UCDAVIS VETERINARY MEDICINE

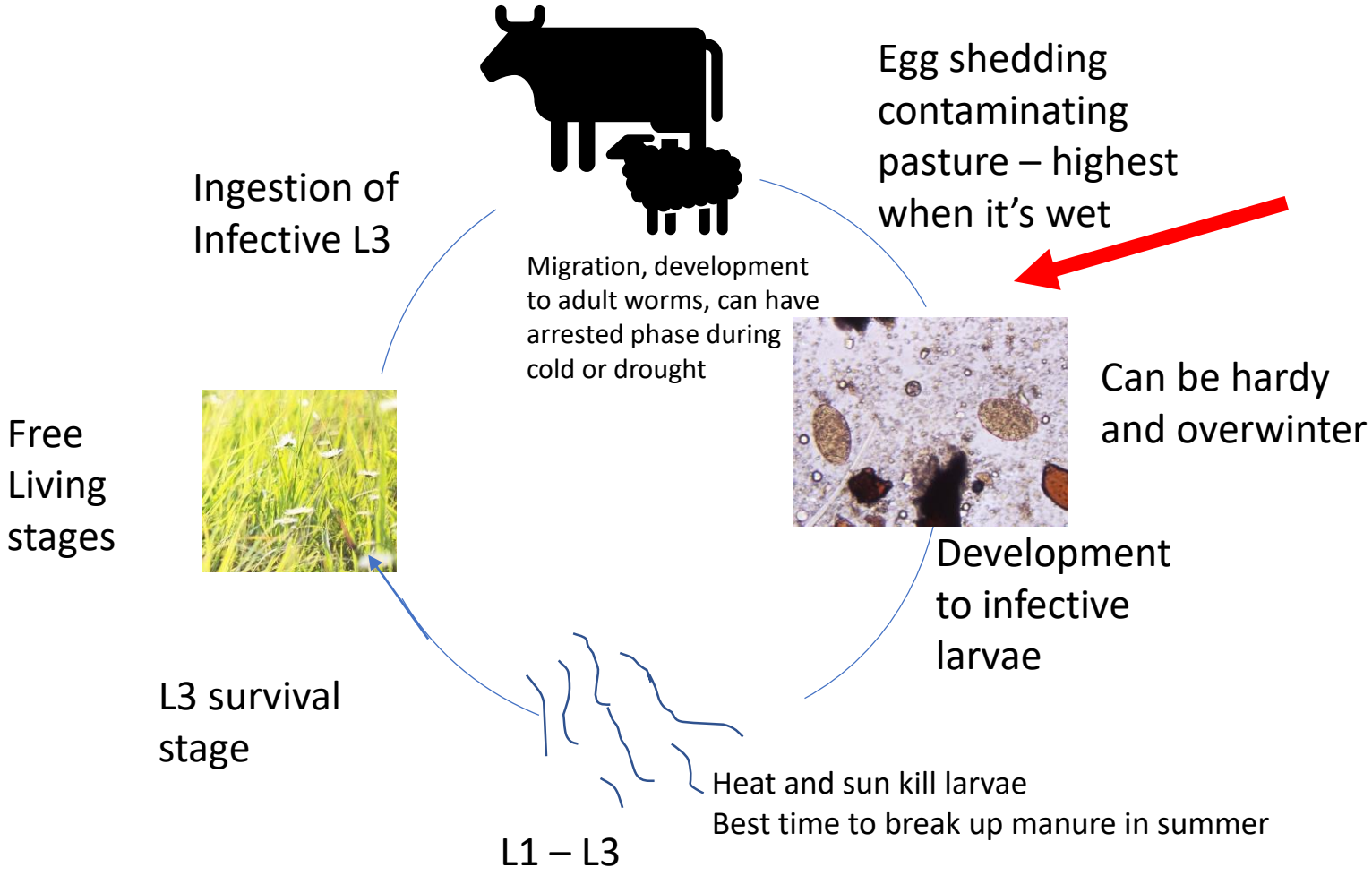
University of California
Agriculture and Natural Resources

Dewormers and vaccinations in beef cattle

February 2019

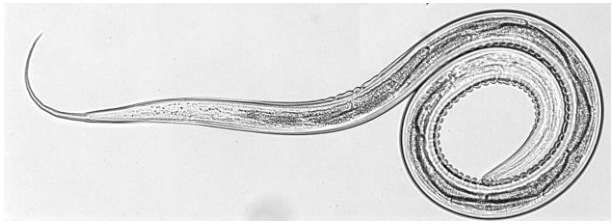
Gaby Maier, DVM, MPVM, PhD DACVPM

Internal parasites – what are we talking about?

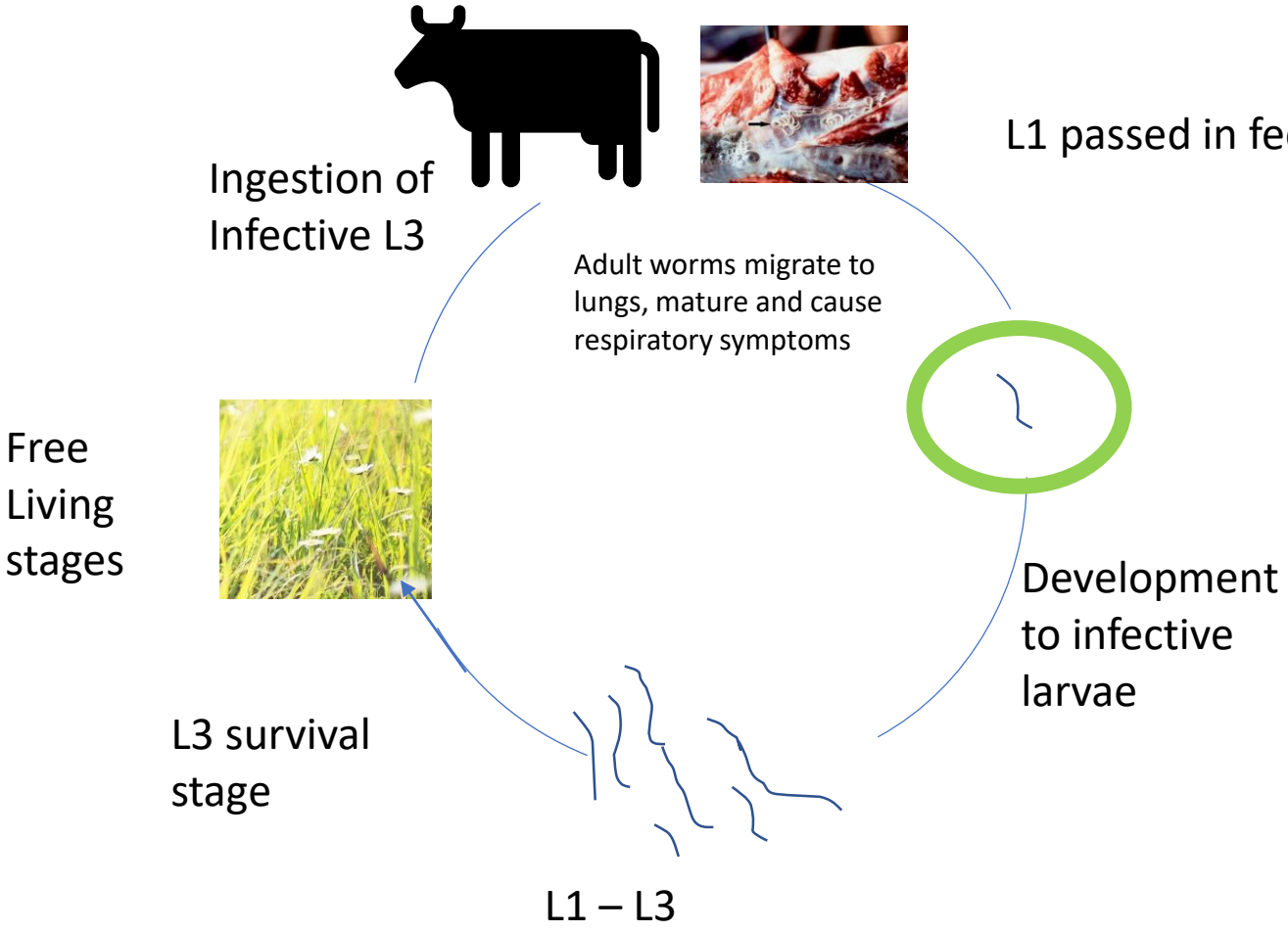


Nematodes (Worms):

- **GI worms:**
  - ***Cooperia spp***
  - *Haemonchus spp*
  - ***Ostertagia ostertagi (brown stomach worm)***
  - *Oesophagostum radiatum*
  - *Trichostrongylus spp*
  - *Bunostomum phlebotomum*
  - *Nematodirus spp*
  - *Moniezia spp*
  - *Strongyloides papillosis*

