Our Approach to Speeding up Development of the Cow of the Future

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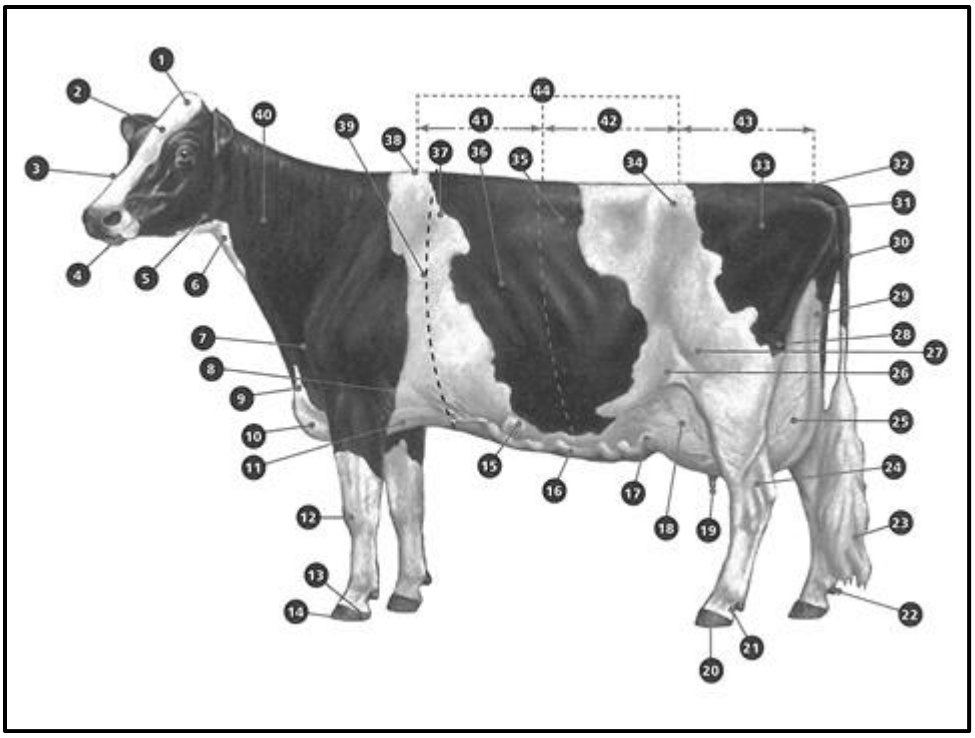
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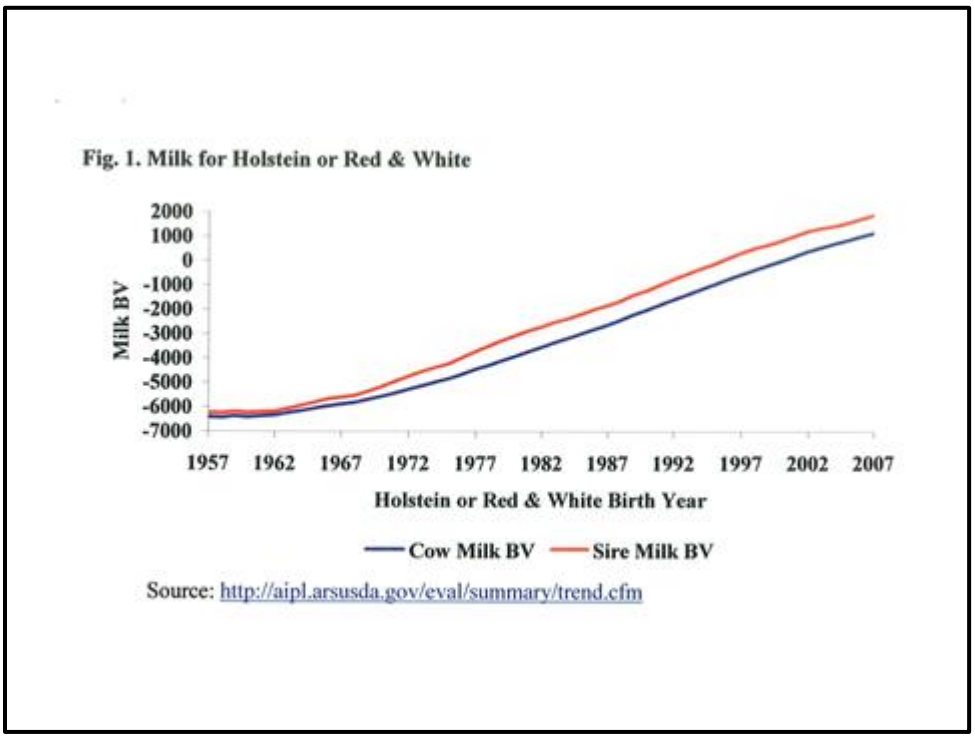
