Norwegian Reds
The Irish experience

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Overview

- Ireland
- Importation
- The trial
- Results
- Immune response
- Economics
- The future??

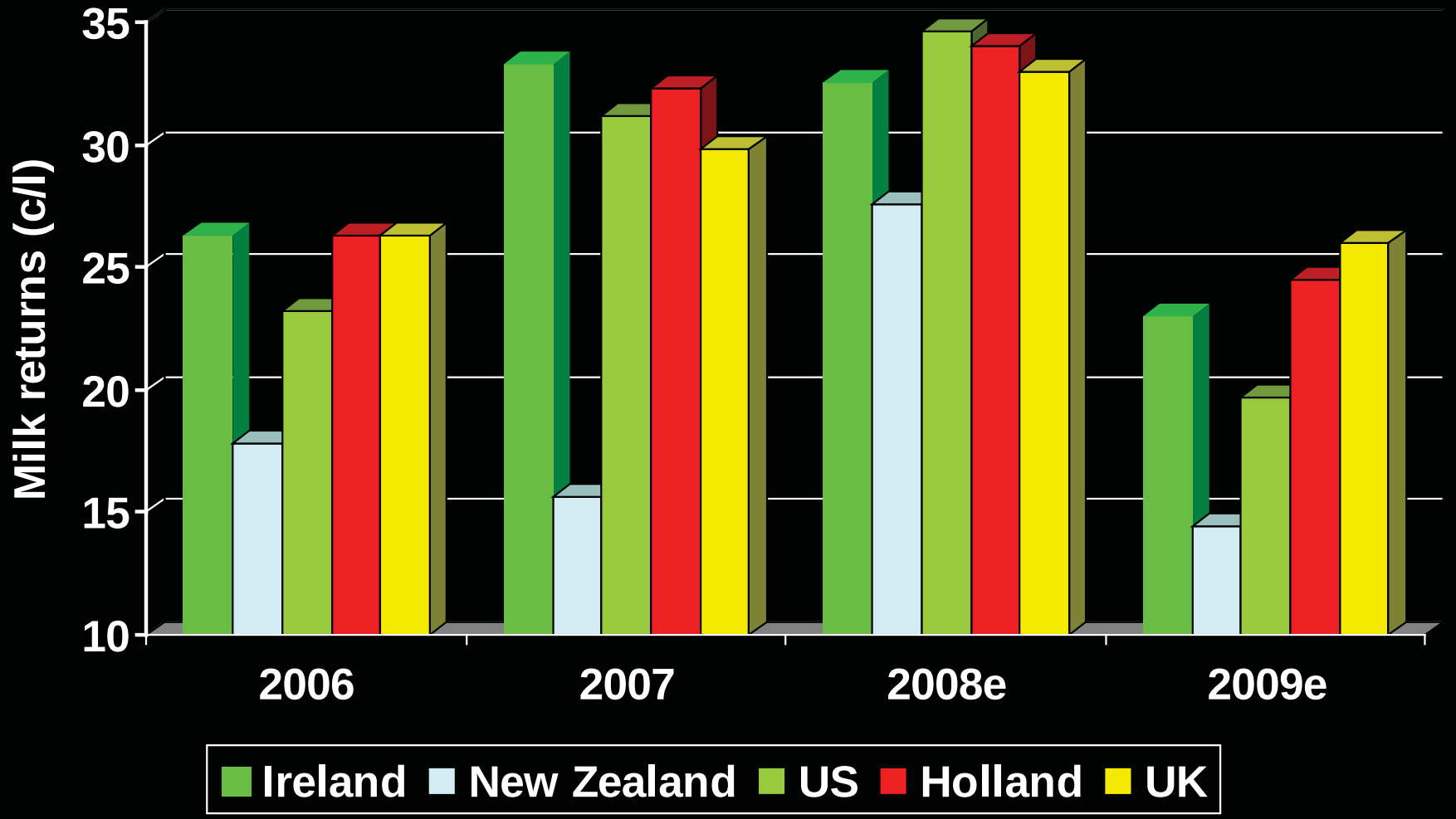
Dairy Production Research Programme

- Milk Production Systems and Systems Analysis
- Grassland, Grazing Management and Regional Resources
- Dairy Cow Nutrition and Supplementary Feeding
- Dairy Cattle Breeding and Reproduction
- Animal Health and Welfare
- Dairy Farm Facilities and Labour Use

Irish Dairy Industry Profile

- 4.5% of EU-15 milk supply
- 5.2 million tonnes of milk
- 18,000 milk suppliers
- Average herd size 46 cows
- 80% exported

Milk Returns



Relative Feed Costs

- Large variation in feed costs
  - Grazed grass costs - 4 cent/kg DM
  - Silage costs - 11.5 cent/kg DM
  - Concentrate costs - 19.5 cent/kg DM