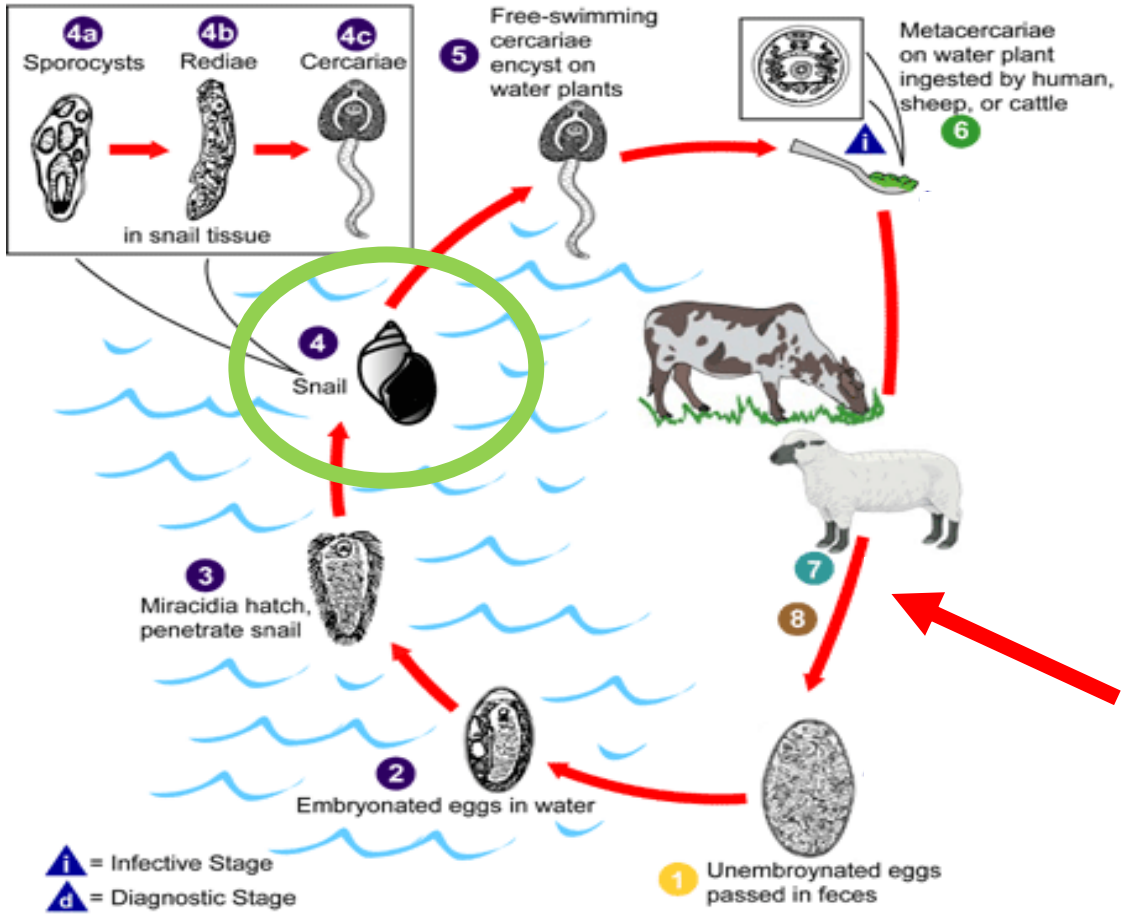


Internal parasites continued



- **Lung worms**
  - *Dictyocaulus viviparous*

Internal parasites continued



- **Liver flukes**
  - *Fasciola hepatica*

Intervention: adult flukicide: adult flukes, before egg shedding, August / September
Snails hibernate in winter

Advantages of deworming

- Better
  - Health
  - Immunity
- Increased
  - Weight gain
  - Reproductive performance

Three classes of anthelmintics

1)Benzimidazoles

2)Nicotinic agonists

3)Macrocyclic lactones

Benzimidazoles (BZ)

First class of modern anthelmintics (1961)

1. Fenbendazole
   Safe-guard®
2. Albendazole
   Valbazen®
3. Oxfendazole
   Synanthic®
4. ~~Thiabendazole~~
   ~~TBZ~~

Benzimidazoles kill worms by interfering with energy metabolism on a cellular level by binding to beta tubulin.

Nicotinic agonists

1) <u>Imidazothiazoles (IMID)</u>

   Levamisole
   Prohibit®
   LevaMed®

2) <u>Tetrahydropyrimidines (TETR)</u>

   Morantel
   Rumatel®

Act as agonists at nicotinic acetylcholine receptors of nematodes, causing paralysis of the worms.

Macrocyclic lactones (ML)

Newest family of anthelmintics - circa 1980's

1) <u>Avermectins</u>

Ivermectin
Ivomec®
Eprinomectin
Eprinex®
LongRange®
Doramectin
Dectomax®

2) <u>Milbemycins</u>

Moxidectin
Cydectin®

Macrocylic lactones interfere with GABA-mediated neurotransmission, causing paralysis and death of the parasite.

The past – first reports of resistance

Drug	Host	Year of initial drug approval *not necessarily in US	First published report of resistance
Benzimidazoles			
Thiabendazole[1]	Sheep	1961	1964
	Horse	1962	1965
Nicotinic agonists			
Levamisole[2]	Sheep	1970	1979
Macrocyclic lactones			
Ivermectin	Sheep	1981	1988
	Horse	1983	2002
Moxidectin	Sheep	1991	1995
	Horse	1995	2003

From Kaplan R.M., 2004

First resistance in U.S. cattle

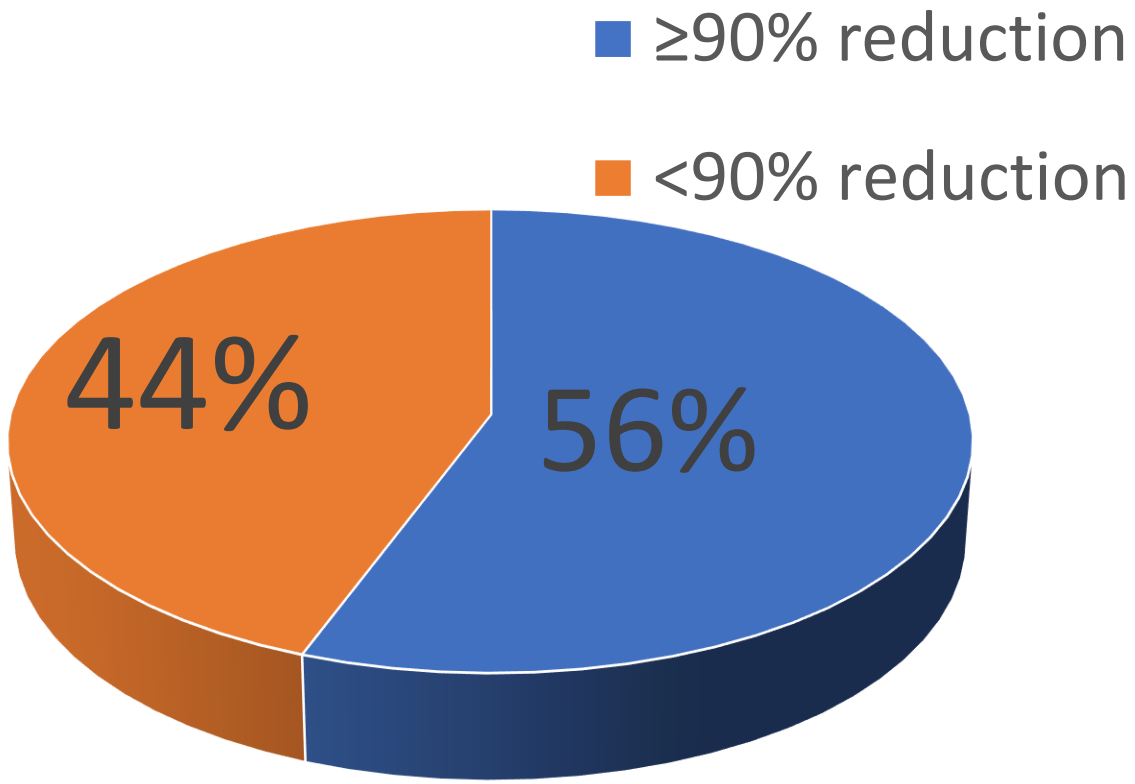
- Gasbarre et al., 2009:
- 2003: stockers, upper Midwest, southeastern origin, 9-11 months old, poor weight gain, GI signs, intensive grazing, pasture with strategic deworming > 17 years
- Resistance to all common avermectins and benzimidazoles

Winter 2002/2003 Assembly at auction Dectomax injectable	Grazing in Alabama /Mississippi Ivomec or Cydectin	May 2003 Iovmec Plus injectable	June 4 and July 17 Dectomax injectable
Assembly	Grazing	Re-assembly	Wisconsin

FECRT:	% reduction
Iovmec inj	57%
Eprinex pour on	42%
Dectomax inj.	62%
Cydectin pour on	82%
Valbazen	69%
Control	54%

The past: 2008 NAHMS cow-calf survey

- NAHMS 2007-2008: 61 cow-calf operations in U.S. participated:
  - Fecal sample collection March 1 – December 2, 2008
  - Weaned calves (6 – 18 months)
  - Grazing for at least 4 weeks
  - Not dewormed in previous 45 days
  - Second set of samples 2 weeks after deworming
  - = Fecal egg count reduction test



Resistance by drug formulation

Drug formulation	Number of herds using	Percent ≤ 90% egg reduction
Brand name pour-on macrocyclic lactone	27	48%
Generic pour-on macrocyclic lactone	16	75%
Brand name injectable macrocyclic lactone	12	17%
Generic injectable macrocyclic lactone	1	0%
Oral benzimidazole	5	0%

