Production, health and fertility performance of Norwegian Red and Norwegian Red crosses in Ireland

EAAP Warsaw 2015

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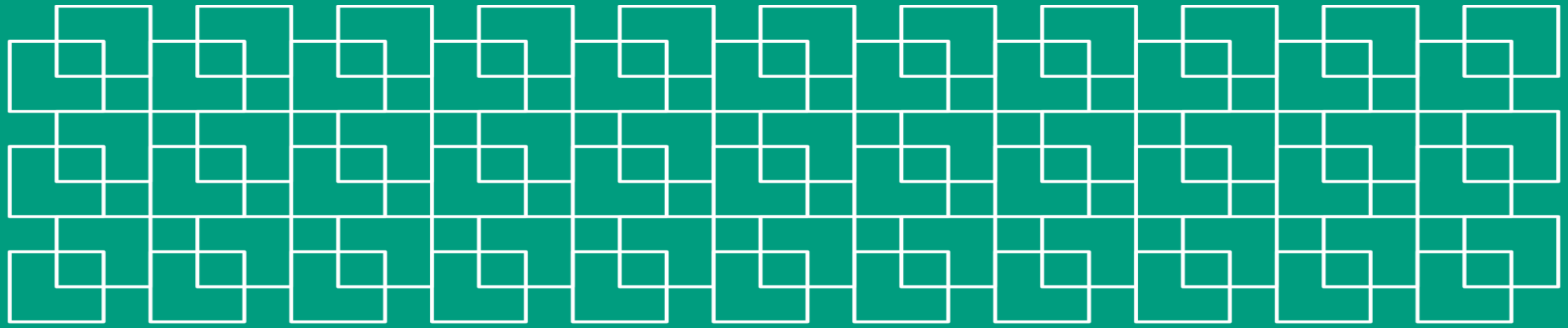


Background

- Holstein breed – inbreeding depression and selection for high milk production
  - **HO** in this presentation
- Norwegian Red Cattle (“Norsk rødt fe”/NRF in Norway) have had a broad breeding goal for over 40 years
  - **NR** in this presentation, **NRX** for Norwegian red crossbreds
- NRF bulls have been crossed with Holstein cows in over 20 different countries, starting in the early 2000s
  - Semen sales internationally
  - Trials in several countries

PhD project

Effects of Crossbreeding with Norwegian Red Cattle

- International data from Holstein x Norwegian red crossbreds
- Compare Norwegian Red crosses and pure Holstein
- Examine GxE interactions

Source: geno.no

Previous studies have found that NR and NRX have…

- Improved udder health over Holstein (Begley et al., 2009)
- Lower calving difficulties & fewer stillbirths (Ferris et al. 2014)
- Reduced SCC (Ferris et al. 2014)
- Increase in longevity and lifetime profit (Heins et al. 2012)
- Lower milk production, but higher protein and fat %
- Lower incidence of postpartum diseases (Israel, unpublished)

For my project we are looking into more countries, updated data, more herds, and we will combine data from different countries and analyze jointly, investigate possible GxE

