

Horse Immunity and Biosecurity

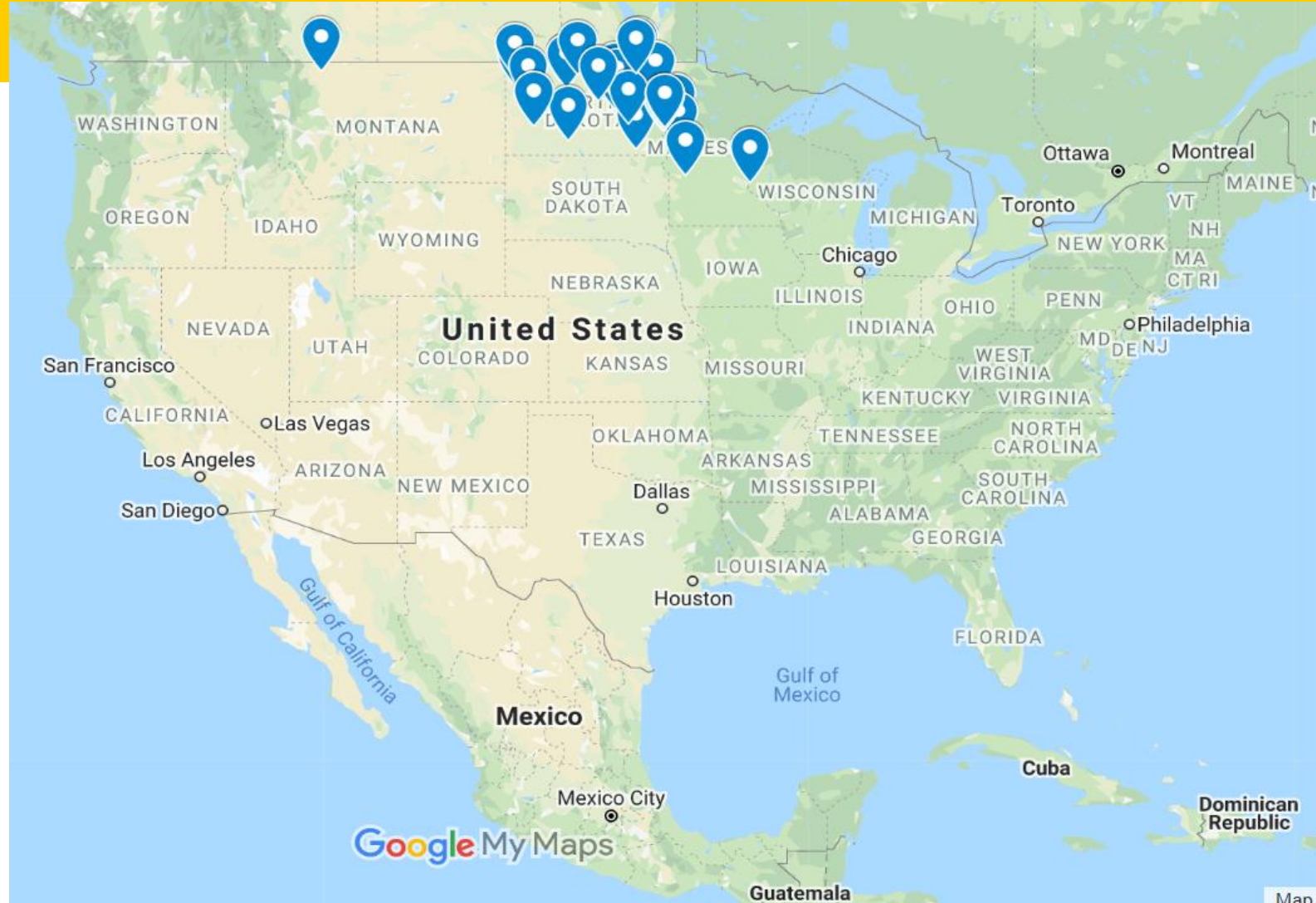
Jerry Stokka, Paige Brummund,
Rachel Wald and Mary Keena

NDSU

EXTENSION

Who's Here Today?

