BVD Vaccination Programs: Field Trials and Serology

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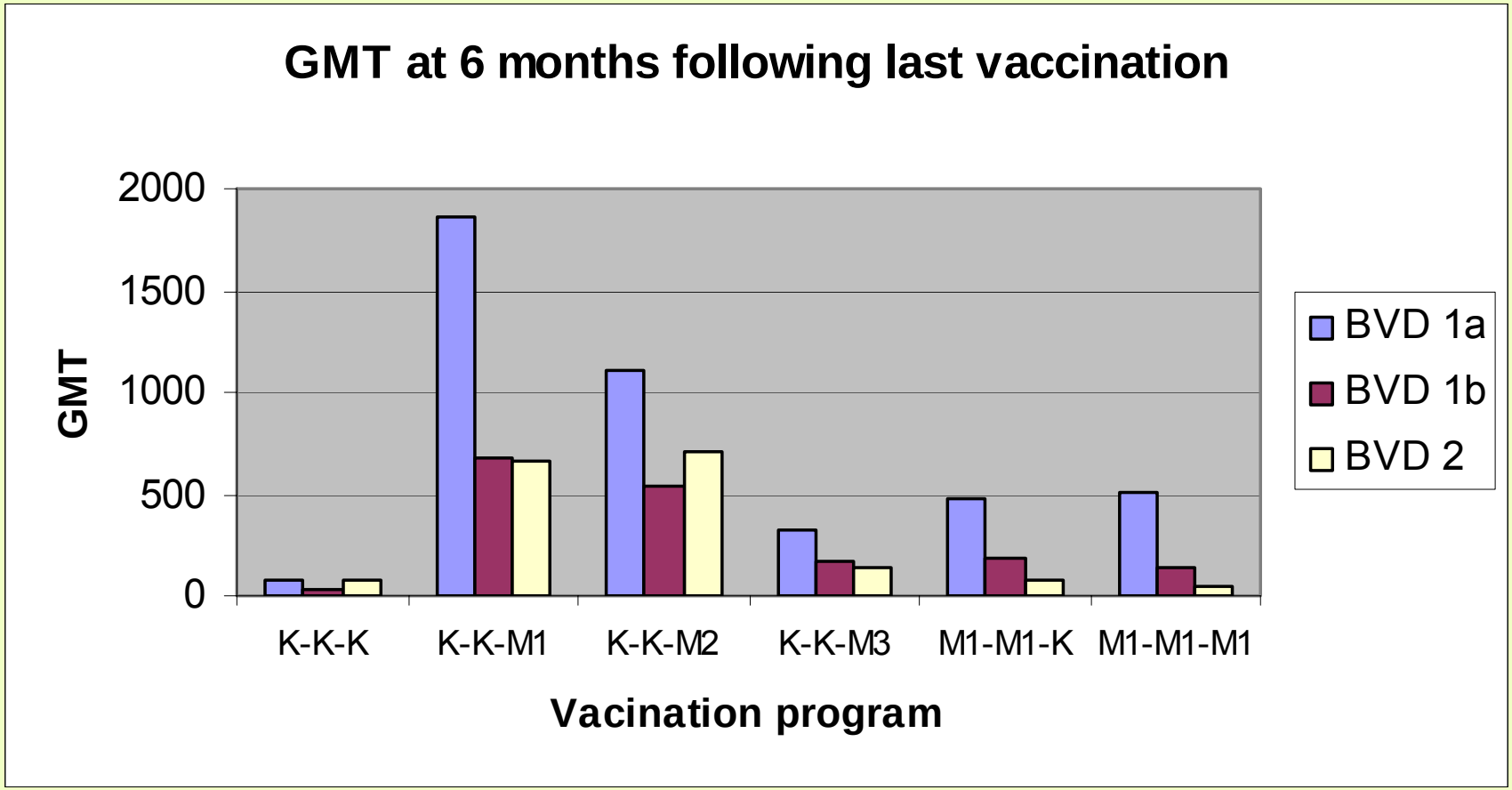
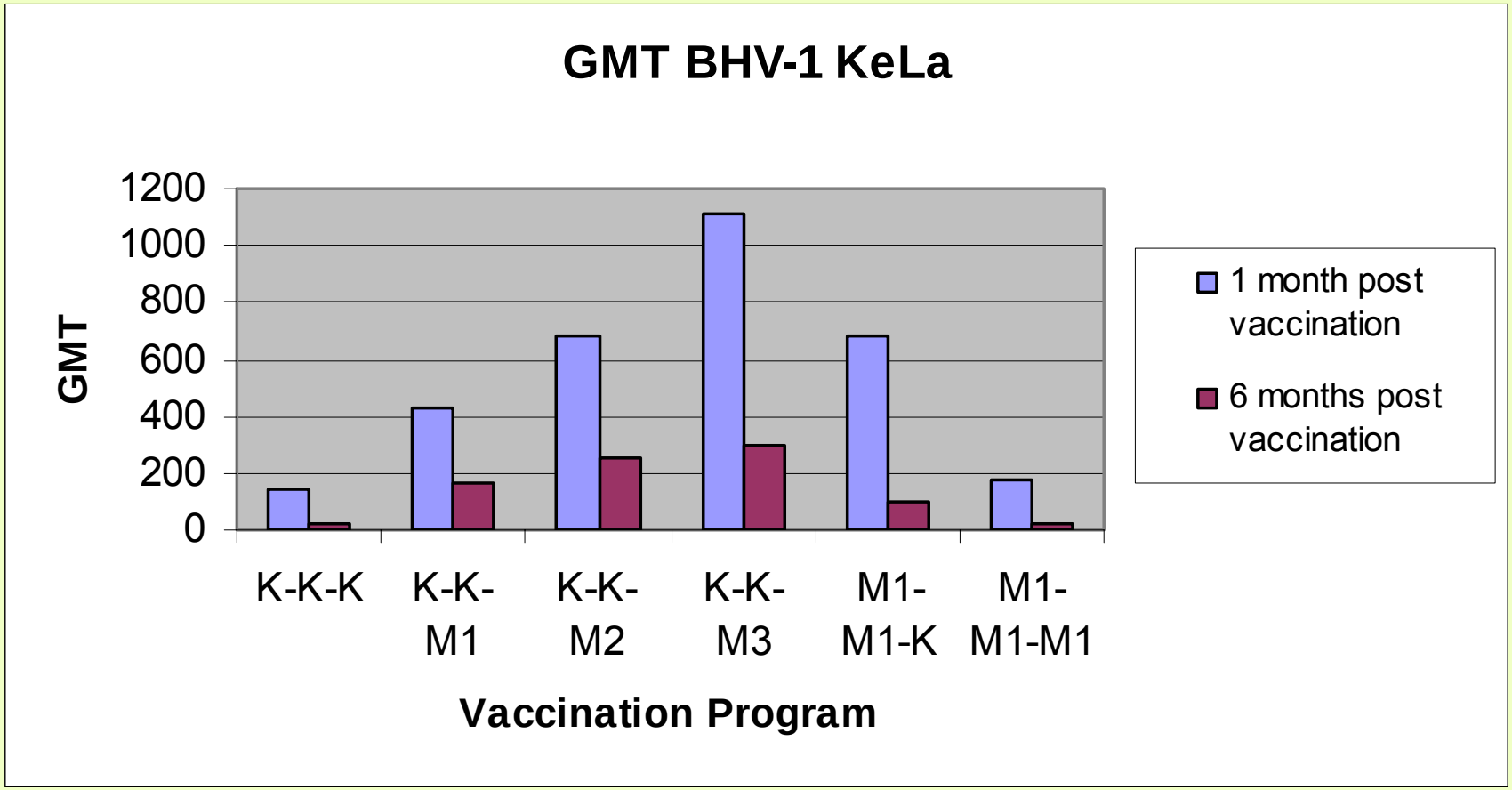
- Veterinarians often change vaccines for scientific and business reasons;
- Pressure to change BVD vaccines is particularly intense:
  - broaden range of BVD viruses in program;
    - different vaccines may contain different strains;
    - Combinations of MLV and inactivated vaccines may optimize immune response;
  - vaccines containing both type 1 and 2;
  - vaccines containing both type 1a and 1b;
  - vaccines containing cytopathic and non-cytopathic biotypes.