- Maximising the use of grazed grass in the diet

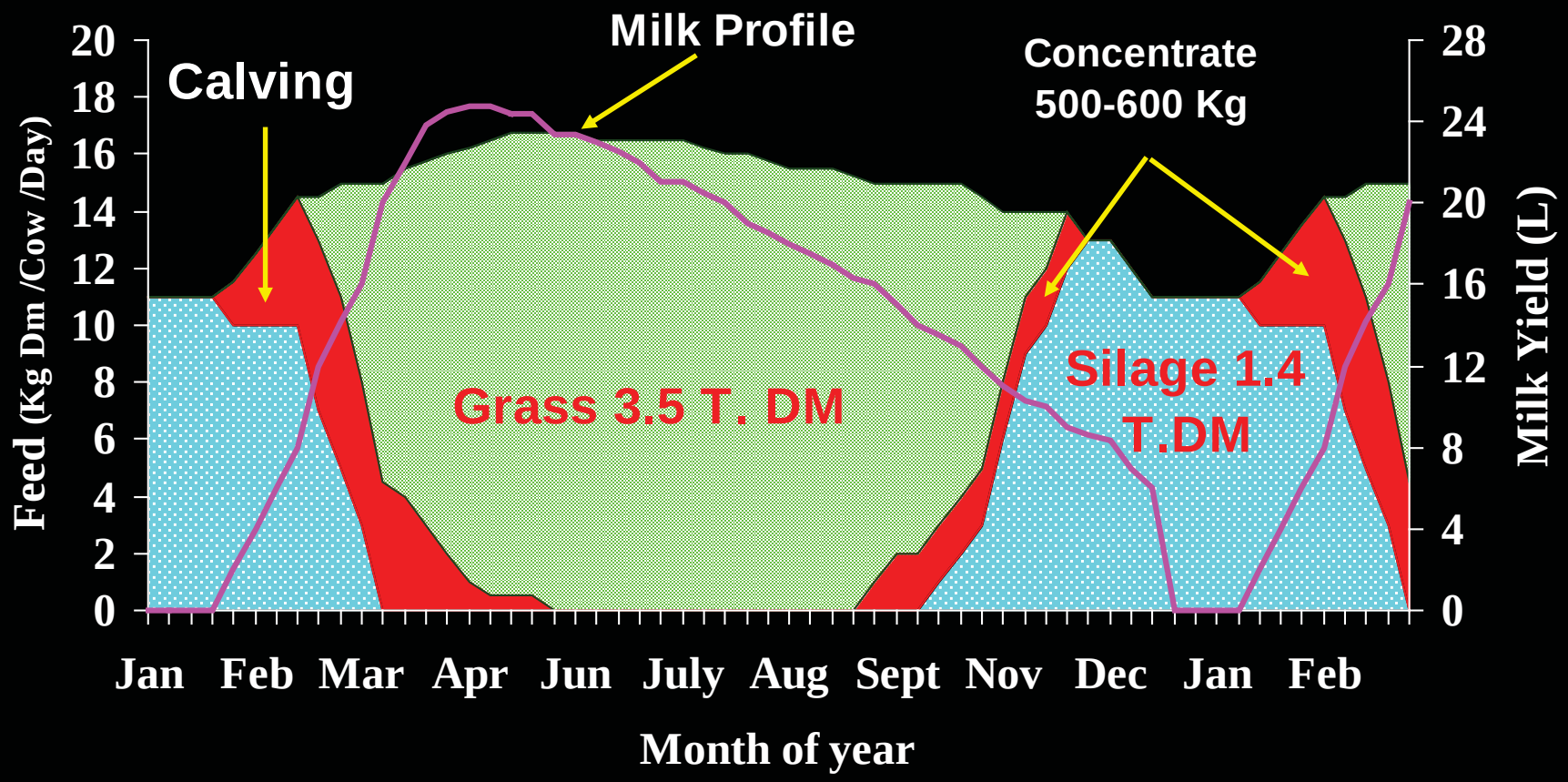
Grassland Management

- Long grazing season: 250 + days grazing
- Compact spring calving
  - 13 weeks: mean calving date = late February
- Lactation length = 280 to 300 days
- Pasture supply assessed every 7 to 10 days
- Rotational – New pasture every 12 to 48 hrs

Grass Manangement

- Cows go out to grass by day in early February
- Cow out day + night from early March
- Entire farm is grazed in first rotation
- 45% land area conserved (silage) on May 24th
- 35% land area conserved on July 15th
- Cows in by night from November 10th
- Cows inside day + night from Dec 1st

Spring Milk Production



Dairy Cattle Breeding At Moorepark

Economic Breeding Index (EBI)

Strain of Holstein-Friesian

Alternative Breeds/Crossbreeding

Most Profitable Cow

Alternative Breed Studies

- 1996 – 2000 (Castlelyons)
  - Holstein (HF), Montbeliarde (MB), Normande (NM)
- 2001 – 2005 (Ballydague)
  - HF, MB, MB×HF, NM, NM × HF, Norwegian Red (NRF)
- 2003 – 2008 (On-farm)
  - HF, NRF, NRF×HF
- 2006 – 2010 (Ballydague)
  - HF, Jersey (J), J×HF, MB, NRF