- India
- 4 horses
- 10-15 horses



Horse Immunity and Biosecurity

- Principles of a Biosecurity SOP
 - Biosecurity - procedures intended to protect humans and or animals against disease or harmful biological agents.
 - Vaccination - inoculation with a vaccine to produce immunity against a specific disease

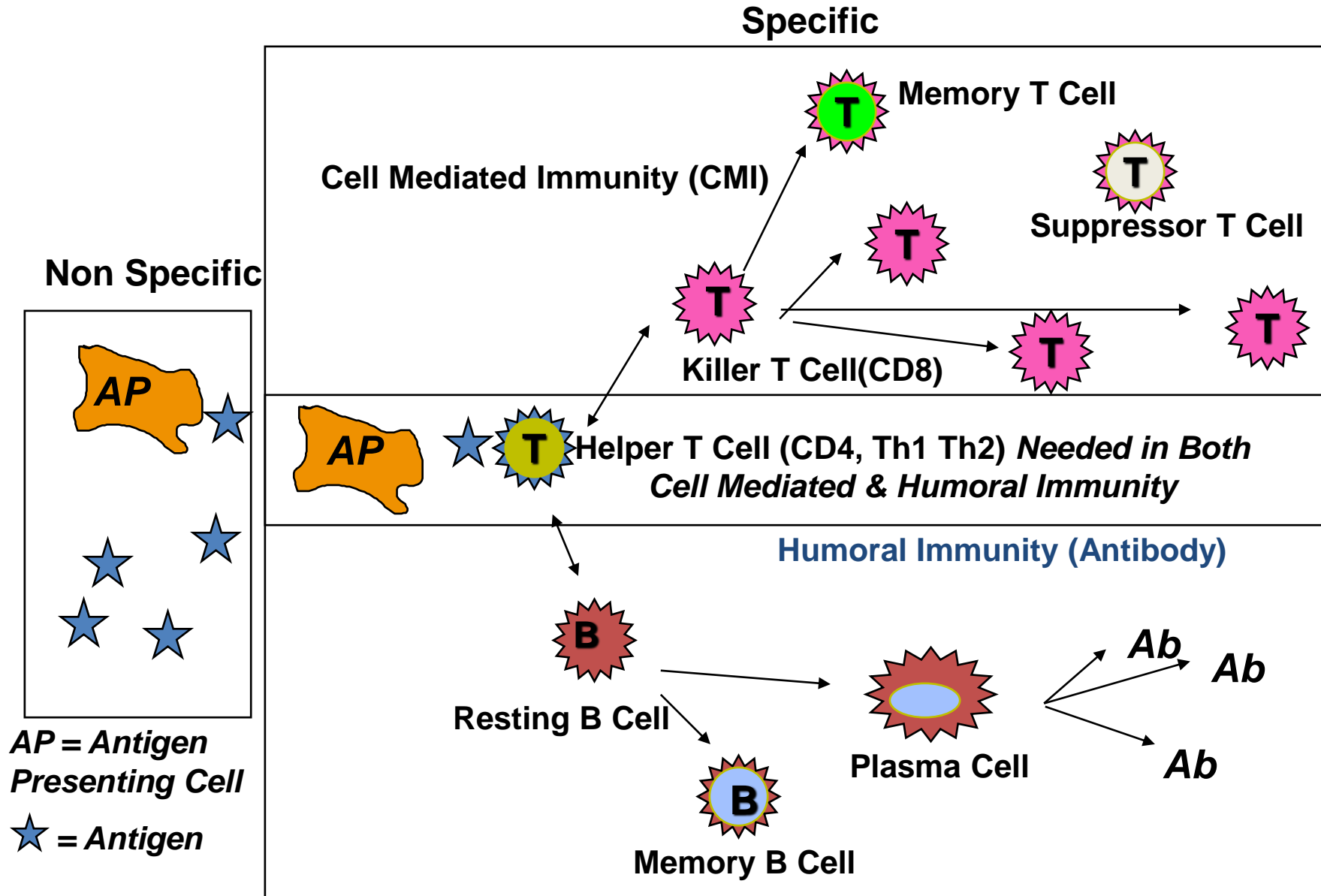
Bio secure

- Awareness of spreading pathogens via mechanical and biological vectors
 - Needles, flies, mosquitoes, rodent control
 - Halters, bridles, feed and water buckets
 - Wheelbarrows, forks, trailers etc.
 - New arrivals and animals returning from shows, fairs and exhibits. Rectal thermometers
 - New arrivals 2-3 week quarantine
 - 1 week for resident horses