- But what do you get when you change vaccines:
  - different brands of vaccines do not necessarily contain different strains of BVDV:
    - Singer, NADL and Oregon/C24V are the type 1a BVDV commonly used in many commercial MLV and inactivated vaccines; (Fulton et al, 2003)
    - 296 type 2 BVDV is used in several commercial MLV vaccines. (Fulton et al, 2003)
    - there is no assurance that a change in vaccine will mean you are using a different BVDV.

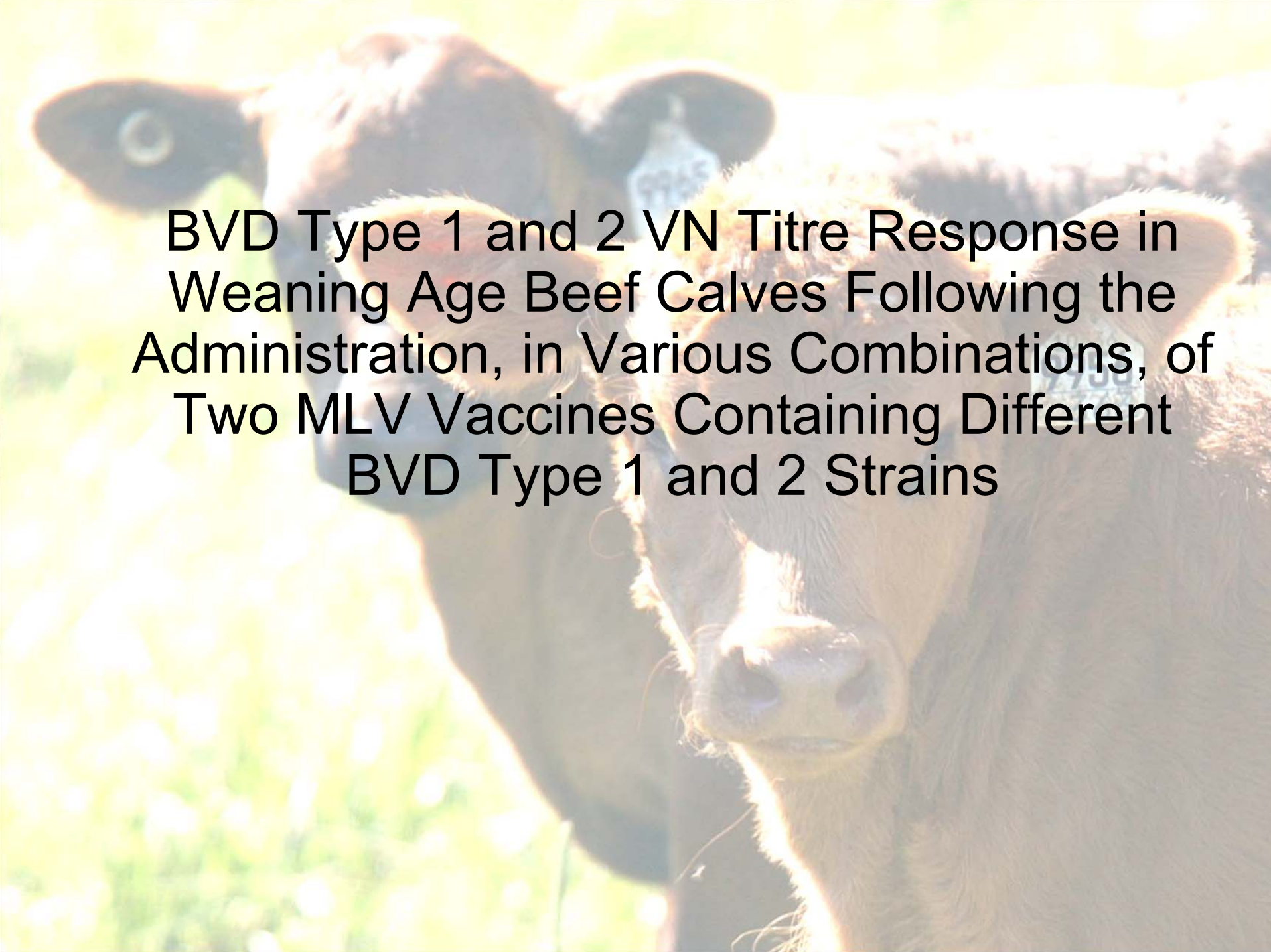
- But what do you get when you change vaccines:
  - even though the same viruses may be used in different vaccines, the vaccines may differ substantially in the quantity of viral antigen in the vaccine;
  - data on antigen and virus concentration is not usually available from companies.