Ideal Cow

- High milk solids per unit area
  - grazed pasture
  - compact calving
- Fertile and healthy – Robust!
- Easy to manage
- Good type

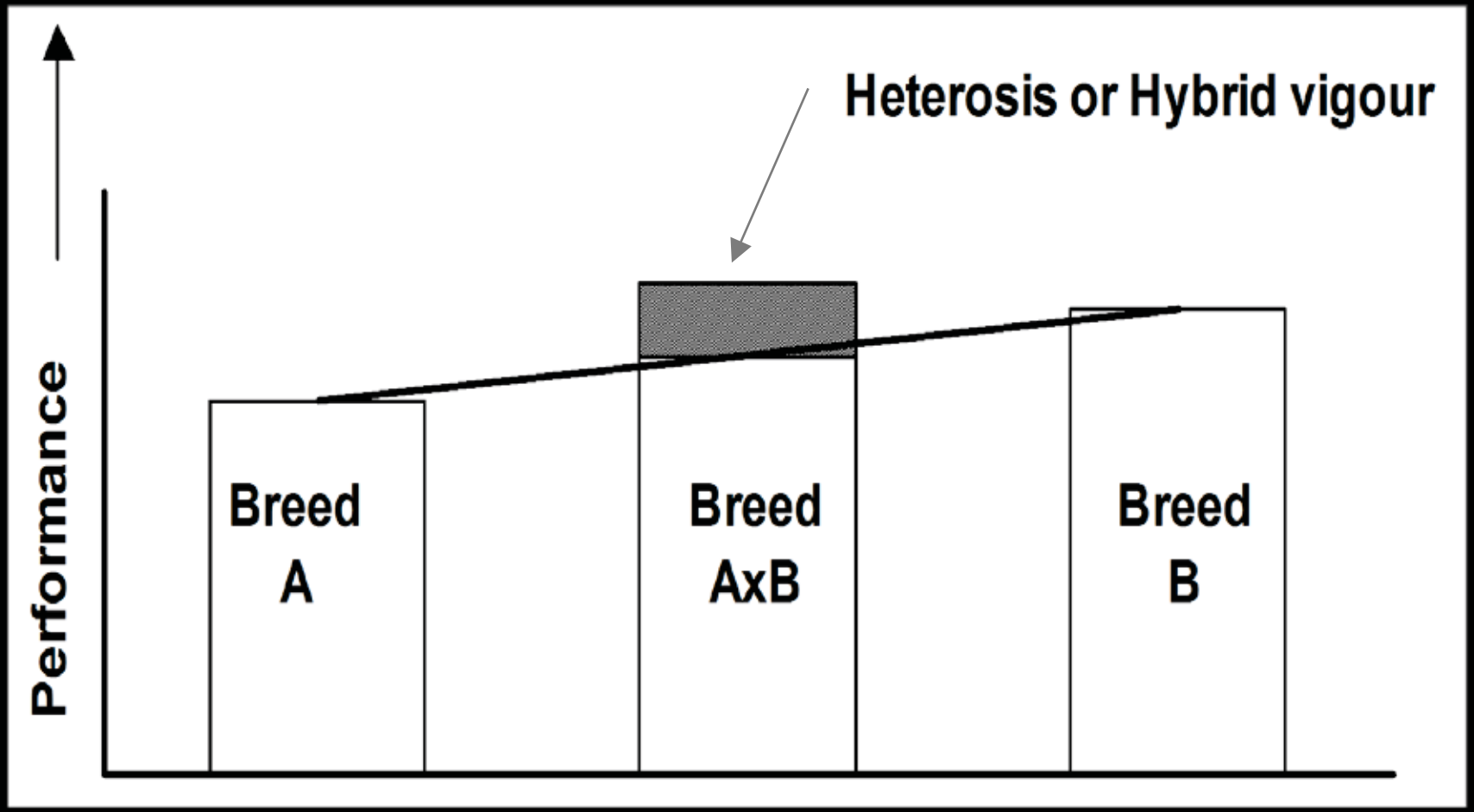
- Does crossbreeding have a role?

Why Crossbreeding?

- Declining reproduction and health
- Increase overall profitability
  - Favourable characteristics
  - Hybrid vigour/heterosis
    - Production – 5% to 6%
    - Health/fertility – up to 20%
  - New Zealand
    - 25% of herd crossbred and rising – 'popular because profitable'
    - Crossbred cows have improved health and reproduction
  - Growing farmer interest in Ireland and internationally
- ICBF - Across Breed Evaluation system