Principles of a Vaccination Protocol

- Principles
 - Necessary
 - To reduce the risk of disease infection which may cause sickness, long term health issues or death.
 - Effective
 - Vaccine protocols have been demonstrated to be effective in reducing the risk of infection leading to sickness and or death.
 - Safety
 - Vaccine choices have minimal local and systemic reactions.
 - Injection reactions, anaphylaxis

Cells of an Immune Response



Immune Response

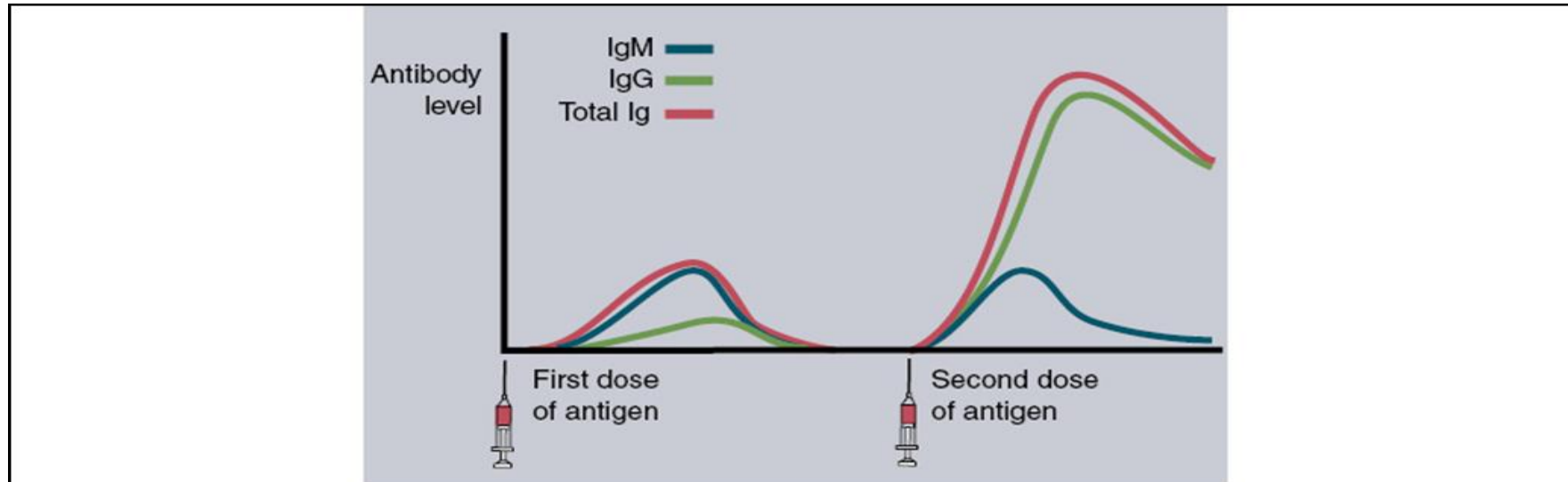


FIGURE 16-5 The relative amounts of each immunoglobulin class produced during the primary and secondary immune responses. Note that IgM predominates in a primary immune response, whereas IgG predominates in a later response.

Tizard, Ian R. *Veterinary Immunology*. St. Louis, MO: Elsevier, 2013.

(Copyright © 2013, 2009, 2004, 2000, 1996, 1992, 1987, 1982, 1977 by Saunders, an imprint of Elsevier Inc.)

AAEP Core Vaccinations

- Eastern and Western encephalomyelitis
- Tetanus
- West Nile
- Rabies
- All of these require individual immunity, as none are transmitted from horse to horse.

Individual Immunity

1. Induces protection against disease, i.e. clinical signs.
2. Reduce susceptibility of an individual against infection, infectious dose needed to establish infection is higher after vaccination.
3. Reduces infectivity after the occurrence of an infection.



AAEP Risk Based Vaccinations

- Anthrax
- Equine Herpes (Rhinopneumonitis)
- Influenza
- Strangles
- Botulism
- Snake Bite
- Leptospirosis
- Potomac Horse Fever, Equine Viral Arteritis, Rotaviral Diarrhea

Herd Immunity

- Reduced probability of an individual becoming infected when it is part of a vaccinated population.
- Chance of becoming infected in a population decreases with increasing density of individuals being vaccinated.
- Prevent transmission of pathogen within the population to such an extent that the infection will eventually be controlled or become extinct.