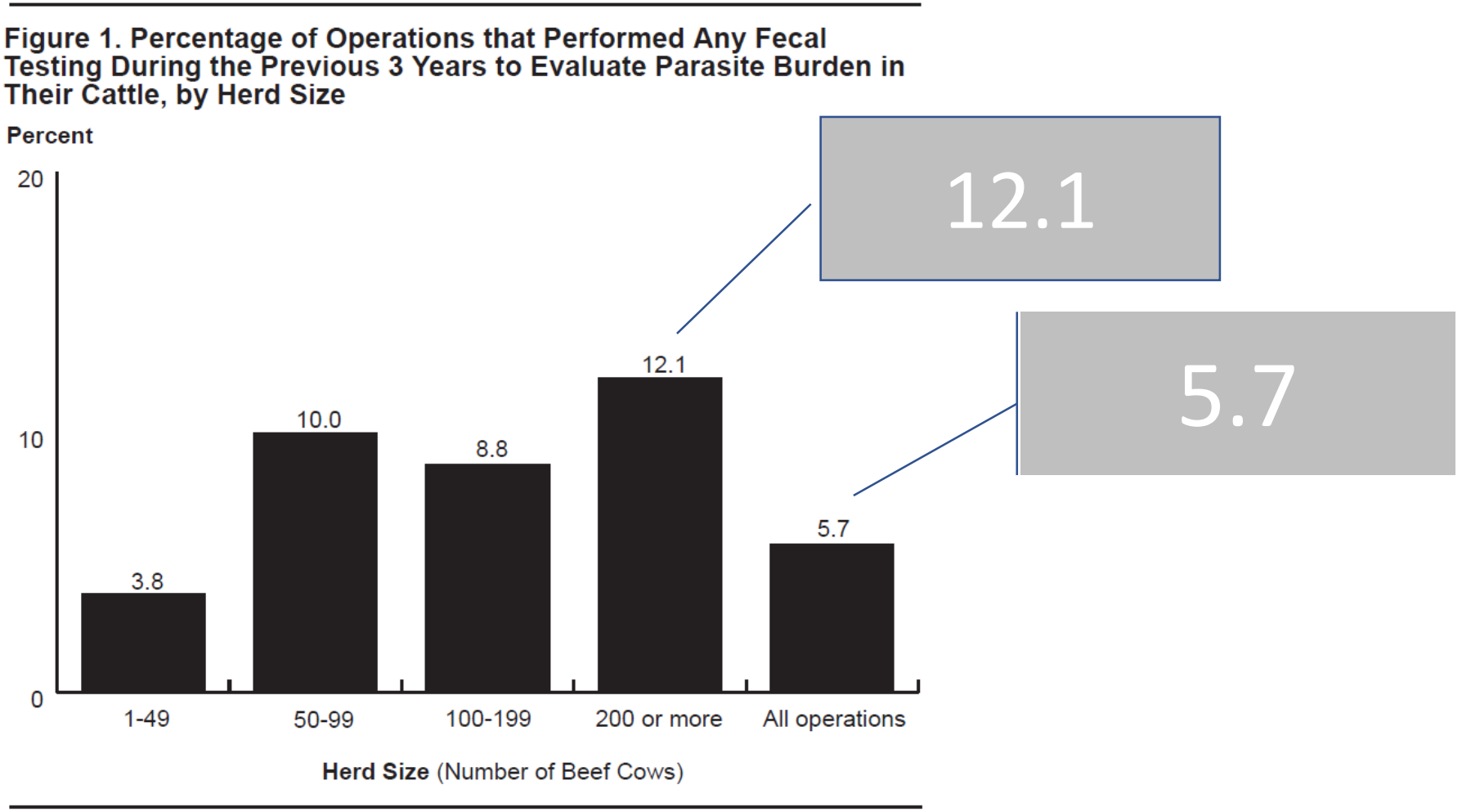
Gasbarre et al. 2015

What about pour-ons?

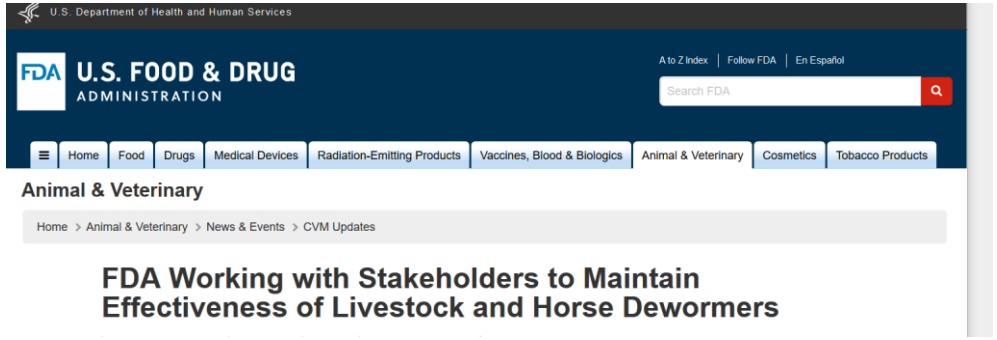
- Easy to use, less stress to cattle
- Label often not followed => underdosing
- Plasma levels lower than oral products (Leathwick and Miller, 2013)
- Licking changes plasma kinetics (Sallovitz, 2005) and leads to variable drug exposure
- **Most likely to be incorrectly dosed**

How many test to evaluate parasite burden

From: APHIS Veterinary Services
Info Sheet: Parasite Control Practices on U.S. Cow-calf Operations, 2007-08



Present: FDA request for label revision



December 6, 2018

- Any use of a dewormer can result in antiparasitic resistance
- Proper dosing is critical
- End-users should work with their veterinarian to determine the extent of antiparasitic resistance
- Dewormers should be only one part of an internal parasite control program

What leads to resistance?

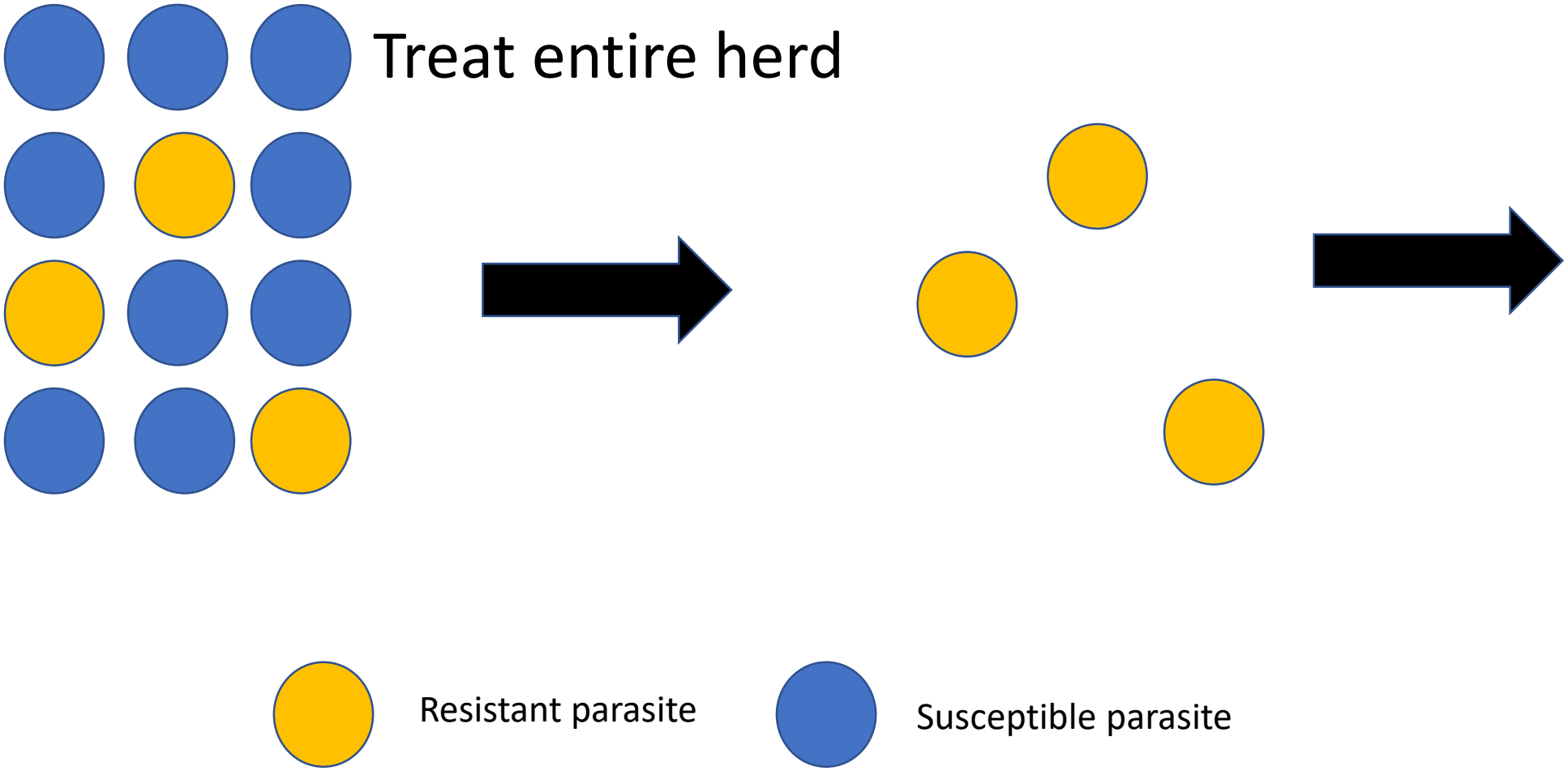
From FDA's public meeting on Antiparasitic Drug Use and Resistance in Ruminant and Equines

- Management factors:
  - Treating too often
  - Treating every animal
  - Treating when most parasites are in the animal and not the environment
  - Inadequate quarantine: not testing or treating new animals
  - Under dosing: sub-therapeutic doses

Ways to slow resistance

- Choosing the right drug
- Good pasture management
  - Do not overgraze
  - Disperse manure pats in dry weather
- Long-acting drugs may increase resistance
- Refugia
  - In animal: only deworm 90% of cattle
  - Environmental refugia: only deworm when parasites are on pasture

What is refugia?



