

Core Vaccines in Dairy Cattle

Definitions

- **Pathogen:** disease-causing microbe (e.g. bacteria, virus, parasite).
- **Antigen:** pathogen feature that allows the body to recognize it as “foreign” (non-self), and generate an immune response.
- **Antibody:** a protein produced by the body that binds an antigen, marking it to be destroyed by immune cells.
- **Herd immunity:** when a high proportion of animals are vaccinated within a herd, preventing the spread of disease.

Why We Vaccinate:

When used effectively and within the larger context of herd management, vaccine programs are an **investment** that result in a **positive economic return-on-investment** over time (as well as other **intangible benefits** such as improved animal welfare and farmer satisfaction). **Core vaccines** recommendations are based on region and other criteria.

The Immune System: There are two branches of the immune system: Innate and Adaptive.

- **Innate** (~synonymous with **local** or **mucosal** immunity) = “**the security guards**” – the first line of defense, e.g. physical barriers (skin, mucus membranes) as well as non-specialized cells (pacman). Present at birth.
 - **IgA** (antibody type A) is important in local mucosal immunity. **Intranasal vaccines** stimulate IgA production.
- **Adaptive immunity** (~synonymous with **systemic** immunity) = “**special forces**” - trained over time in the face of repeat exposures to pathogens. Stores “memory” cells and generates specialized responses (e.g. killer cells and antibody-producing cells).
 - **IgG** (antibody type G) is important in adaptive immunity. **Injectable vaccines** stimulate IgG production.
- **Maternal IgG:** Dams also deliver IgG to their offspring “**passively**” via colostrum
 - Maternal IgG **will not interfere with intranasal** vaccines, but **will interfere with injectable** vaccines
 - Maternal IgG levels **start to taper off around 3-6 months**, while the calf’s own immune system is still developing. The calf’s immune system will begin to respond to injectable vaccines at 3-6 months, but it will be important to booster after 6 months.

Core Vaccine Program

Always consult your herd vet

- Calves: **Intranasal** (viral, bacterial)
- Replacement Heifers, Cows:
 - **5-way Modified Live Vaccine** with FP (fetal protection) OR **Killed** vaccine
 - **Mastitis** Vaccine (coliform at minimum, staph also recommended, strep uberis as per risk)
 - **Scour** Vaccine (even better when used in combination with transition milk feeding)

Intranasal vaccines have a shorter duration of immunity than injectable vaccines.
Modified live vaccines generally stimulate a better immune response than **killed** vaccines, but need to be used **safely** (ask your vet).

Putting a Face to the Names

Respiratory +

- **Bovine respiratory syncytial virus (BRSV):** “local” to the respiratory tract; causes outbreaks; worst in young calves
- **Infectious bovine rhinotracheitis (IBR):** “red nose”; respiratory & reproductive disease; herpesvirus (latency)
- **Parainfluenza-3 (PI3):** secondary respiratory pathogen, cannot cause disease on its own

- **Mannheimia haemolytica**: “shipping fever”; “commensal” until animal is stressed; toxin kills white blood cells
- **Histophilus somni**: versatile (infects: lungs, reproductive tract, neurologic system, ears, heart valves, joints)
- **Pasteurella multocida**: secondary pathogen that contributes to respiratory disease

Reproductive +

- **Bovine viral diarrhea**: “persistently infected” (PI) calves can’t distinguish virus as “non-self” – shed high volumes of virus into the environment
- **Leptospirosis spp.**: more commonly causes increase in early embryonic loss, but can cause abortion outbreaks

Mastitis

- **Coliform mastitis (E. coli, Klebsiella, etc.)**: environmental, mild to severe (toxic mastitis)
- **Staphylococcus aureus**: #1 cause of mastitis & reduced production; mostly goes undetected; protected by biofilm
- **Streptococcus uberis**: emerging as an important mastitis pathogen; often see recurring cases

Scours

- **Rotavirus/Coronavirus**: very common in calves <3 weeks of age; prevents absorption of water/nutrients
- **E. coli type K99 (scours)**: toxin tricks intestinal cells into releasing excess electrolytes; profuse watery diarrhea
- **Clostridium perfringens type C** toxin kills intestinal lining; bloody fetid diarrhea +/- neurological signs

Quick Tips

- **Vaccine killers**: contaminants (dirty bottle, needle, injection site), incorrect/fluctuating temp (ideal 4°C), shaking (roll or invert instead)
- **Use MLVs within 1-2 hours of mixing**. If you have many doses to give, bring a cooler bag along, and mix bottles as you go.
- Don’t be afraid to recruit your herd vet in tracking data over time. You don’t know what you don’t measure.