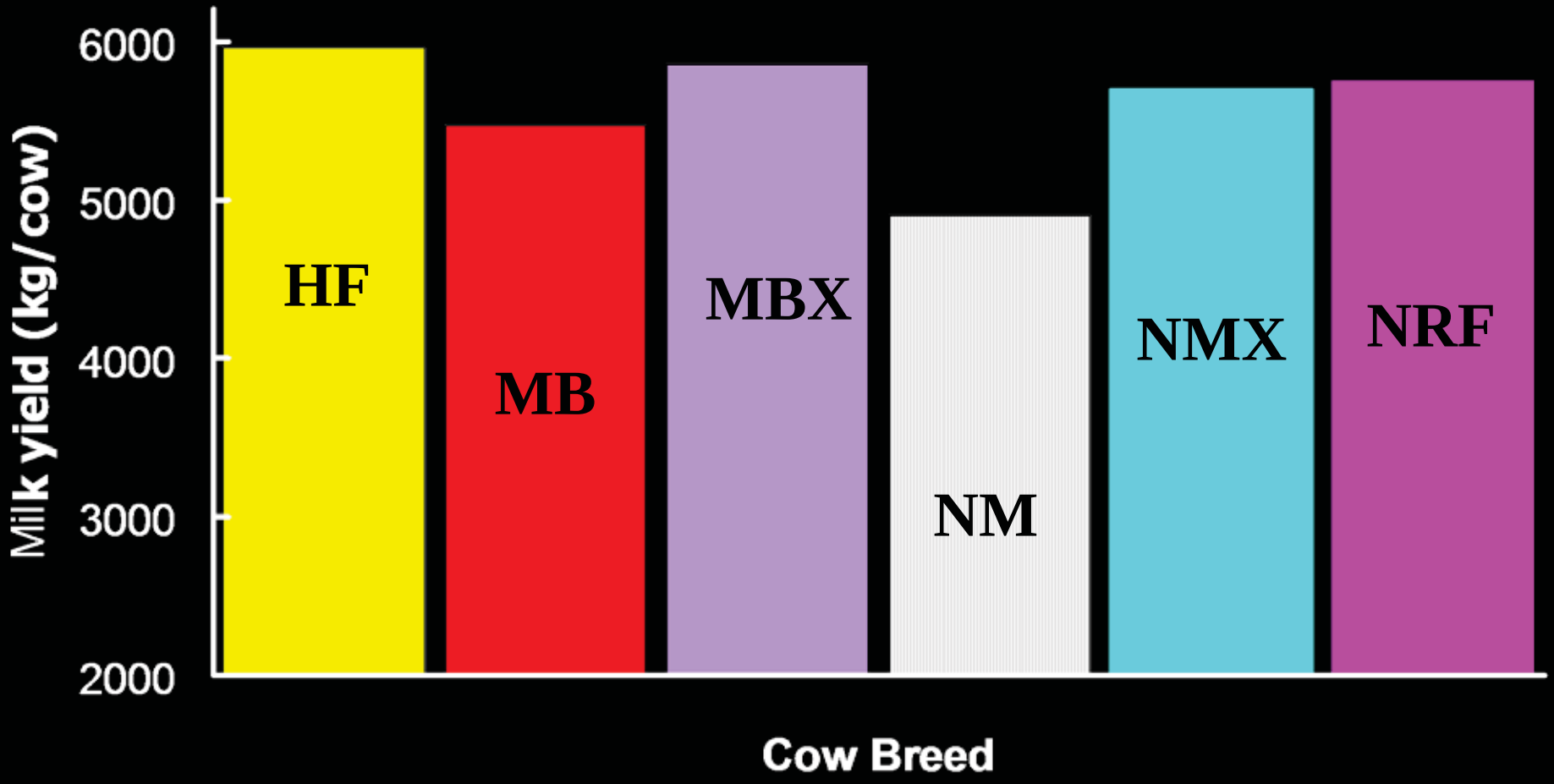
More high EBI sires

Breed & Heterosis Effects



HV = Extra performance above mid-parent mean

Milk Production 2001-2003



Breeding Values

- Milk kg – 104
- Udder - 103
- Protein % - 105
- Daughter Fertility – 103
- Mastitis Resistance – 103
- TMI – 9 (1.4)

NRF Sires

- Valset 5291
- Skjærpe 5314
- Flaten 5322
- Sveen 5108
- Bø 5150
- Skarbø 5163
- Fuglem 5267
- Brandsegg 5215
- Holte 5274
- Ulsaker 5277

Statistical Design

- Luc Janns - Geneticist - The Netherlands
  - Pure Holstein-Friesian
  - Pure Norwegian Red
  - Norwegian Red x Holstein-Friesian (F1)
- Contemporary comparison within farm contribute to the reliability of the outcomes
- NRF pure breed & F1 evaluated simultaneously

Time Scale

2003	2004	2005	2006	2007	2008	2009
Inseminate HF ↓ HF x NRF	HF x NRF born 	Yearlings inseminated 	1st lactation 	2nd lactation	3rd lactation	Across breed evaluation
Inseminate HF ↓ HF x HF	HF born					
	Pure NRF delivered 					