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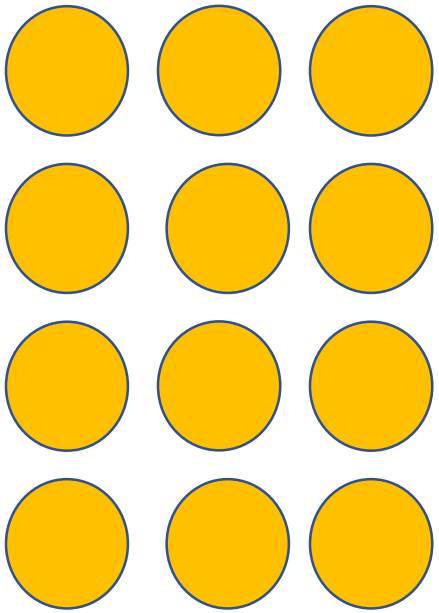
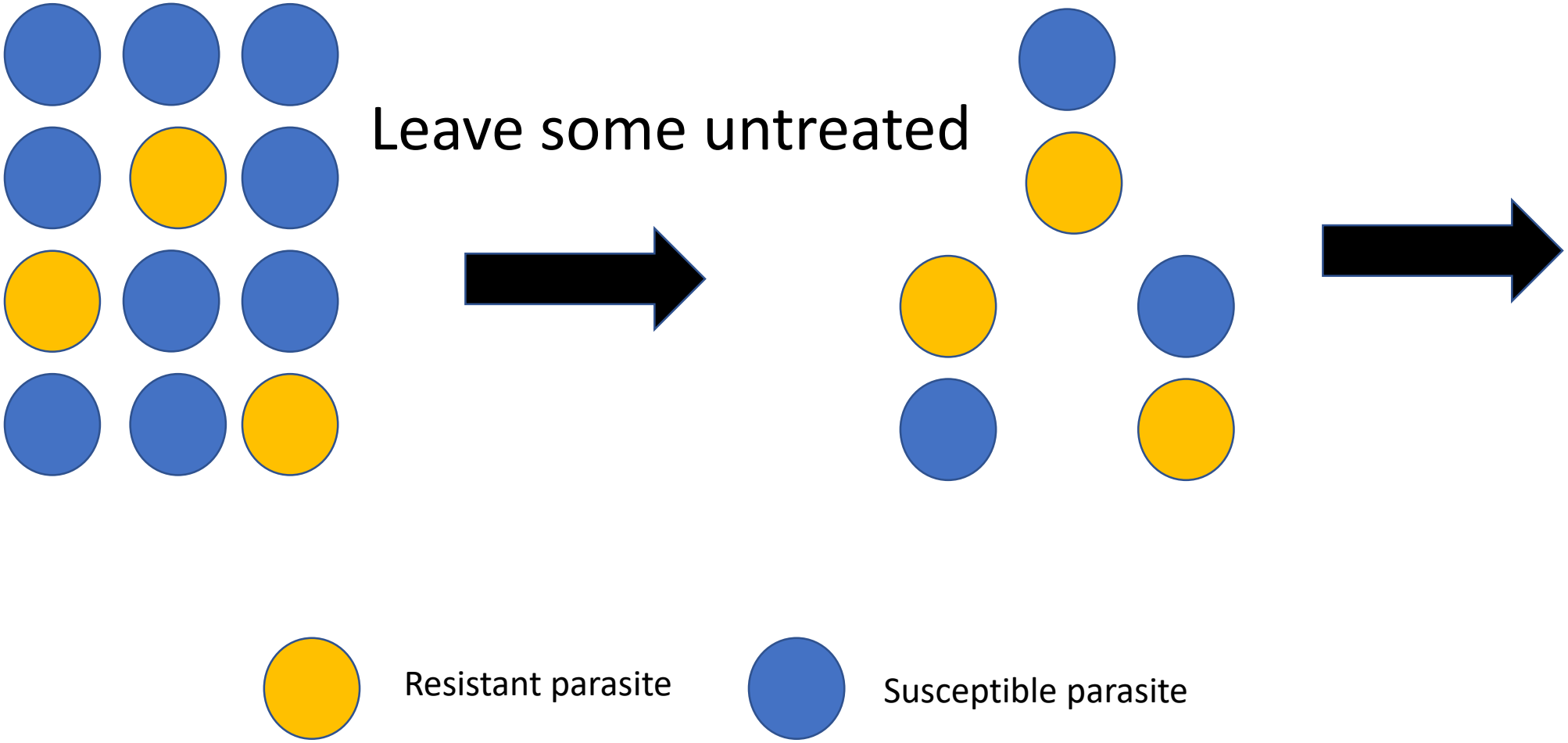


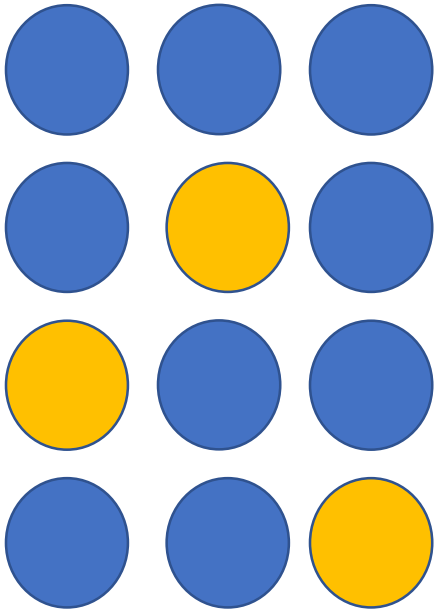
Resistant parasite

Susceptible parasite

What is refugia?



What is refugia?



No studies have demonstrated the validity of this concept for bovine nematodes

Resistant parasite

Susceptible parasite

General recommendations

- Test your method if response to treatment is less than expected:
  - Especially if unhappy with weight gain
  - 10 animals at least if re-testing same animals
  - 17 animals at least if testing group (not re-testing same animals)
  - Test high-risk group: calves at weaning / yearlings
    - Egg count will decrease with age
  - CAHFS: McMasters test: lower detection limit 50 eggs per gram cost $10.50
  - Summer 2019 – UC Davis dewormer efficacy study
- Do not under-dose:
  - Don't go by the "average" weight – will by default under-dose 50% of animals
  - If no scale – use girth tape

Gasbarre, 2014

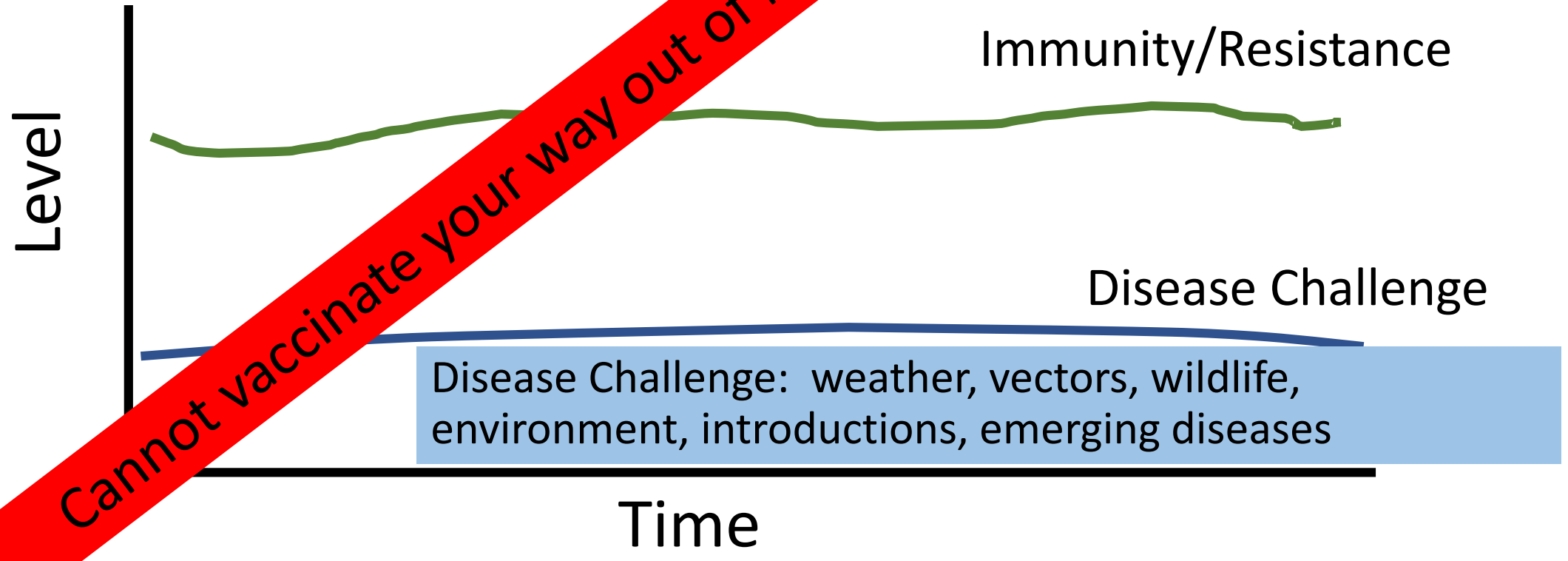
Summary

- Internal parasites cause damage
- Parasite resistance to dewormers appears to be on the rise
- A program that consists of only repeated use of the same single drug will eventually fail
- To use dewormers judiciously:
  - Make sure you are dosing correctly
  - Consider testing to ensure efficacy
  - Apply good pasture management
- Look out for upcoming UC Davis study!

Vaccinations in cow calf operations

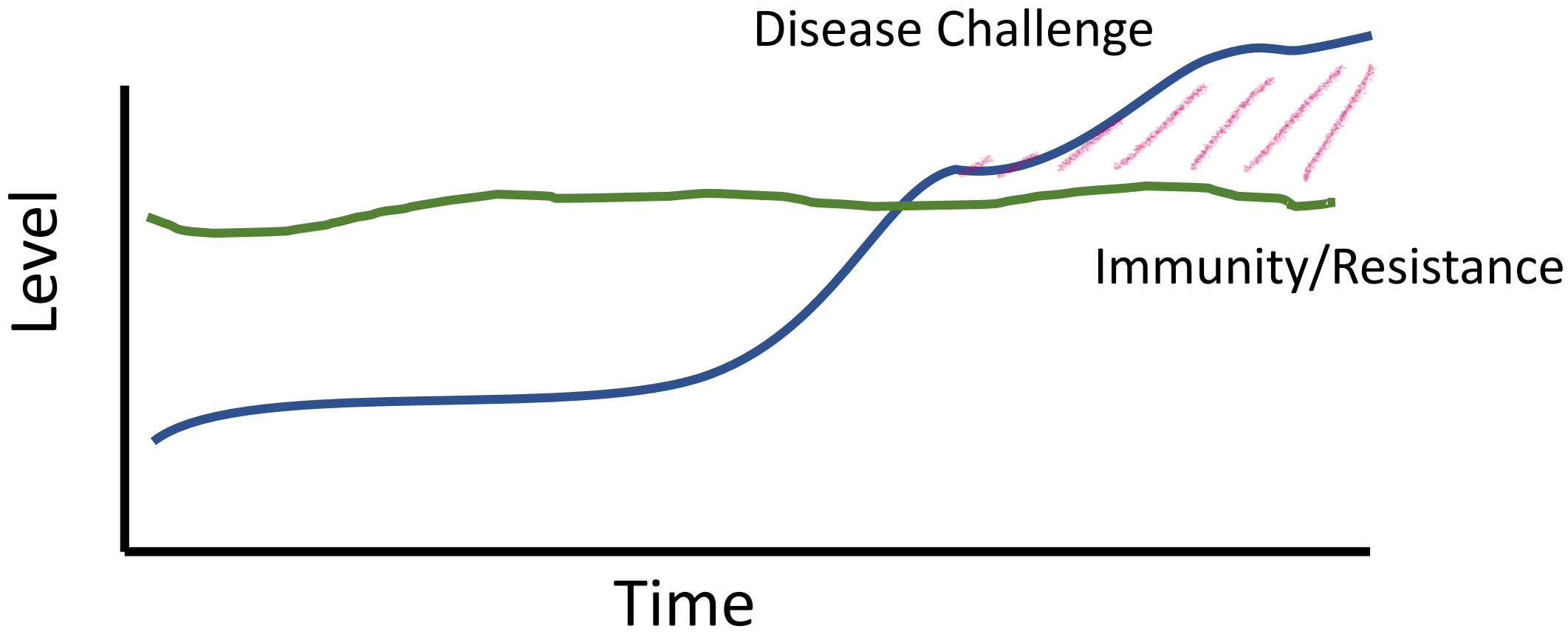
Goal of herd health including v[illegible]nations