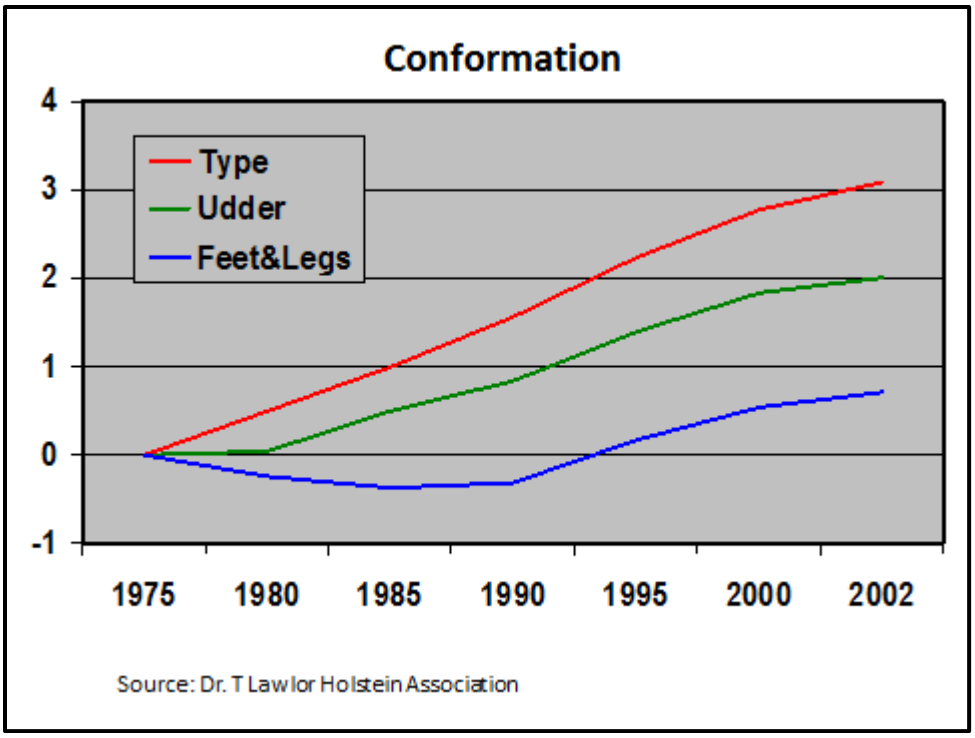
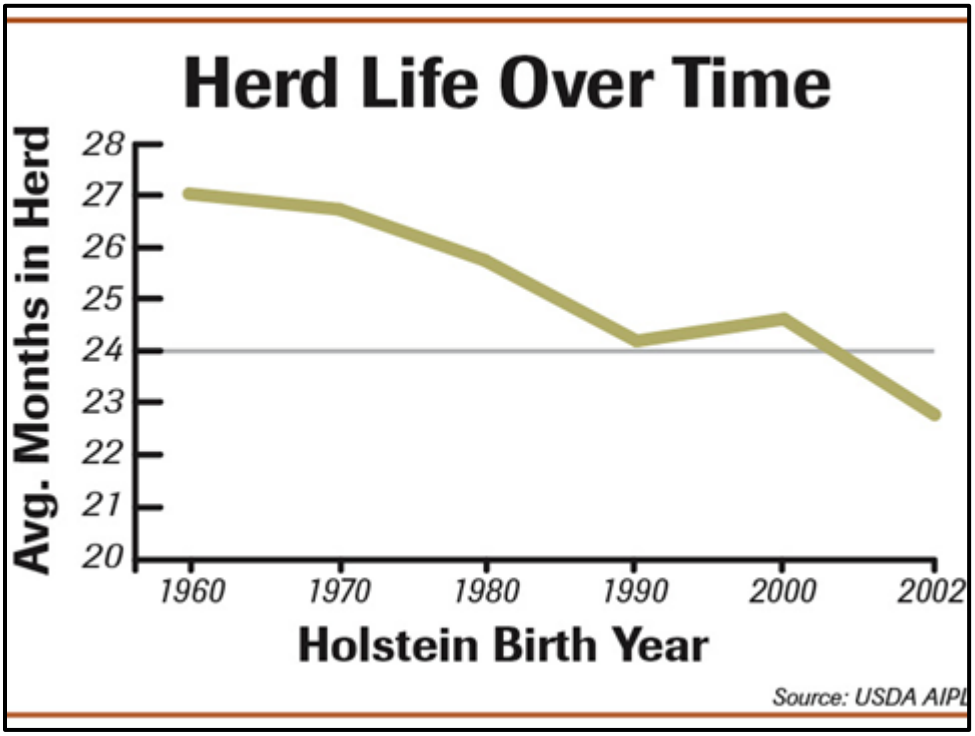
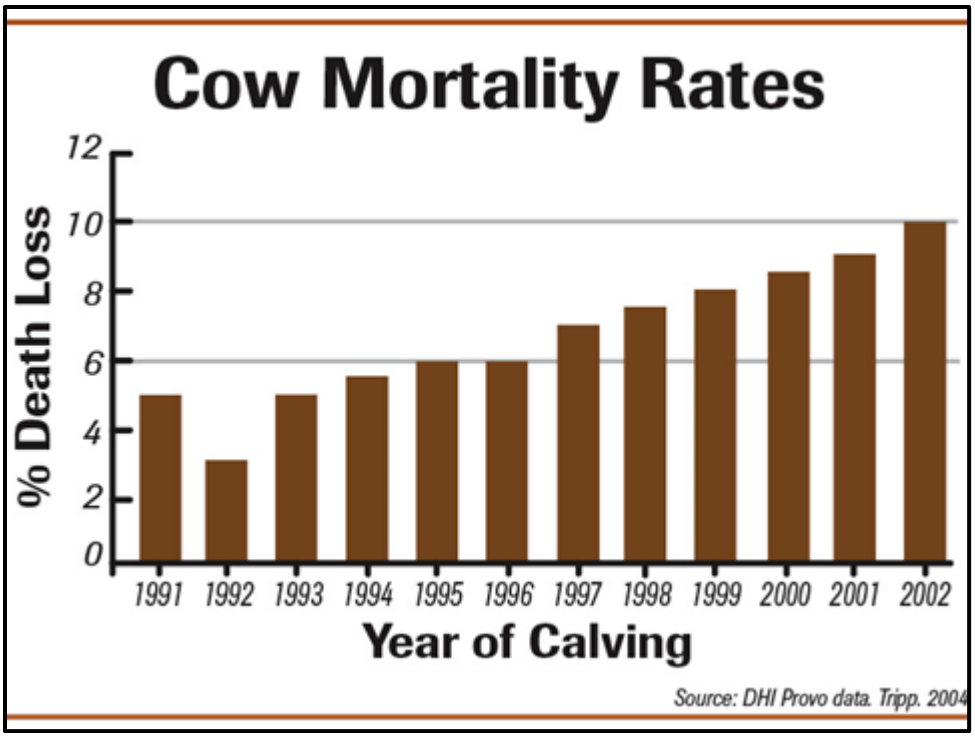