HF = Holstein-Friesian, NRF = Norwegian Red

Results

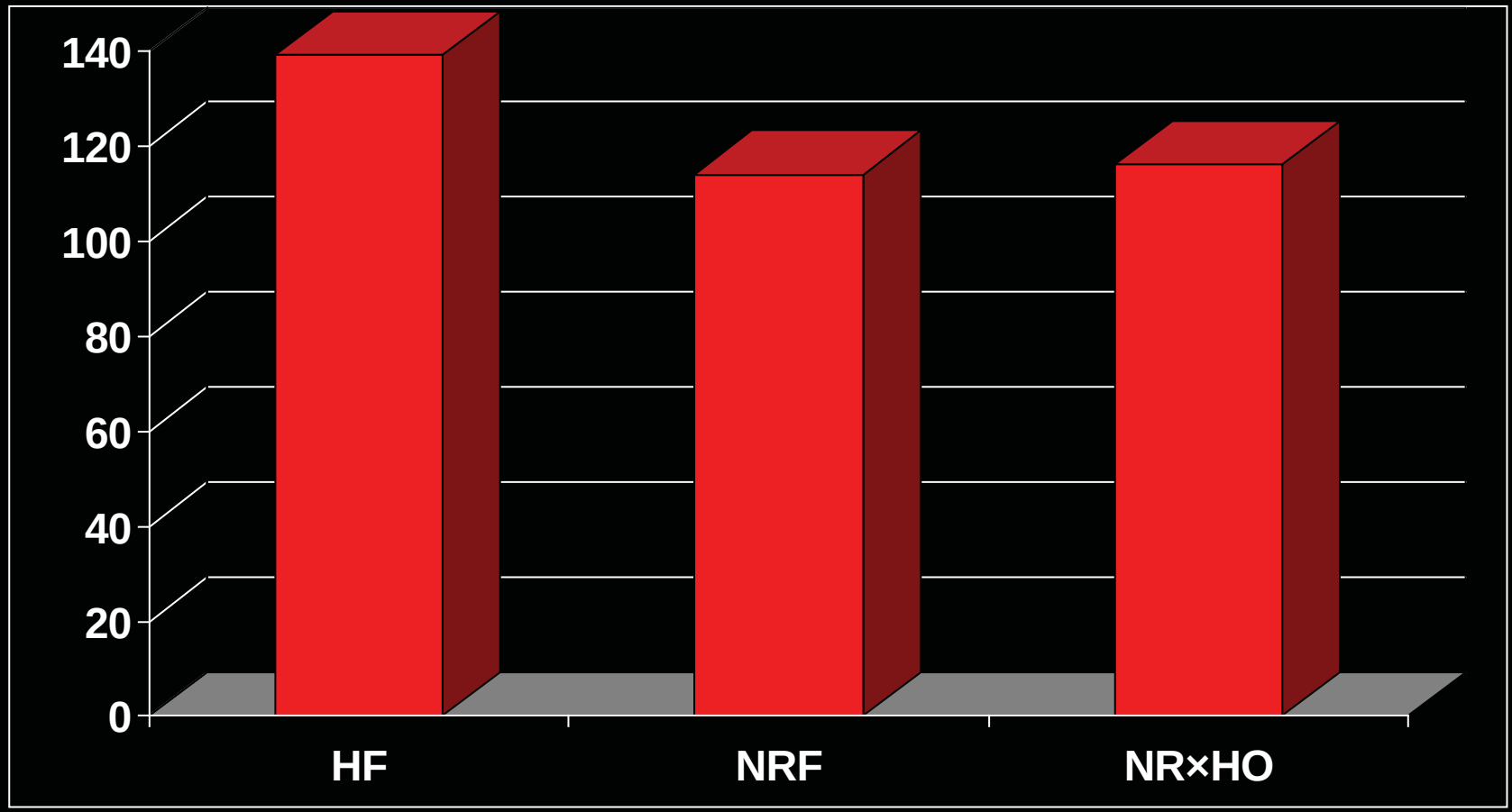
Milk Yield – 3 Years Data

	Breed categories					
	HO	FR	NR	HO×FR	NR×FR	NR×HO
Milk yield (kg)	6214	5570	5874	6198	6037	6108
Fat (kg)	243	238	227	246	237	238
Protein (kg)	214	196	202	214	208	211
SCS	2.02	1.95	1.90	2.01	1.95	1.95

On-Farm Study – Milk

	HO	NR	NR×HO
Milk	5860	5513	5777
Fat%	4.00	3.93	3.95
Fat (Kg)	233	215	226
Protein%	3.48	3.49	3.49
Protein(Kg)	203	191	201

Udder Health -SCC



Summary

- No differences in peak milk or fat yields
- No differences in persistency
- Similar SCS curve
- NR
  - Lowest nadir for protein content
  - Lowest lactose content during lactation
  - Superior udder health