Immunity/Resistance: good biosecurit[illegible]trum management, mineral supplementation, nutrition[illegible]tion, parasite control, stockmanship, vaccinations

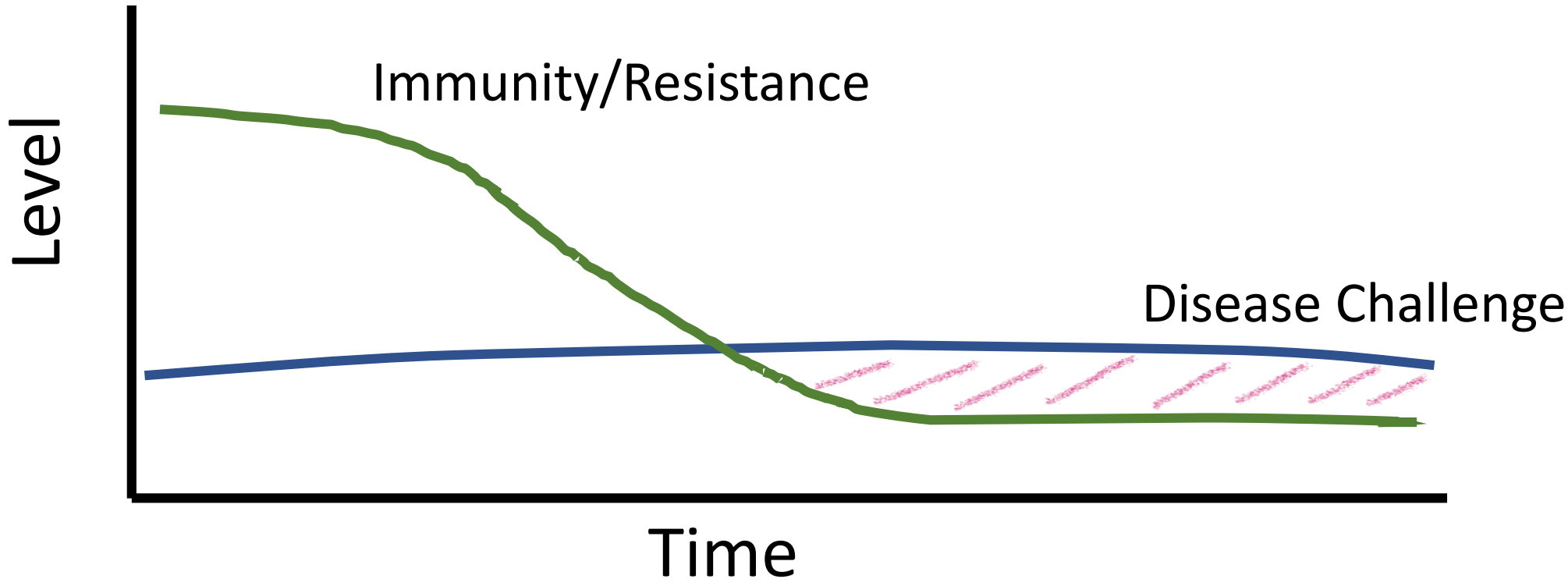


Disease Challenge: weather, vectors, wildlife, environment, introductions, emerging diseases