Irish dataset

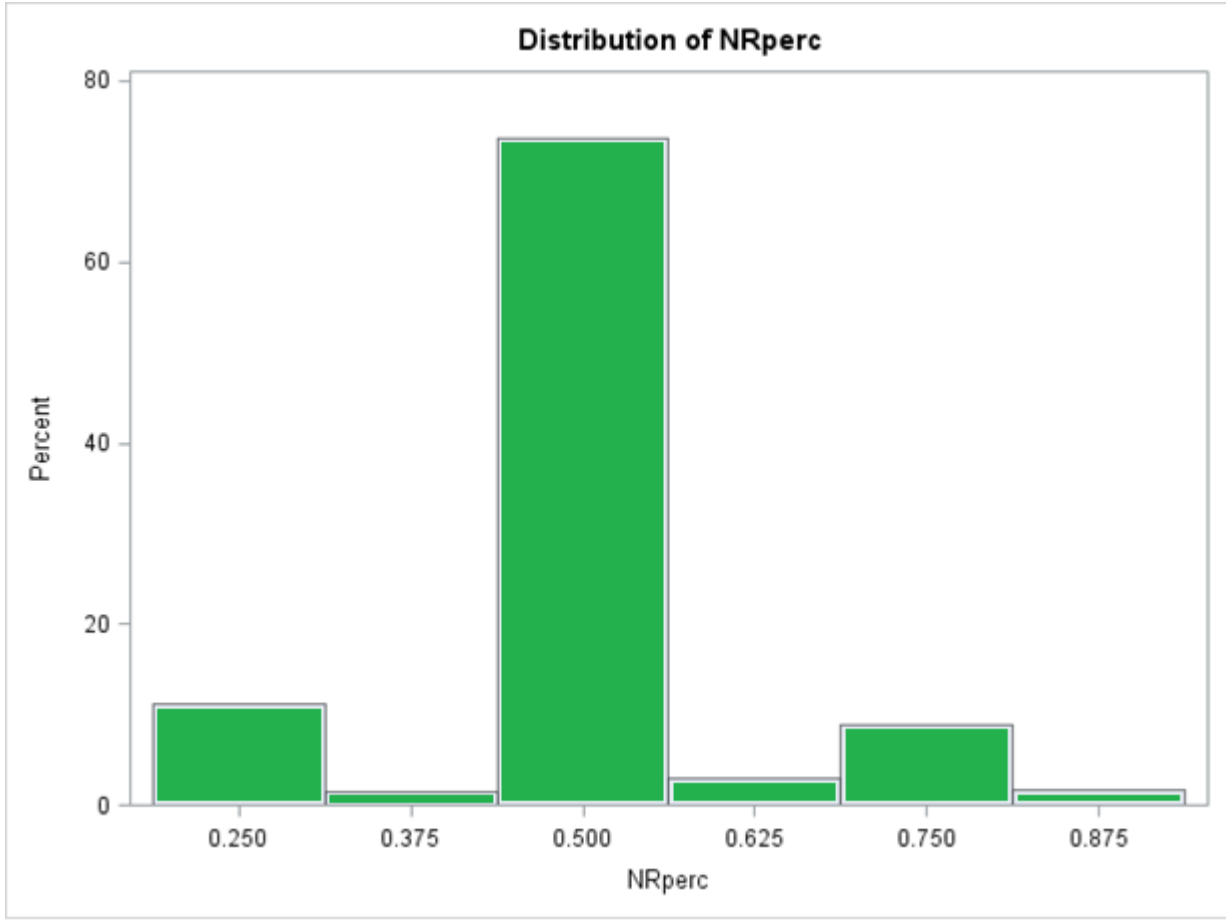
- Provided by Ross Evans, Irish Cattle Breeding Federation
- Only herds with at least 30 records on NR or 30 records NR kept
  - NRX must be at least 25% Norwegian red
- 98 Norwegian Red sires
- Edited for calving date 2001 and later

Irish data edits

- 305-d milk: 1500-9500kg
- 305-d protein and fat: >50kg
- Calving interval: 260-600 days

Source: youtube.com

Proportion of Norwegian Red genes in NRX



Irish data

- 67 herds after edits
- All cows either pure Holstein (**HO**), pure Norwegian Red (**NR**), or 50%NR/Holstein (**NRX**)

	Number of cows by parity			
	1	**2**	**3**	**Total**
HO	13015	10860	8998	32873
NR	582	525	428	**1535**
NRX	1324	924	636	**2884**
Total	14921	12309	10062	37292

Milk, protein and fat yeilds

LSM for 305-d milk (kg)			
	par1	par2	par3
HO	5112*	6128*	6603*
NR	4889	5677	6057
NRX	5020	5954	6402
het	**20**	**52**	**72**

LSM for 305-d protein (kg)			
	par1	par2	par3
HO	180*	217*	233*
NR	172	202	216
NRX	177	212	228
het	**2**	**2**	**4**

LSM for 305-d fat (kg)			
	par1	par2	par3
HO	210*	246*	264*
NR	199	226	242
NRX	205	236	255
het	**1**	**0**	**2**