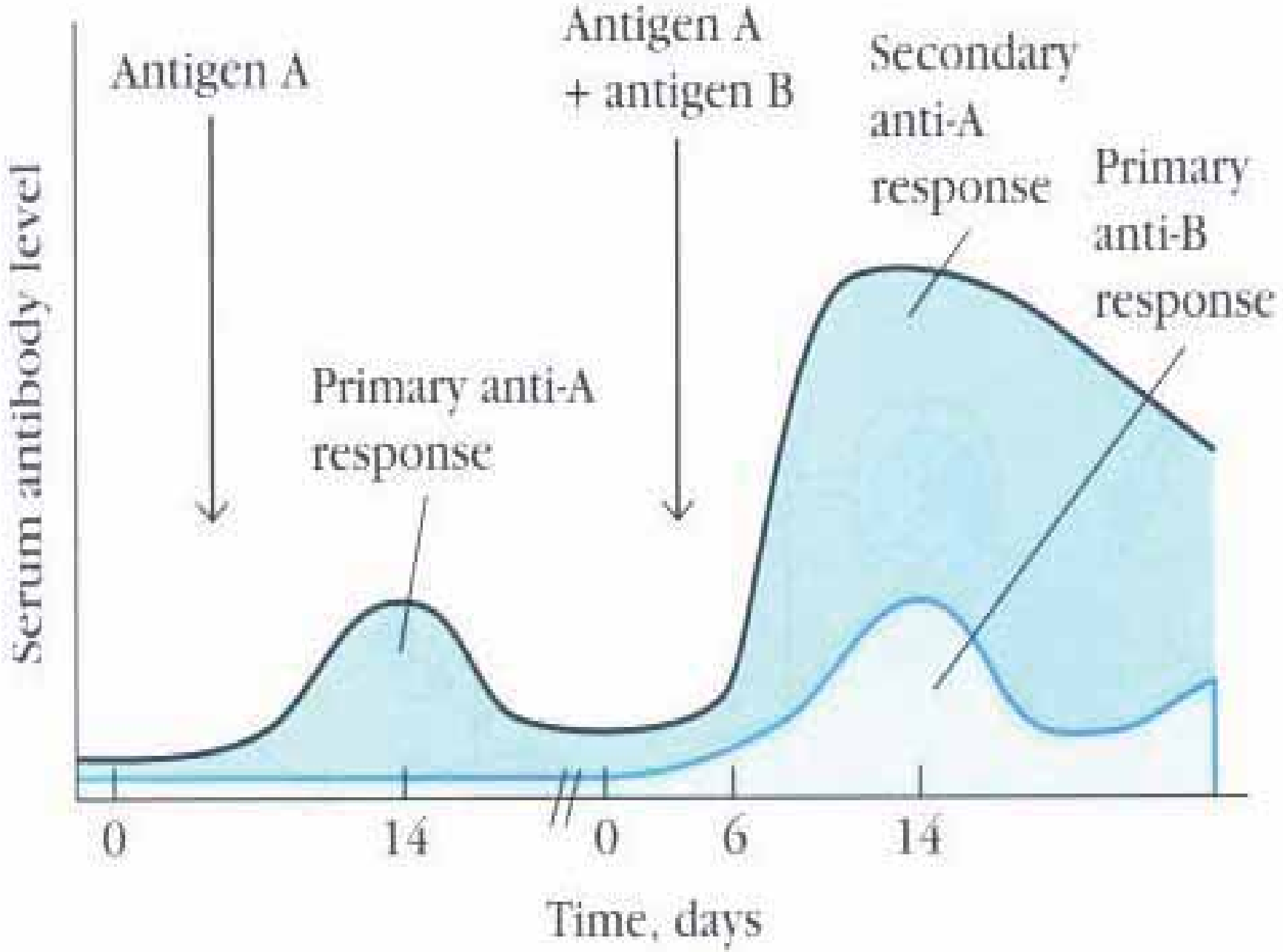
On-Farm Study – Fertility

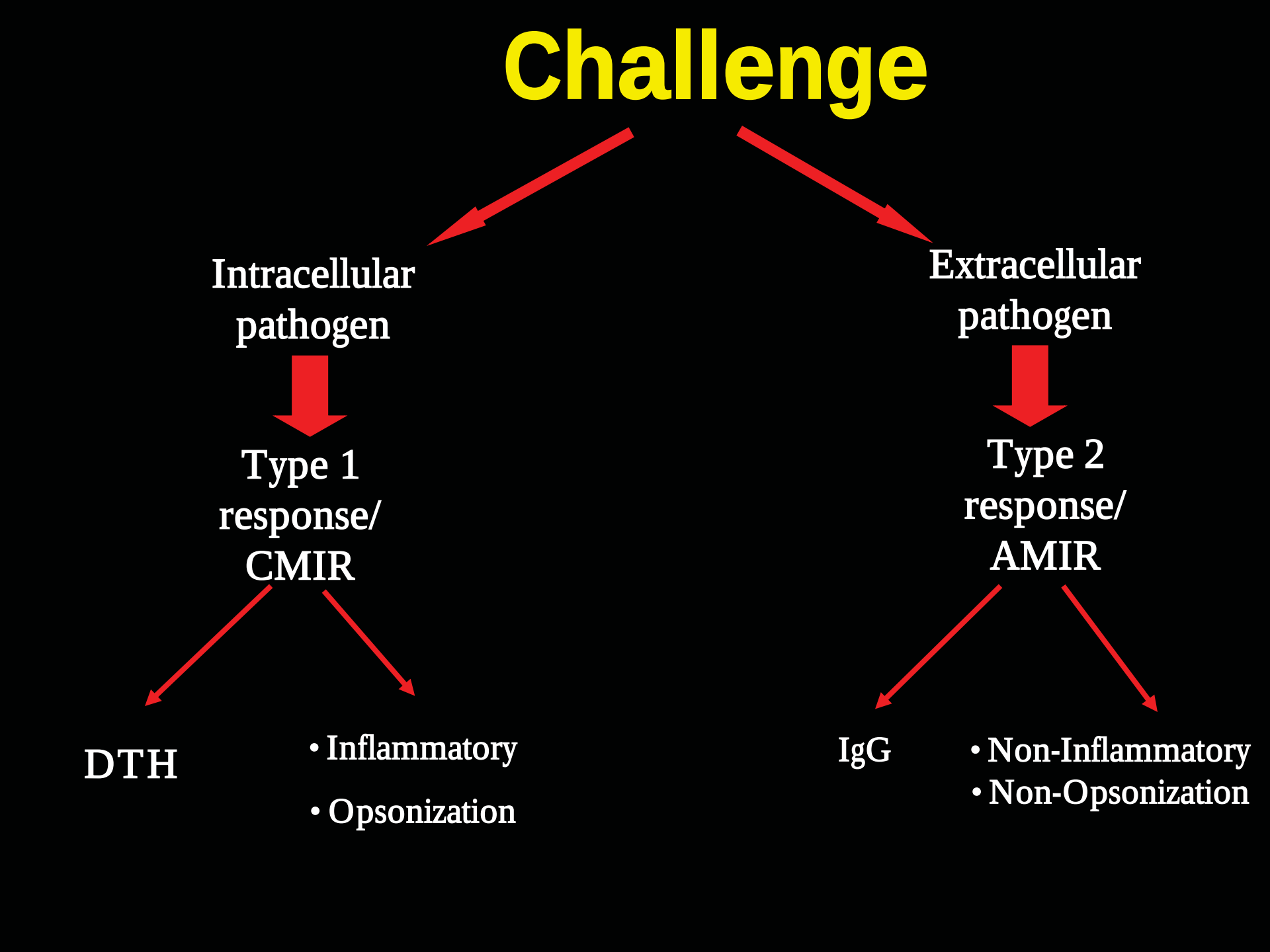
	HO	NR	NR×HO
PRFS(%)	52	60	60
INCALF6 (%)	62	69	77
INCALF 13 (%)	86	90	91
CCI (days)	92	88	87
Services	1.67	1.55	1.55

Immune Response

- 2 traits to be examined:
  - Antibody mediated immune response (AMIR)
  - Cell mediated immune response (CMIR)
- Cows can also be classified into high and low responders *(Hernandez et al 2003)*