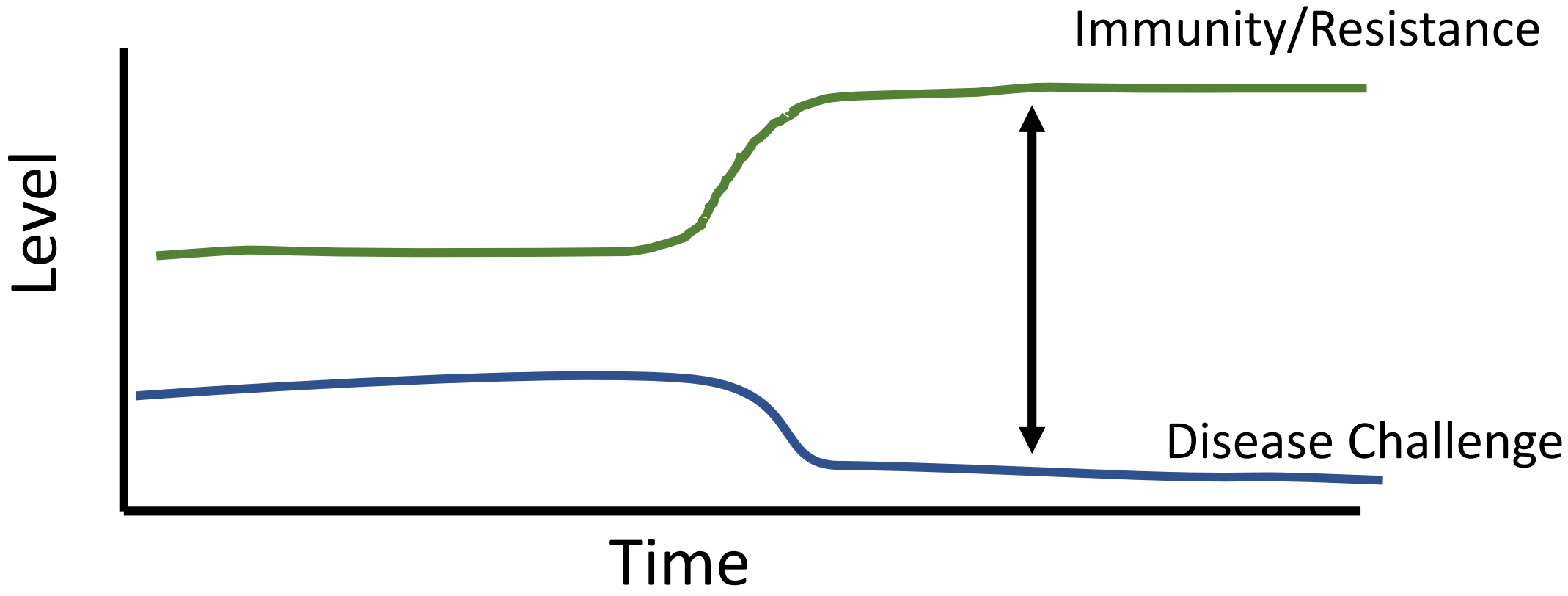
Problems with herd health



Problems with herd health

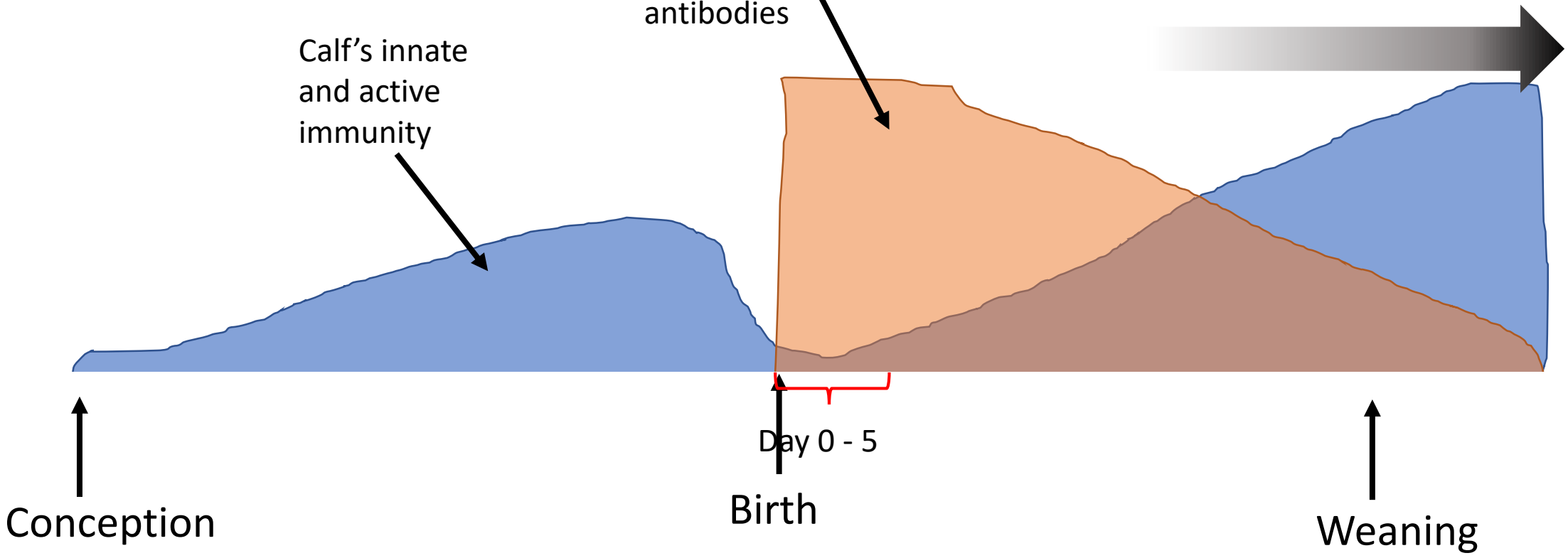


Goal of herd health including vaccinations



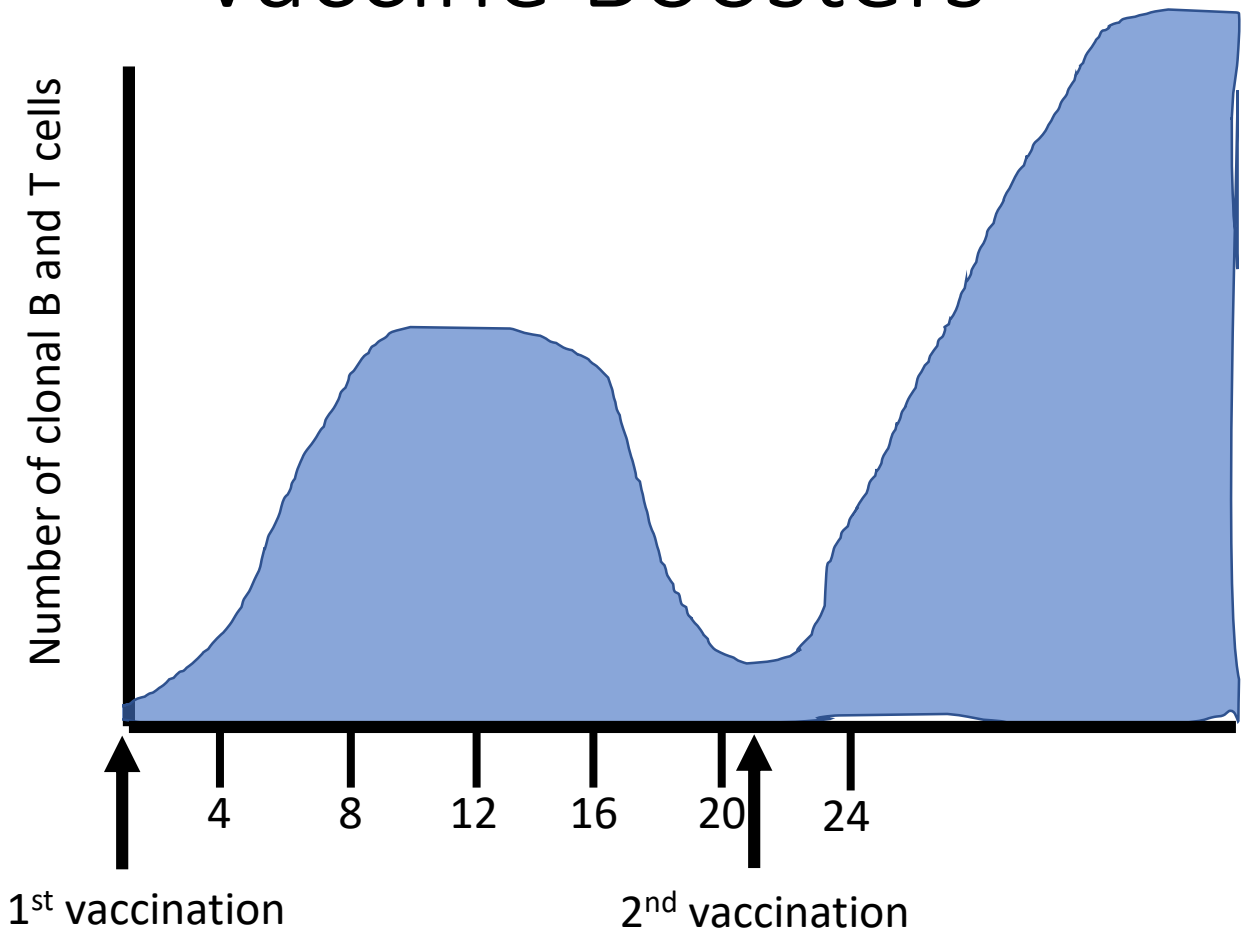
Maternal antibody interference

Responsiveness to injectable vaccines
In particular BVD, Mannheimia, Pasteurella



According to Chase et al. Neonatal Immune Development in the Calf and Its Impact on Vaccine Response, Vet Clin Food Anim 2008 87-104

Vaccine Boosters



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Things to do with vaccines

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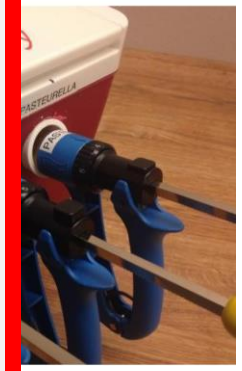

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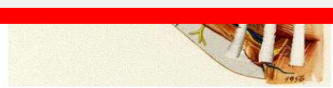
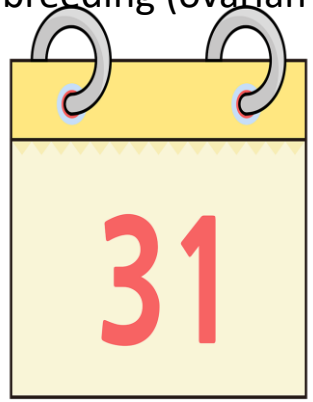
Before you make changes to your vaccination protocol– please talk to your vet!



ucanr.edu

Things NOT to do with vaccines

Don't vaccinate with a **modified live** vaccine for **IBR or BVD** less than 30 days before breeding (ovarian pathology)

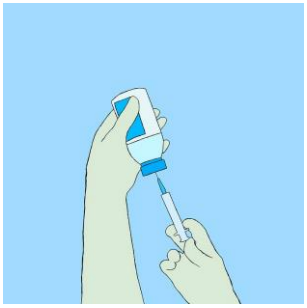


Do not freeze

Do not vigorously shake bottle when mixing vaccines

Do not inadvertently inactivate vaccine with disinfectants

Do not contaminate the vaccine bottle



Do not mix 2 vaccines in 1 syringe

Do not use the same syringe for different vaccines

Do not give Vitamin EAD with scour vaccines => can potentiate endotoxins and lead to abort[illegible]s

Don't give too many vaccines at one time, especially Gram negatives (E. coli, Vibrio, Histophilus, pinkeye, Mannheimia, Pasteurella) => fever, off feed

Considerations for herd vaccination protocols

- No standard protocol can be recommended for all herds
- Will depend on:
  - Circumstances of your herd
  - When you can do it
  - Where you are

  - Age (calf, replacement, adult)
  - Use (breeding, feedlot)
  - Stocking density
  - What diseases are common
  - Cost
  - Facilities
  - Location (foothill abortion, anaplasma, trich)

Modified live or killed?

- Modified Live:
- Pros:
  - Longer immunity than killed
  - Stronger response
  - Fewer hypersensitivity reactions
- Cons:
  - Less forgiving if stored improperly
  - Potential to revert back to virulence (rare)
  - Need to use up immediately
  - Pregnant animals can abort
    - If not already vaccinated with same vaccine pre-breeding within 12 months
    - Also not recommended for suckling calves on pregnant dams, if dam not vaccinated with **same** vaccine

- Killed:
- Pros:
  - Cannot cause disease
  - Safe for pregnant animals
  - Longer storage
  - No mixing required
- Cons:
  - Require more frequent boosters
  - Often cause reactions
  - Shorter immunity and slower onset
  - Oil-adjuvanted vaccines confer longer immunity, more likely to cause swelling