Horse Immunity and Biosecurity

- Bio secure
 - Keeping potential pathogens out
- Vaccination
 - Enhancing the immune response to protect against specific pathogens.

Importance of Biosecurity

- Why?
 - To reduce chance of infectious disease being carried onto your farm by people, animals, equipment or vehicles.
- Benefits
 - Healthier horses
 - Fewer vet bills
 - Human safety (zoonotic diseases)
 - Environmentally sound
- Prevention is best

Biosecurity Challenges Faced by Equine Owners

- Some depend on public traffic to their barn
- May rely on frequent participation in shows and events
 - Do not maintain a closed herd
- Consider losses from outbreaks:
 - Economic
 - Emotional
 - Reputation
 - Sometimes life threatening

Visitors to Your Property

- Low Risk
 - Do not own horses and rarely visit farm
 - Field trips, relatives from ‘the city’
- Medium Risk
 - Make regular visits to farms but do not have contact with horses
 - Feed delivery personnel, repairmen, etc.
- High Risk
 - Regular trips to horse farms and have close contact with animals
 - Vets, farriers, trainers
- Management Strategies
 - Keep visitor log
 - Provide hand and boot washing stations
 - Clearly mark off-limit areas
 - Parking away from feed and manure sources
 - Dog policy

Vector: Manure

- Manure can harbor pathogens
- Breeding Ground for insects
- Insects carry and/or transfer disease



Why Manage Manure?

- Manure contains valuable nutrients plants need. If the nutrients are not used they become a pollutant and are wasted.
- **Improper manure storage and land application**
 - Excess soil nutrients
 - Surface runoff
 - Leachate
 - Water-contaminated with manure



Harmful algal bloom. Photo courtesy: NDDEQ.

Other Manure Management Considerations

- Bacteria and Pathogens
- Flies
- Internal parasites
- Rodents
- Odors
- Weed seeds

Manure Management Options

- Drylot
- Stockpile
- Spread
 - Rotate
- Compost

Dry Lot Considerations

- Giving up land that could be used as a pasture in order to **protect the remaining pasture area**
- Location of dry lot (click for Manure Management presentation)
 - Surface and groundwater pollution
- Soil characteristics and structure
 - Clay vs. sand
 - Hoof traffic
- Ease of use
 - Dry lot can be the hub of the grazing wheel
- Manure collection - weekly
 - Location relative to manure storage area

Example of Why to Dry Lot



Manure Stacking/Stockpiling Guidelines - ND

- Short-term Manure Stockpiles
 - Manure may **not** be stockpiled for **more than** nine months at short-term stockpile locations.
 - The same location cannot be used from year to year.
- Permanent Manure Stockpiles
 - Manure stockpiles **for more than** nine months must be stored at a permanent stockpile location.
 - Involves soil investigation and regulatory oversight.

Stockpiling Site Selection

- **Sandy soils have rapid permeability** that allows nitrate to move quickly through the soil to ground water (leaching), while **loamy or clayey soils have slower permeability** that helps retain nitrate in the soil profile.
- Manure stockpiles may **not** be located:
 - In gravel pits, or any other excavations;
 - Along streams or lakes; Within a flood plain; or,
 - Within 50 feet of a private water supply well or 100 feet of a public water supply well

Working With a Custom Manure Hauler

- Things you will need to know
 - How much manure do you have to spread?
 - Where are they spreading it?
 - Work with a local farmer/rancher to spread on their land if you do not have property available
 - This is your responsibility, not your haulers.
 - Can they get into your manure storage area with their equipment?
 - Can you pay them?