- What is known about outcome when changing vaccines:
  - E J Dubovi, YT Grohn, D V Nydam, *Vaccination Programs for Breeding Heifers Using Combinations of Killed and Modified-Live Vaccines*. (Dubovi et al, 2003)
  - dairy heifers were vaccinated with 1 of 6 different programs:
    - K-K-K, K-K-M1, K-K-M2, K-K-M3, M1-M1-K, M1-M1-M1;
    - vaccinated at 4 months, 5 months and 10 months of age.
  - calves were followed using serology.


GMT at 6 months following last vaccination
2000
1500
1000
500
0
GMT
K-K-K
K-K-M1
K-K-M2
K-K-M3
M1-M1-K
M1-M1-M1
Vacination program
BVD 1a
BVD 1b
BVD 2


GMT BHV-1 KeLa
GMT
1200
1000
800
600
400
200
0
K-K-K
K-K-M1
K-K-M2
K-K-M3
M1-M1-K
M1-M1-M1
Vaccination Program
1 month post vaccination
6 months post vaccination

- Using combinations of vaccines:
  - Conclusions:
    - some combination vaccination programs using MLV and inactivated vaccines tended to produce better serologic responses that purely inactivated or purely MLV programs;
    - not all combinations will gave the same result;
    - not all combinations will give the same result for all antigens
    - any benefit in improved serologic response occurs only with specific combinations.



BVD Type 1 and 2 VN Titre Response in Weaning Age Beef Calves Following the Administration, in Various Combinations, of Two MLV Vaccines Containing Different BVD Type 1 and 2 Strains

- Objectives:
  - To evaluate VN titre response to BVDV Type 1 and 2 and weight gain in weaning age beef calves following various vaccine combinations;
  - To determine if revaccination with a different vaccine would result in a different serological response and improved weight gain.

- Materials and Methods:
  - 5 month old beef calves.
  - Bulls and heifers were randomly assigned to one of four treatment groups. Bulls and heifers were equally distributed among treatment groups.
  - Calves were enrolled in 1 of 4 vaccination programs.
  - Blood was collected for VN assays at:
    - Day 0: At time of first vaccination
    - Day 25: At time of second vaccination
    - Day 56: At conclusion of the trial
  - Calves were individually weighed at day 0 and 56.

Treatment Groups

	3-4 Weeks Prior to Weaning	At Weaning	N =
Group 1	M 1	M 1	24
Group 2	M 1	M 2	24
Group 3	M 2	M 1	25
Group 4	M 2	M 2	25

- Materials and Methods:
  - Sera were separated and stored frozen and were assayed at the same time.
  - Sera were assayed at Benchmark Bio Labs (Lincoln, NE) for VN activity against:
    - Singer BVD virus;
    - NADL BVD virus;
    - NVSL 125 c
  - Laboratory personnel were blind to treatment.