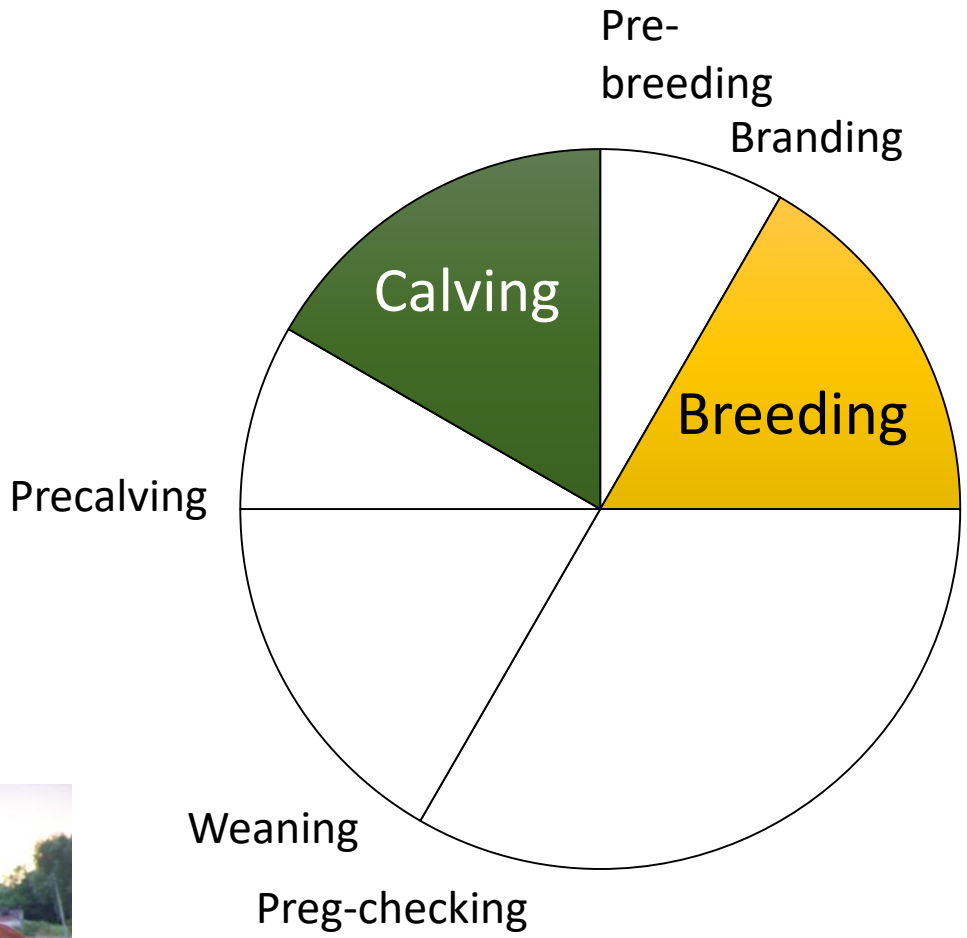
Calves from birth to weaning

www.fwi.co.uk/

Replacement heifers

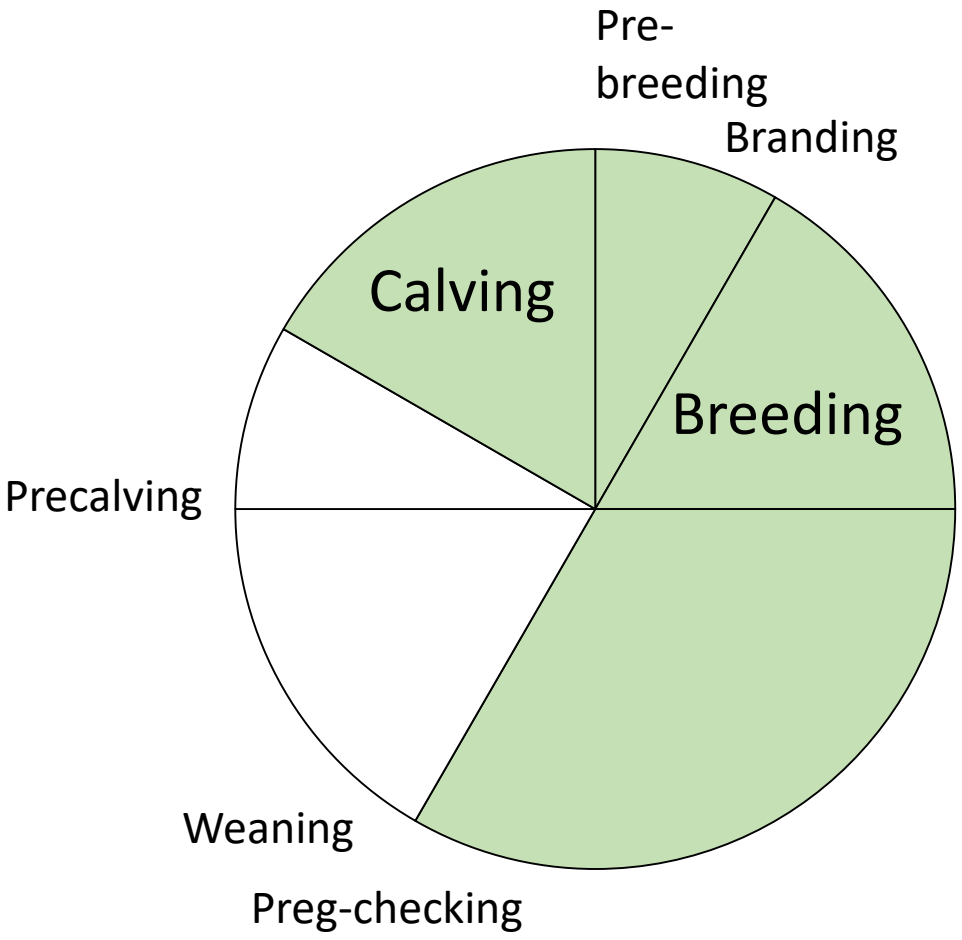
Breeding Bulls

Adult cows



Calves from birth to weaning

www.fwi.co.uk/



<u>Diseases</u>

- Scours: E. coli, Rota, Corona, Salmonella, Giardia, Cryptosporidium, Coccidia Clostridium perfringens,
- Respiratory disease
- Tetanus (castrations)
- Other Clostridial diseases (Blackleg, enterotoxemia)

Calves: options and considerations

<u>At birth:</u> Most important for immunity is good quality COLOSTRUM

Maternal antibodies may interfere with some injectable vaccines

Avoid injectables the first 5 days of life

<u>Vaccines: oral or intranasal</u>

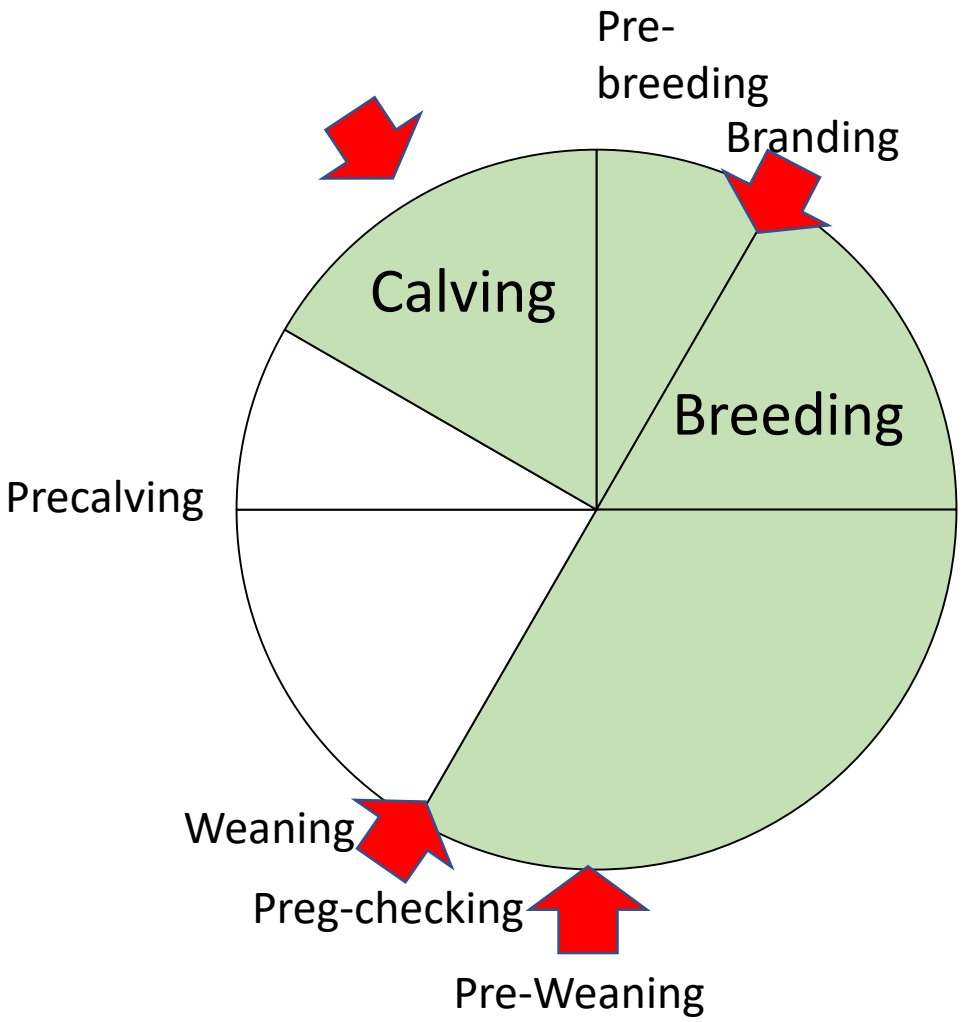
- Calfguard®: Rota/Corona– oral, before colostrum
- Bar-Guard 99™: E. coli K99 – oral, after colostrum but within 20 hours of birth
- Intranasal IBR/PI3/BRSV
  - ML, local immune response
  - make sure nose is clean
  - Fast onset, but shorter immunity
- Bo-Se / Mu-Se / Multimin (not a vaccine, but can help with immunity)

www.BeefResearch.ca

Calves: options and considerations

Injectable vaccines:

- 7 or 8 way Clostridial (Blackleg etc.)
  - Need 2 doses
  - Include *Clostridium hemolyticum* (cause of Redwater) if flukes are a problem
  - Tetanus, especially if banding for castration
- 4-way viral BRD +/- Lepto
  - Small risk of abortion in dam if suckling calf is vaccinated with MLV unless dam received same vaccine in previous 12 months (check label)
  - Option: MLV intranasal + injectable killed BVD (needs booster)
  - Killed (needs booster)



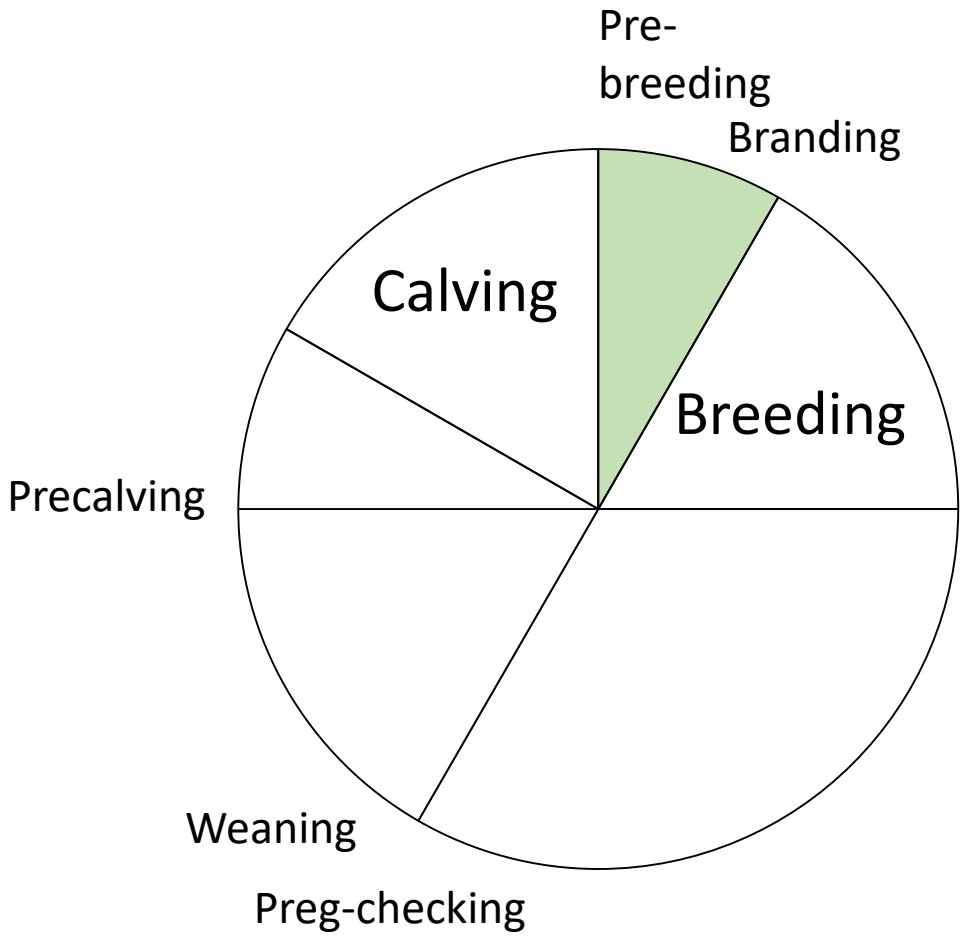
Replacement heifers

<u>Diseases</u>

- Reproductive diseases:
  - IBR, BVD, Vibrio, Lepto, Trich
  - If using AI, Vibrio and Trich of little concern (neighbors?)
- Clostridial diseases

