate protective immunity, and significant Marek's outbreaks occurred.

An idea to stimulate earlier immune response

"The idea occurred: could we give the vaccine time to initiate immunity before chicks hatch?" Sharma says.

He began to experiment with the non-lethal herpesvirus turkey (HVT) to stimulate an immune response against Marek's disease virus, also a herpesvirus, by inoculating

unhatched eggs. He and his team focused on inoculating at day 18 of incubation, when the chick's immune system is developed enough to be functional. When they hatched three days later, on day 21, the chicks were challenged with Marek's disease virus. "They were fully protected, and that was a result beyond anybody's expectation. We had solved the early exposure issue by giving the vaccine enough time to produce protective immunity," Sharma says.

Sharma published his first paper on in ovo vaccination in 1982. Soon after, he was granted a patent on the idea of immunising birds before they hatch. Despite experimental success, the poultry industry did not immediately see practical value in this approach. "There was a lot of scepticism," Sharma says.

Uncertainty evolves into cascading adoption

A visionary who read Sharma's paper approached him with the idea of commercialising the technology. Through a blend of biology, engineering and mechanical processes, the newly formed Embrex team began developing a device based on Sharma's patent. "Taking that from the laboratory to the commercial poultry industry was our challenge," added Chris Williams, retired director of BioDevices Technical Services at Zoetis.

The Embrex team focused on developing technology to support

efficacious vaccination while meeting throughput and safety needs of commercial hatchery operations. They ultimately determined five in ovo vaccination success factors that are still imperative today:

- Adaptive egg location to deliver vaccine effectively despite the angle in the tray.
- Consistent shell penetration without exposing the embryo to exterior shell contaminants.
- Effective sanitation.
- Efficacious site of injection.
- Gentle vaccine delivery that maintains vaccine integrity.

Achieving commercial success took time and many iterations. As they refined the design, the industry started embracing the technology.

"There was a cascade," he says, comparing in ovo vaccination technology adoption with the adoption of the mobile phone. "Now people cannot walk down the street without one. The poultry industry is the same with in ovo vaccination. It is an integral part of their business."

Marek's vaccine was the first to protect against a tumour disease – cancer – in any species. And in ovo vaccination is the first time an animal was inoculated before it was born. "It is a major breakthrough, not only for poultry," Gimeno says. "It is a major breakthrough for science."

Today, hundreds of hatcheries around the globe rely on Embrex BioDevices from Zoetis every day for in ovo vaccination and support for flock protection. ■