Results:

Singer BVD-1 Geometric Mean Titre			
Group	Day 0 (1st Vac.)	Day 25 (2nd Vac.)	Day 56
1 (M1-M1)	69.5	68.3	62.9
2 (M1-M2)	75.6	45.4	1580.7
3 (M2-M1)	83.1	2257.2	3984.3
4 (M2- M2)	71.7	1758.8	3328.0

Day 0: No significant differences ($p \geq 0.8796$)

Day 25: Differences between groups 1 and 3, 1 and 4, 2 and 3, and 2 and 4 ($p < 0.0001$).

Day 56: Group 1 differed from groups 2, 3 and 4 $p < 0.0001$).
Group 2 differed from group 3 and 4 ($p \leq 0.0230$).

Results:

NADL BVD-1 Geometric Mean Titre			
Group	Day 0 (1st Vac.)	Day 25 (2nd Vac.)	Day 56
1 (M1-M1)	49.5	23.3	36.0
2 (M1-M2)	36.3	16.8	384.3
3 (M2-M1)	30.5	290.6	781.4
4 (M2-M2)	39.4	258.1	662.2

Day 0: No significant differences ($p \geq 0.1309$).

Day 25: Differences between groups 1 and 3, 1 and 4, 2 and 3, and 2 and 4 ($p < 0.0001$).

Day 56: Group 1 differed from groups 2, 3, and 4 ($p < 0.0001$).
Group 2 differed from groups 3 and 4 ($p \leq 0.0126$).

Results:

NVSL 125C BVD-2 Geometric Mean Titre			
Group	Day 0 (1st Vac.)	Day 25 (2nd Vac.)	Day 56
1 (M1-M1)	23.7	20.2	131.9
2 (M1-M2)	29.8	12.6	170.5
3 (M2-M1)	31.8	73.5	175.5
4 (M2-M2)	36.2	74.1	256.7

Day 0: No significant differences ($p \geq 0.2931$).

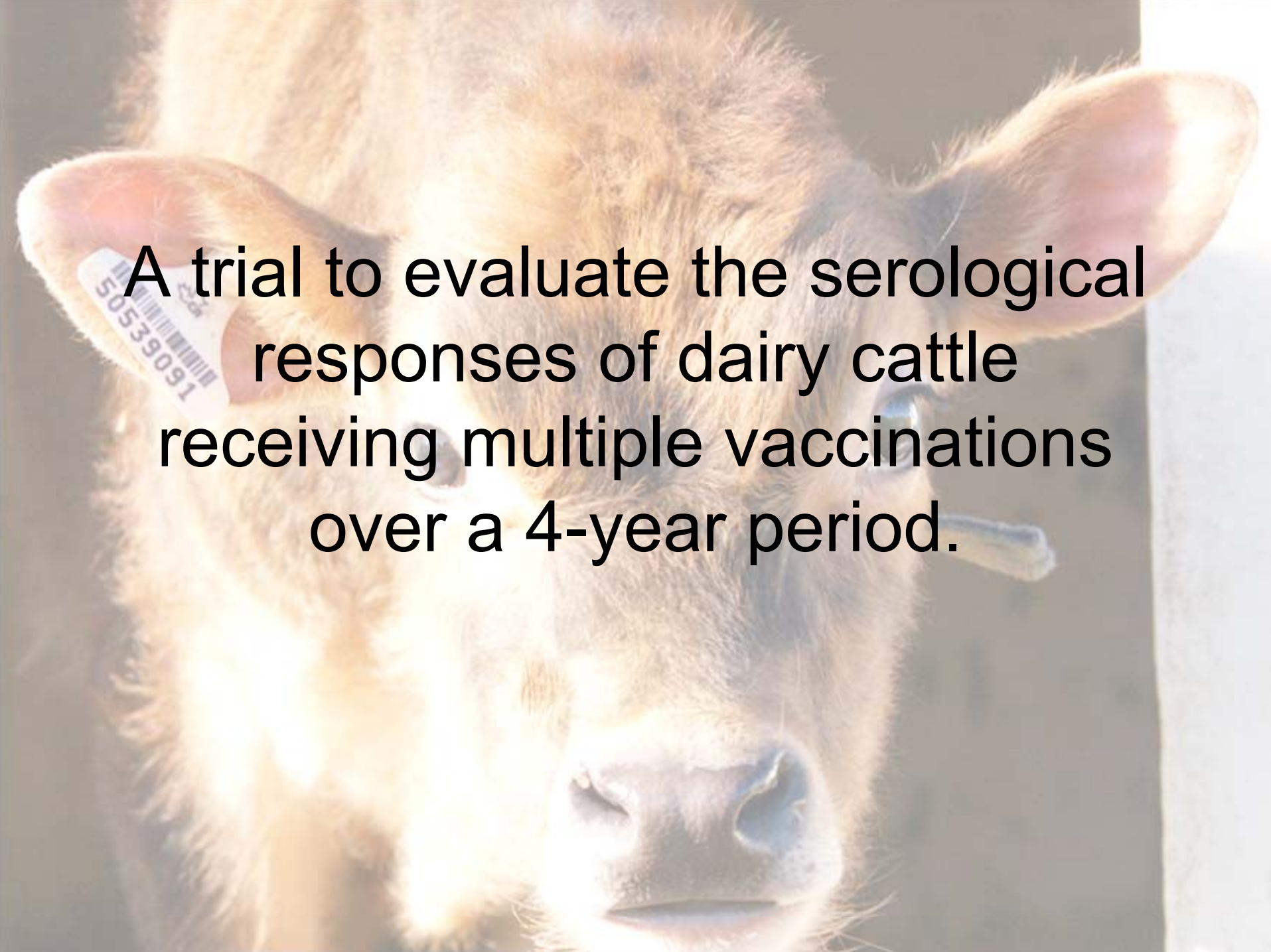
Day 25: No significant differences ($p \geq 0.0566$).