*significantly higher at p<0.01

Fixed effects:
Breed
Herd
Year of calving
Month of calving
Year*Month of calving

Somatic Cell Score and Calving Interval

LS-means for SCS			
	par1	par2	par3
HO	2.86	2.82	3.01
NR	2.58*	2.62*	2.66*
NRX	2.68*	2.61*	2.80*
het	-0.04	-0.11	-0.04

LS-means for Calving Interval (days)	
HO	385.9
NR	382.5**
NRX	382.0*
het	-2.2

* significantly lower at p<0.01
** significantly lower at p<0.05

Fixed effects:
Breed
Herd
Year of calving
Month of calving*
Year x Month of calving*
Parity*

*Only significant when analyzing calving intervals

66 herds

$$SCS = \log_2 (SCC/100{,}000) + 3$$

Mastitis, Lameness and Temperament

- 53 herds in dataset
- Lower incidence of lameness for NR
- Lower incidence of mastitis for NR and NRX
- More favorable temperament for HO and NRX than NR (scale of 1-5)

	n	Lameness	Mastitis	Temperament
NR	979	0.02*	0.04*	4.0*
NRX	2718	0.04	0.05*	4.2
HO	17941	0.04	0.07	4.2
het	-	0.01	0	0.1

*significantly less at p<0.01

Fixed effects:
Breed
Herd
Parity
Year of calving

Canadian data

- Provided by Larry Schaeffer, Univ. of Guelph and Filippino Miglior, Canadian Dairy Network
- Records from production, milk composition, fertility and conformation traits from 2007-2011
- 9 Norwegian Red sires
- *Crossbreeding results in Canadian dairy cattle for production, reproduction, and conformation* Schaeffer et al. 2011

Trait group	n obs HO	n obs NRX
Production	241,053	6,457
Fertility	54,165	611
Conformation	29,019	637
Milking speed/temperament	36,400	739

Canada & Ireland SCS

	Canada		Ireland	
Parity	**HO**	**NRX**	**HO**	**NRX**
1	2.09*	2.24	2.86	2.68*
2	2.29	2.19	2.82	2.61*
3	2.49	2.69	3.01	2.80*

*significantly lower at $p<0.01$

$SCS = \log_2 (SCC/100{,}000) + 3$

Israeli data

- Provided by David Dror & Israeli Cattle Breeding Association
- Milk production/fertility records for 29 herds
- 60,969 cows
- 54347 HO
- 6622 NRX
- 2007 - present
- Health records for 23 herds: mastitis, milk fever, uterine prolapse, abortion, metritis, ketosis, etc…

Source: www.tama.co.il

Descriptive statistics - Israel

Means for production traits in Israeli herds				
Trait	**Parity**	**HO**	**NRX**	**Difference in %**
305-d milk	1	11024	10890	-1.22 %
	2	11201	11028	-1.54 %
	3	11246	10968	-2.47 %
305-d fat	1	382	390	2.09 %
	2	392	400	2.04 %
	3	389	395	1.54 %
305-day protein	1	343	349	1.75 %
	2	355	361	1.69 %
	3	347	351	1.15 %
First service to conception	all	49	38	-22.45 %

Conclusions

- Results are consistent with previous studies except Israel.
  - In most studies NRX milk production has been at least 5% less than HO; for the Irish cattle it varied from 1.5%-3%
  - 3-4% less for milk solids
  - Reduction in calving interval – important for Ireland
- Temperament is an issue with producers in NR because they are more lively than HO
- NRX give greatest benefits in calving interval and mastitis resistance and this may compensate for loss of milk

Future work

- Data from USA and possibly UK
- Continue to analyze Israeli data
- Combine data, analyze jointly and investigate GxE
  - By country/region
  - By production system

Photo: Ellen Rinell

Acknowledgements

- Ross Evans and ICBF
- Larry Schaeffer and Filippo Miglior
- David Dror

Source: http://www.genoglobal.com/

Thank you for your attention!