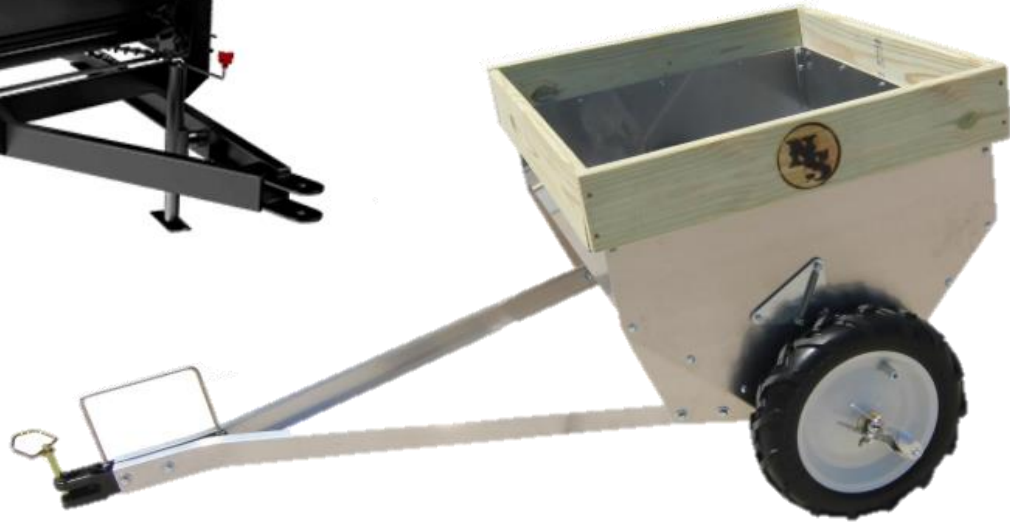


At-home Spreading Options

- Small, pull type, ground driven spreader
- Pulled by ATV, lawn mower, horse
- Examples:
 - ABI Classic Spreader
 - Loyal Manure Spreader
 - Newer Spreader 225

head
ground capacity
vehicle
spreading
variable
shredding

At-home Spreader Examples



Composting

- Mixture of organic residues
 - Piled
 - Mixed
 - Moistened
 - Thermophilic decomposition
- Results
 - Crumbly, low odor, stable nutrient-rich soil amendment that lacks weed seeds, pathogens, and has decreased 50-65% in volume.



Benefits of Composting Manure



- ↓ Nutrient Loss
- ↑ Nutrient Stability
- ↓ Flies and Parasites

Reducing Weed Problems

- Weeds lower nutritional value of pasture
 - Some can be harmful to health
- Properly Compost Manure

TABLE 1. Estimated amount of time required to kill 90 percent of seeds at various temperatures.

	Temperature (F)			
	140°	122°	115°	108°
Weed	Number of hours required to kill 90% of seed			
Annual sowthistle	<1.0	2.1	13.3	46.5
Barnyardgrass	<1.0	5.4	12.6	Unaffected
London rocket	<1.0	4.0	21.4	83.1
Common purslane	1.3	18.8	Unaffected	Unaffected
Black nightshade	2.9	62.0	196.6	340.6
Tumble pigweed	1.1	107.0	268.5	Unaffected

Source: *Time and Temperature Requirements for Weed Seed Thermal Death*, by N. Dahlquist et al., 2007

American Association of Equine Practitioners

Table 5. Effects of temperature on the survival, development and persistence of free-living stages (eggs, L1, L2, L3) of strongyles (Nielsen et al., 2007)

Development	Temperature Range	Survival
No development above this level	> 40 °C > 104 °F	Free-living stages die rapidly. Intact fecal balls may retain enough humidity to enable L3 to survive for some weeks.
Optimal temperature range for development of eggs and larvae. Reach infective L3 stage in as little as 4 days.	25 -33 °C 77 - 91 °F	Larvae survive on the shorter term (ie a few weeks), but conditions are too warm for long term survival
Eggs develop into L3 within 2-3 weeks.	10-25 °C 50-77 °F	L3 capable of surviving for several weeks to a few months
Lower limit for egg hatching is about 6 °C. At temperatures in this range, development will take several weeks to a few months.	6-10 °C 43-50 °F	L3 survive for many weeks and months under these circumstances
No hatching and no development	0-6 °C 32-43 °F	Eggs and L3 can survive for several months at temperatures just above the freezing point
No development during frost	< 0 °C < 32 °F	Developing larvae (L1 and L2) are killed, but unembryonated eggs and L3 can survive and persist for long periods (ie months)
Alternation between freezing and thawing will usually not lead to development unless temperatures exceed 6 °C	< 0 > °C < 32 > °F	Repeated freeze-thaw cycles are detrimental to egg and larval survival

Off-Farm Manure Disposal

- Soil Conservation Districts
- Local vegetable growers/CSA's
- Landfill
- Community Compost Project
- Working with a custom manure hauler

Vector: Rodents

- Prevention
 - Store feed in hard sided containers
 - Keep garbage covered
 - Eliminate holes in buildings larger than $\frac{1}{4}$ inch
 - Trim weeds and long grass near buildings
 - Remove hiding places
 - Avoid clutter
- Control
 - Traps
 - Poisons
 - Fumigation
 - Electric Rodent Control
 - Predators (barn cats)