- High responders lower incidence of mastitis

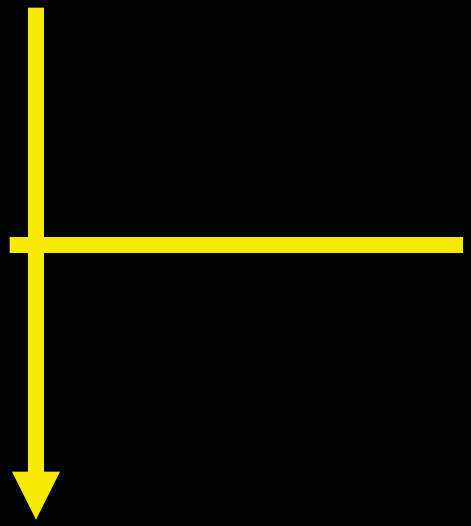
(Wagter et al., 2003)


Antigen A
Antigen A
+ antigen B
Secondary
anti-A
response
Primary
anti-B
response
Primary anti-A
response
Serum antibody level
0
14
0
6
14
Time, days


Challenge
Intracellular pathogen
Extracellular pathogen
Type 1 response/ CMIR
Type 2 response/ AMIR
DTH
• Inflammatory
• Opsonization
IgG
• Non-Inflammatory
• Non-Opsonization