<u>Vaccines pre-breeding:</u>

- Multitude of options, modified live and FP recommended
- Combinations available
- Vaccinate > 1 month before breeding (ovarian pathology due to vaccines) and to establish immunity
- Make sure appropriate boosters have been given
- Trichguard®: “aids in the reduction of shedding of *T. foetus*”
  - Only recommended for affected herds



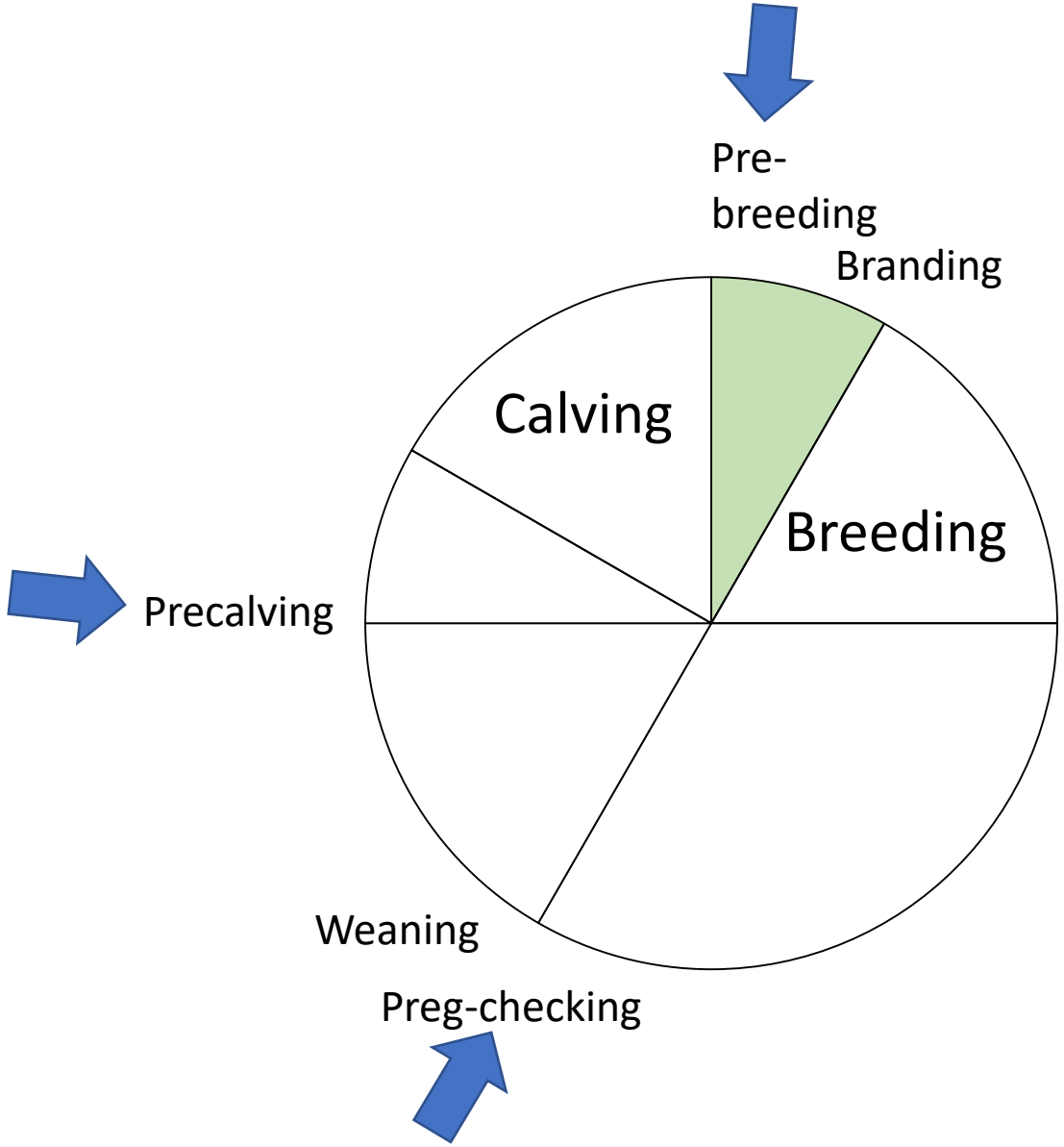
Adult cows

<u>Diseases</u>

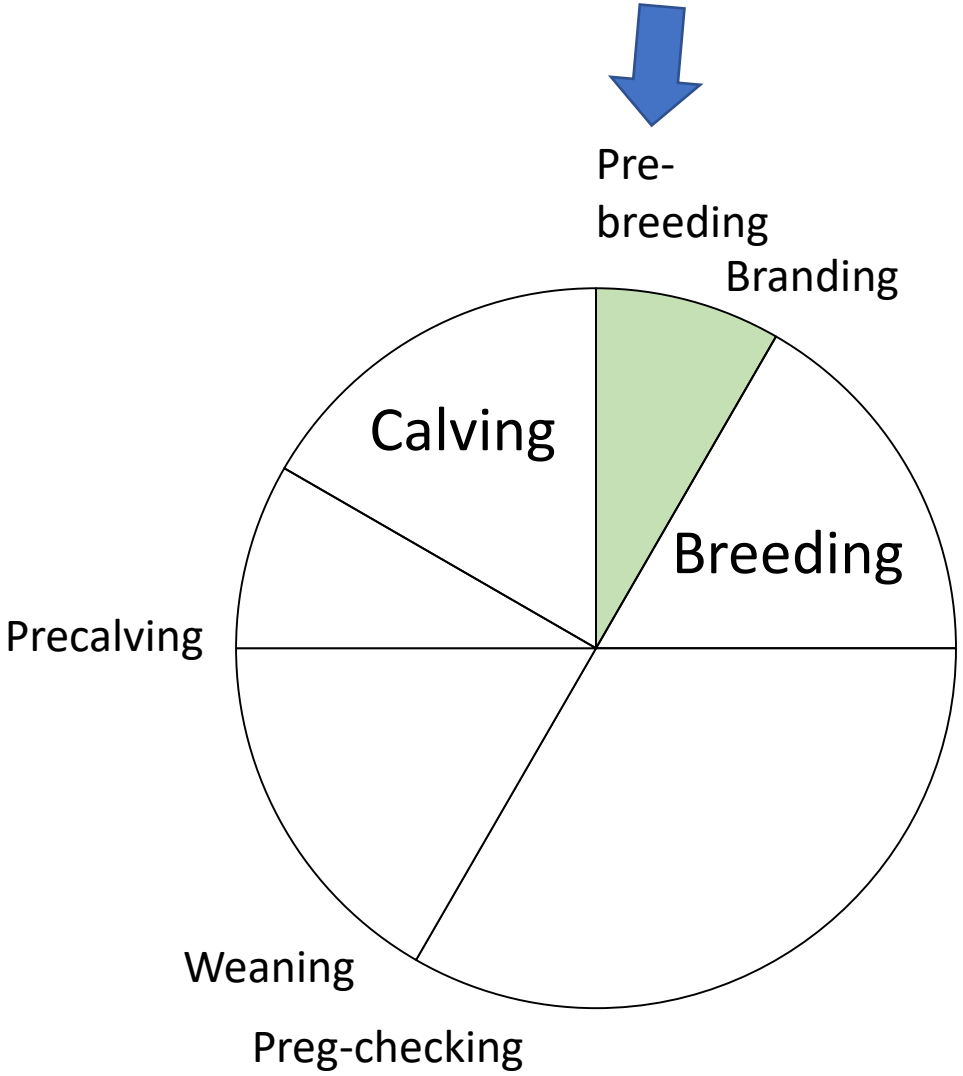
- Reproductive diseases:
  - IBR, BVD, Vibrio, Lepto, Trich
- Calfhood diseases => colostrum

<u>Vaccines:</u>

- Pre-breeding / Preg-check / Pre-calving
- Pre-calving/Preg check: to booster colostral antibodies
  - Scours vaccine – Don't give with Vitamin AED shots
  - Prior to calving – check label
- Lepto: short duration of immunity



Breeding Bulls



Diseases

- Reproductive diseases:
  - IBR, BVD, Vibrio, Lepto, Trich

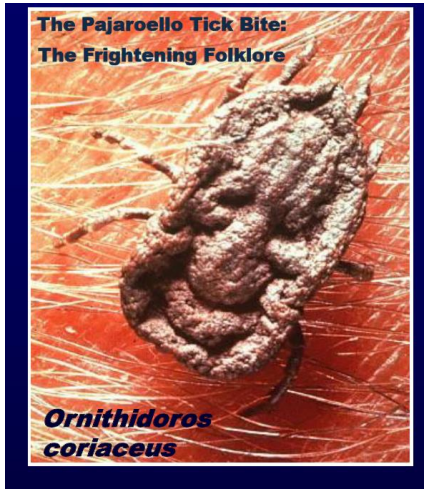
Vaccines:

- Pre-breeding
  - Also BSE and Trich test (vaccine not labelled for bulls)
  - Mineral status, parasites

Optional vaccines

- Pinkeye – before fly season
  - Commercial
  - Autogenous – made from bacteria isolated from your cattle
- Mannheimia, Histophilus, Pasteurella
  - To prevent shipping fever (BRD)
- Anaplasma:
  - Experimental vaccine – not fully licensed
  - Available through CCA
  - Does not prevent infection
  - Make the decision to vaccinate with your vet
- Anthrax
  - Only if you have had cases in the past
- Brucellosis
  - heifers 4 – 12 months old
  - only mandatory for change of ownership unless going to slaughter or feedlot

Update on Foothill abortion vaccine



- Local small manufacturer found
- Still in USDA approval process
- Dr. Stott hopeful vaccine commercially available in 2020
- Vaccine trials ongoing, but closed to new participants
- Currently vaccinating about 100 herds / year

Thank you

Questions?

Contact:

gumaier@ucdavis.edu

https://vetext.vetmed.ucdavis.edu/programs/beef-cattle-herd-health

Twitter: @gabymaier6