Vector: Birds

- Prevention
 - Birds are drawn to an easy food source
 - Cover feed and garbage containers
 - Keep manure and compost piles covered or away from facility
 - Clean up spilled grain and hay
- Control
 - Netting
 - Noisemakers
 - Visual repellents
 - Poison: research state pesticide laws
 - Natural enemies

Vector: Insects

- Prevention
 - Store feed in insect-proof containers
 - Manage manure and compost piles
 - Clean up spills
 - Reduce stagnant water
 - Clean feed buckets
- Control
 - Feed additives (IGR)
 - Fly predator wasps
 - Screens
 - Screens, Fly Sheets, Masks, Boots
 - Physical barriers
 - Insecticide Sprays and Repellants
 - Landscaping solutions
 - Traps

Other Common Wildlife in ND

- Unwelcome
 - Skunks
 - Raccoons
- Welcome:
 - Hawks and other predatory birds
 - Non venomous snakes
 - Fish
 - Frogs

Transportation

- Clean trailer after each use
 - Disinfect regularly (inside and out)
- Hauling is stressful
 - Stress affects immune responses
- Allow horse to lower head to clear airway regularly

Away From Home

- Potential for outbreak to spread rapidly at group events
- Pre-travel
 - Check your horse prior to travel, don't transport a sick animal
 - Make sure vaccines are current to protect against diseases spread
- Stay Separated
 - Do not house your horses with other animals
 - Do not allow nose to nose contact
 - Separate with tack or feed stall
- Equipment
 - Do not use shared water or feed buckets, tack, grooming supplies, manure forks
- Monitor Health
 - Keep vital signs chart before, during, and after event

New Horses

- Quarantine
 - 14-28 days recommended
 - Away from nose to nose contact with resident horses
 - No access to common areas (cross ties, wash rack, round pen, etc.)
 - Monitor temp daily
- History of new animal
 - Sale barn or private treaty?
 - Travel/show history

Considerations



- Communal water sources
- Avoid dunking hose in water
 - Hose then becomes a fomite
- Comingling of horses
- Shared Equipment
 - Face rags, buckets
 - Girths, saddle pads, brushes
 - Halters, bridles



How strict do I need to be?

- You decide
 - Competing regularly or pasture/companion animal
 - Value of horse
 - Value of lost training/competition time if ill
 - Cost of treatment vs. cost or prevention measures
- Evaluate your protocols
 - Every horse facility is unique – effective biosecurity plans should be tailored to your needs

Disinfecting Your Farm

- Disinfectants work best on clean surfaces
- Make sure disinfectant is horse-safe
- Follow labeled instructions for use
- **NEVER** mix products off label
 - Can create toxic gases, cause fires, or become more toxic to people

Disinfecting Process

- Remove everything from stall
- Sweep out debris, remove organic material
- Wash walls and floor with detergent
- Apply disinfectant following label instructions. Do not rinse.

Disinfectant Guide

Phenols & Cresols (Prosovet, Osyl)	Works well in the presence of organic materials
Chlorines & Hypochlorites (Bleach)	Inactivated by organic material
Quaternary Ammonium (Clinicide)	Inhibited by hard water
Iodophors/Iodine (Betadine)	Inactivated by sunlight and organic material
Chlorohexidines (Nolvasan-S)	Not effective against spore-forming bacteria
Formaldehydes/Gluterdehydes	Extremely toxic, used for sterilization of instruments
Sulphates (Virkon-S)	Effective against many germs
Sodium Hydroxides (Lye)	Highly caustic
Alcohols (Isopropyl alcohol)	Used mainly as a surface disinfectant

Handling the Sick Horse

- Prompt Removal of the Sick Horse from other Horses
- Separate Equipment
 - (Halters, Buckets, Feed Pans, Grooming Tools)
- Separate Housing
- Treat/Care for Sick Horse Last
 - Vet, farrier, other family members
- Change or Disinfect Clothing and Footwear
- Wash Hands

