In Ovo Technology

Tarsicio Villalobos
Technical Services
• Pfizer Poultry Health Division was created after the acquisition of Embrex Inc. in 2007.

• 15+ years “commercial” in ovo experience

• Specializing in both in ovo delivery devices and biologics

• Average over 38,000,000+ eggs injected per day!

• Worldwide utilization
## Countries Where the Embrex® Inovoject® System Has Been Installed

<table>
<thead>
<tr>
<th>Europa</th>
<th>Middle East</th>
<th>Africa</th>
<th>América</th>
<th>Asia &amp; Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Jordan</td>
<td>South Africa</td>
<td>Argentina</td>
<td>Australia</td>
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<tr>
<td>Spain</td>
<td>Lebanon</td>
<td>Egypt</td>
<td>Brazil</td>
<td>China</td>
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<tr>
<td>France</td>
<td>Turkey</td>
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<td>Canada</td>
<td>Korea</td>
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<td>The Netherlands</td>
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<td>Colombia</td>
<td>Indonesia</td>
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<td>Hungry</td>
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<td>USA</td>
<td>Japan</td>
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<td>Italy</td>
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<td>México</td>
<td>Malaysia</td>
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<td>Poland</td>
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<td>Peru</td>
<td>Thailand</td>
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<td>Portugal</td>
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<td>Trinidad &amp; T</td>
<td>Taiwan</td>
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<td>United Kingdom</td>
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<td>Venezuela</td>
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<td>Russia</td>
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</table>
Critical Success Factors for *In Ovo* Injection

1. Egg location
2. Shell penetration
3. Site of injection
4. Vaccine delivery
5. Sanitation
1. Egg Location

(Patent # 5136979)
2. Shell Penetration

- Needle inside a punch
- Punch is designed for egg shell penetration
- Needle is designed for vaccine delivery to the embryo or amnion
- Needle inside punch permits targeted, efficient sanitation of contact points of injection mechanism
20 gauge Hypodermic Needle

Inovject 45

Hypodermic 28

3.0 mm

Air Cell Membrane
3. Site Of Injection
Do You Know Where You Are Vaccinating?

- Aircell
- Allantois
- Amnion
- Yolk
- Embryo
18 Day Embryo
Air Cell Membrane
Allantoic Fluid
Amniotic Fluid
Embryo Body – Right Breast SQ
Protective Indices for Different *In Ovo* Sites of MD Vaccine HVT/SB1 Administration

Wakenell *et al.* 2002. *Avian Diseases, 46* (2) 274-280
- **18 days + 0 hrs**: 98.4% of injections were in amniotic fluid + embryo body.
- **18 days + 12 hrs**: 99.6% of injections were in amniotic fluid + embryo body.
- **19 days + 0 hrs**: 100.0% of injections were in amniotic fluid + embryo body.
4. Vaccine Delivery

- Vaccine Integrity – Safe delivery from bag to needle
- Vaccine Efficacy – whole process, from bag to embryo, development of immunity, defense against challenge
Titers (PFU) Obtained with HVT per 0.05 ml using a Jamesway Model Inovject System

From: Marsh, Fluke and Villegas AD 41:452, 1997
Protective Indices of HVT/SB1 Vaccinated Broilers

Vaccination via Inovoject® System at 18 days + 3 hrs of incubation or with syringe and needle SQ at hatch
5. Sanitation

- Needle inside punch permits targeted, efficient sanitation of contact points of the injection mechanism.
- Optimal pathogen reduction sanitation between injections prevents egg to egg bacterial carry over.
Injection and disinfection sequence
Injectables

- Licensed In Ovo Vaccines
  - MDV (3 serotypes)
  - IBDV (Gumboro)
  - Fowl Pox
  - AAC (IBDV, ND)
  - *Eimeria* spp. (coccidia)
  - FP vector LT
  - HVT vector IBDV, ND
Injectables

• Other Vaccines used In Ovo
  – Reo virus (Tenosynovitis)
  – TRT
  – Vectored
    • Fowl Pox (LT*, AI, AE, MG, ND)
    • HVT (IBDV*, ND* ILT*)
    • Adenovirus (AI)

• Antimicrobials

* newly licensed by USDA for in ovo application
• Lowers Vaccine Costs
• Precise
• Safe and accurate
• Flock information system
• Offers decreased priming volumes
A candling device design to identify and remove infertile, early and mid-dead eggs prior to injection and transfer.

- Mobile/modular design
- Can reach a sustainable capacity of 60,000 eggs per hour.
- Information/data collection capabilities.
Identifier Unit
Day 0
Day 5
Day 10
Day 15
Day 18

“Clears”

Live

“Clears” Live
Cups only touch the eggs will be removed
Egg Remover operation
## Hatchability and Clear Egg Removal

<table>
<thead>
<tr>
<th>Age of Breeder</th>
<th>No Candle</th>
<th>Candle</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-30 Weeks</td>
<td>81.29%</td>
<td>80.94%</td>
<td>-0.35%</td>
</tr>
<tr>
<td>31-39 Weeks</td>
<td>85.23%</td>
<td>85.18%</td>
<td>-0.05%</td>
</tr>
<tr>
<td>40-49 Weeks</td>
<td>84.77%</td>
<td>85.56%</td>
<td>0.79%</td>
</tr>
<tr>
<td>50-59 Weeks</td>
<td>75.10%</td>
<td>75.50%</td>
<td>0.40%</td>
</tr>
<tr>
<td>60 + Weeks</td>
<td>65.39%</td>
<td>67.51%</td>
<td>2.12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80.84%</strong></td>
<td><strong>81.29%</strong></td>
<td><strong>0.45%</strong></td>
</tr>
</tbody>
</table>

*Jamesway®*
# Hatchability and Clear Egg Removal

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<th>No Candle</th>
<th>Candle</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-30 Weeks</td>
<td>84.83%</td>
<td>84.62%</td>
<td>-0.21%</td>
</tr>
<tr>
<td>31-39 Weeks</td>
<td>90.33%</td>
<td>89.76%</td>
<td>-0.57%</td>
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<tr>
<td>40-49 Weeks</td>
<td>89.28%</td>
<td>88.96%</td>
<td>-0.32%</td>
</tr>
<tr>
<td>50-59 Weeks</td>
<td>81.84%</td>
<td>82.78%</td>
<td>0.94%</td>
</tr>
<tr>
<td>60 + Weeks</td>
<td>74.43%</td>
<td>77.02%</td>
<td>2.59%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85.14%</strong></td>
<td><strong>85.84%</strong></td>
<td><strong>0.70%</strong></td>
</tr>
</tbody>
</table>

*ChickMaster®*
Hatchery sanitation

Old Flock on Separator Rollers W/Out ER

Old Flock on Separator Rollers With ER
Waste Handling

• Whole egg handling system.

• Whole egg handling and packaging system.
Thank you!