Day 56: No significant differences ($p = 0.0987$).

Results:

- Weight gain
  - Mean average daily gain did not differ significantly between groups.

- Conclusions:
  - BVD Type 1
    - There are significant differences in serological responses between different vaccination programs;
    - There were significant differences in serological responses in vaccination programs using the different vaccines depending on the order in which the vaccines were administered.
  - BVD Type 2
    - Although they were not statistically significant, there was a trend toward differences in serological responses between different vaccination programs.



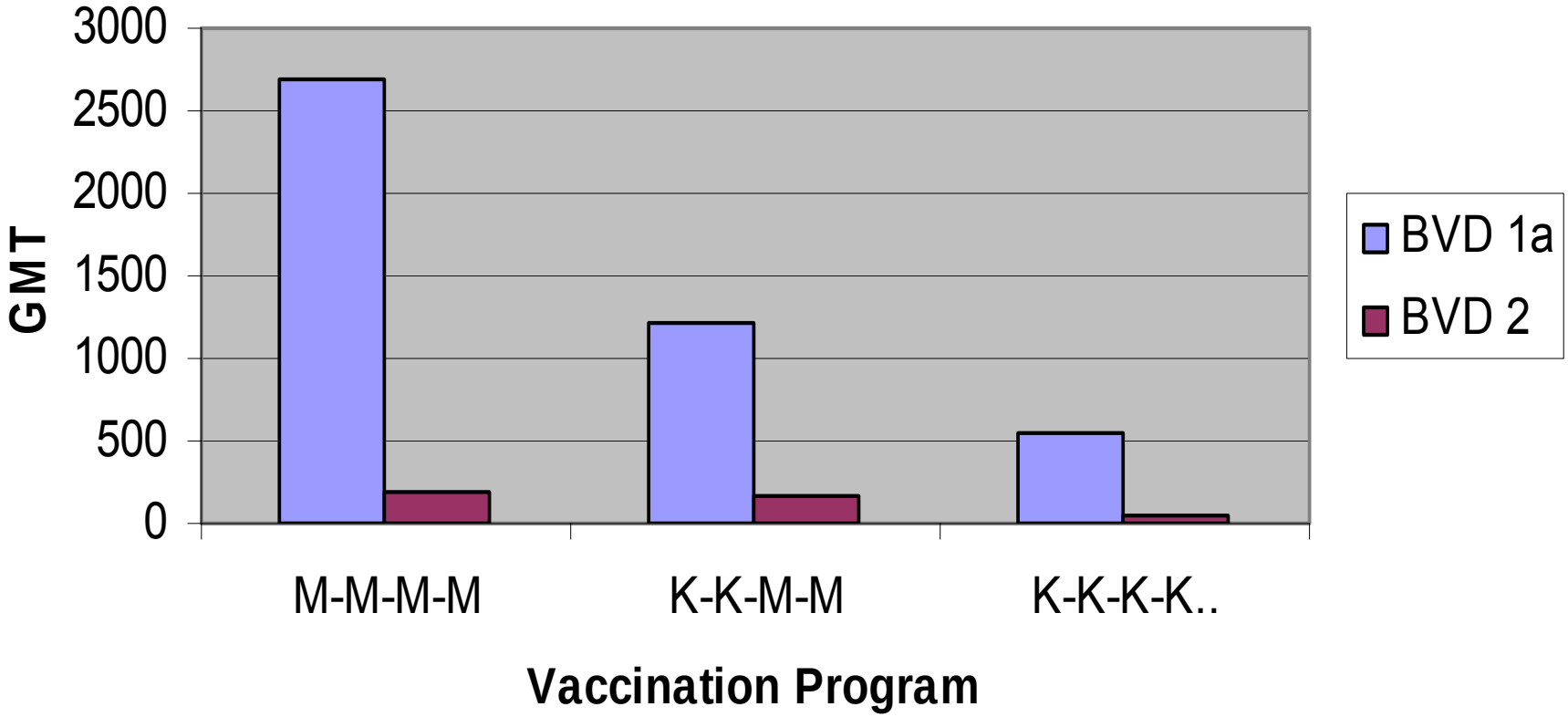
A trial to evaluate the serological responses of dairy cattle receiving multiple vaccinations over a 4-year period.

- Objectives:
  - To evaluate VN serological responses against BVD 1 (Singer) and BVD 2 (NVSL 125c) in cattle following 1 of 3 different vaccination programs over a 4 year period.

- Materials and Methods:
  - Cattle in a commercial dairy herd were enrolled in 1 of 3 vaccination programs:
    1. An inactivated vaccine at 5 and 6 months of age following by boosters with the same vaccine every 6 months (K-K-K-K).
    2. An inactivated vaccine at 5 and 6 months of age followed by boosters with an MLV vaccine prebreeding (K-K-M-M).
    3. An MLV vaccine at 3 weeks of age followed by boosters with the same MLV vaccine prebreeding (M-M-M-M).

- Materials and Methods:
  - Serum samples were collected at intervals throughout the study;
  - Sera were separated and stored frozen to be analyzed at the same time;
  - Serology was performed at the Animal Health Laboratory, University of Guelph for VN activity against Singer (BVD 1a) and NVSL 125c (BVD 2).

Results:


GMT in Post-Fresh Cows
3000
2500
2000
1500
1000
500
0
GMT
M-M-M-M
K-K-M-M
K-K-K-K..
Vaccination Program
BVD 1a
BVD 2

- Conclusions:
  - over the long-term, a program using only MLV vaccines produced the highest GMT to BVDV in post-fresh cows;
  - a vaccination program combining inactivated and MLV vaccines produced a higher GMT than inactivated vaccines administered every 6 months.

- Overall conclusions:
  - Not all vaccination programs produce the same serologic results;
  - Differences in serologic responses cannot be predicted on the basis of category of vaccine in the program or on the basis of the sequence in which the vaccines are used.
  - It remains to be determined if differences in serologic responses translate into differences in clinical protection.

Thank you

Questions