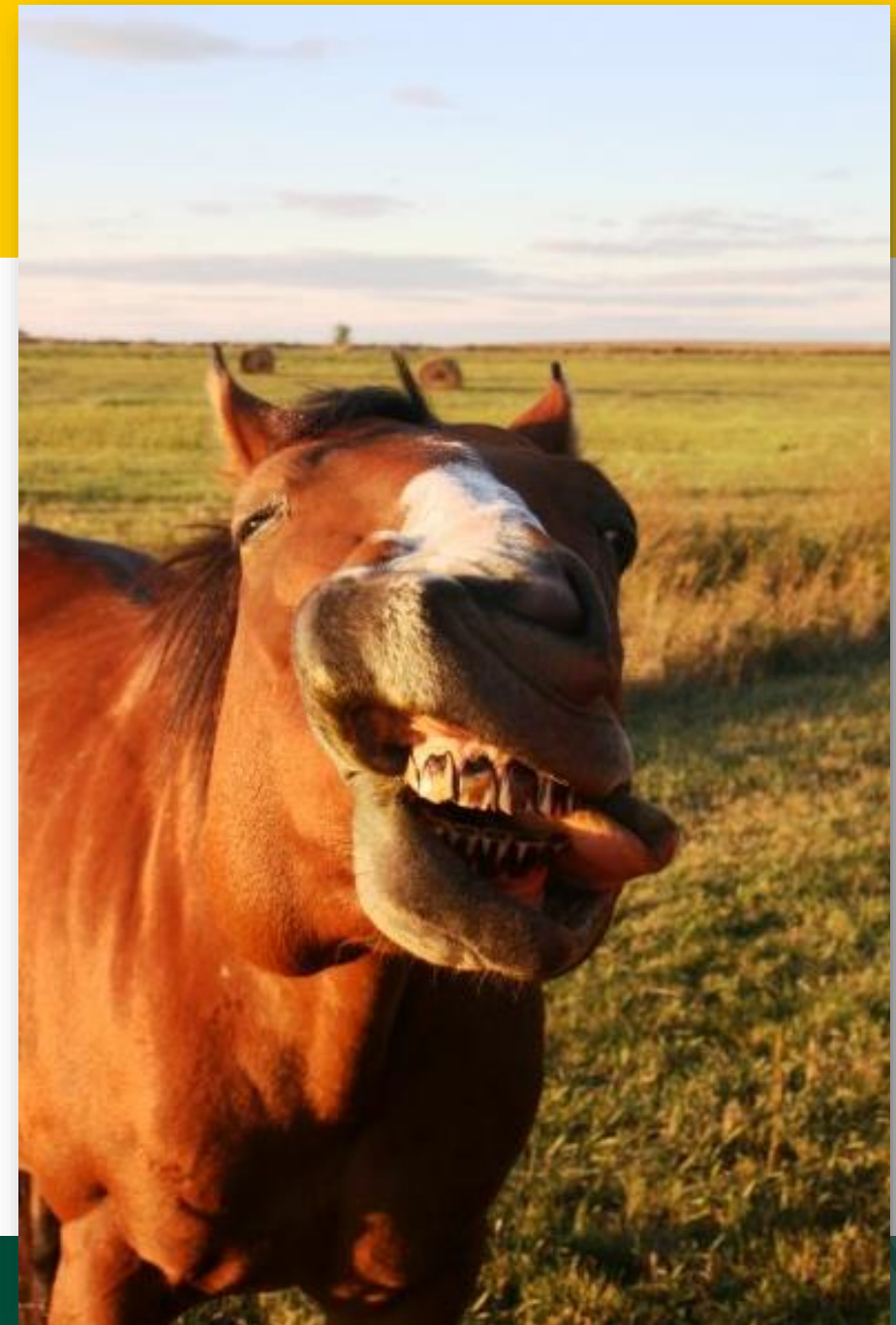
Additional Habits to Adopt

- Learn how to take vital signs and chart them regularly
- Do not share needles
- Treat ill horses last



Sources and Resources

- [NDSU State 4-H Horse Events Biosecurity](#)
- [NDSU Horse Manure Management Webinar](#)
- www.eXtension.com (Horse Quest)
- www.thehorse.com
- [My Horse University](#)
- [APHIS](#)
- [AAEP](#)
- [State Veterinarian](#)
- Your Local Vet



Q and A from Webinar

1. Why do horses need vaccines every year whereas humans, dogs and cats don't necessarily need them every year?

A. We want to heighten the horse's immunity at a time when there is a lot of mosquito pressure. It's very hard to control mosquito populations from year to year so vaccinating the horse vs. vaccinating birds or mosquitos is the best way of keeping our horse's immunity high.