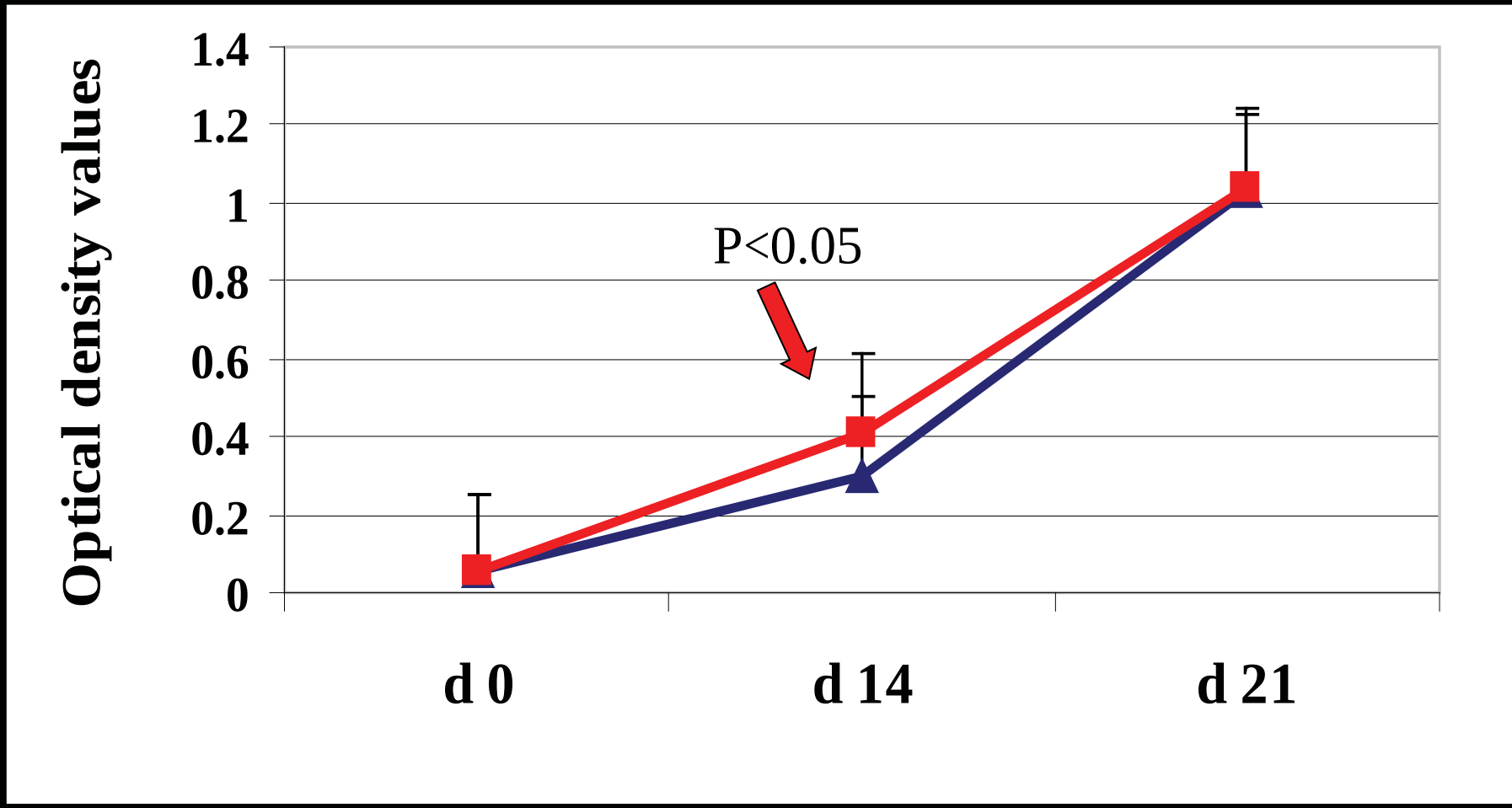
Immunization Schedule

Day 0



- HEWL (0.5 mg) + C. albicans (0.5 mg) in QuilA + PBS (total volume 1 ml) using 21 g needle
- Blood (10 ml tube red top vacu tubes)

Results



Summary

- NR×HO calves greater primary immune response
- No difference in secondary response
- No difference in CMIR
- High and low responders

Anti-HEWL IgG Production

Anti-HEWL IgG	HF	NRF	NRFX	SE	P-value
Day0	0.24	0.23	0.23	0.023	NS
Day14	0.45	0.50	0.46	0.025	0.01
Day21	0.94	0.98	0.96	0.022	NS
DTH (mm)	8.1	7.9	8.1	1.030	NS
SCSIR	2.10^{a}	1.97^{b}	2.07^{a}	0.025	0.05

Summary

- NR ➡ superior udder health
- NR ➡ greater primary response
- No difference in secondary response
- No difference in CMIR
- Traits evaluated were poor indicators of udder health

Implications

	Economic	Holstein	Norwegian Red		F_1	
	value in EBI		Genetic deviation	€	Genetic deviation	€
CI (days)	-11.97	-	-7	+71.8	-7	+71.8
SUV (%)	11.17	-	6.6%	+73.7	3.3%	+36.9
Milk (kg)	-0.09	-	-91	+8.2	+100	-9.0
Fat (kg)	1.26	-	-7.34	-9.1	+3.86	+4.9
Protein (kg)	6.91	-	-2.53	-17.5	+5.29	+36.6
Live weight (kg)	-0.51	-	-16	+8.2	+5	-2.6
SCS	-56.89	-	-0.162	+9.2	-0.01	+4.6
Total		-		+144		+143

NRF Sires 2010

- Bosnes
- Flatjord
- Haugseth
- Nottestad
- Raastad
- Skjenaust
- Velsvik

The Future??

- Across breed evaluation
- Profitability index
- 2-way crossbreeding
- 3 way cross