Fig. 1. Milk for Holstein or Red & White
Milk BV
2000
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
-7000
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
2007
Holstein or Red & White Birth Year
Cow Milk BV
Sire Milk BV
Source: http://aipl.arsusda.gov/eval/summary/trend.cfm


Conformation
4
3
2
1
0
-1
Type
Udder
Feet&Legs
1975
1980
1985
1990
1995
2000
2002
Source: Dr. T Lawlor Holstein Association


Herd Life Over Time
Avg. Months in Herd
28
27
26
25
24
23
22
21
20
1960
1970
1980
1990
2000
2002
Holstein Birth Year
Source: USDA AIPL


Cow Mortality Rates
% Death Loss
12
10
8
6
4
2
0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002
Year of Calving
Source: DHI Provo data. Tripp. 2004

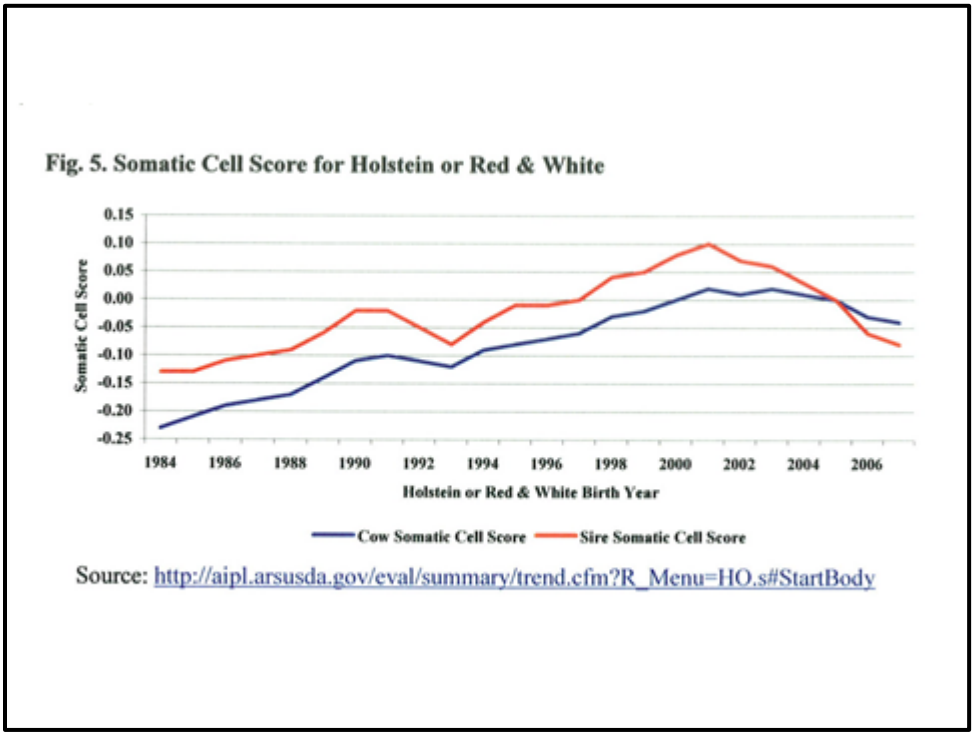


Fig. 5. Somatic Cell Score for Holstein or Red & White
Somatic Cell Score
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006
Holstein or Red & White Birth Year
Cow Somatic Cell Score
Sire Somatic Cell Score
Source: http://aipl.arsusda.gov/eval/summary/trend.cfm?R_Menu=HO.s#StartBody

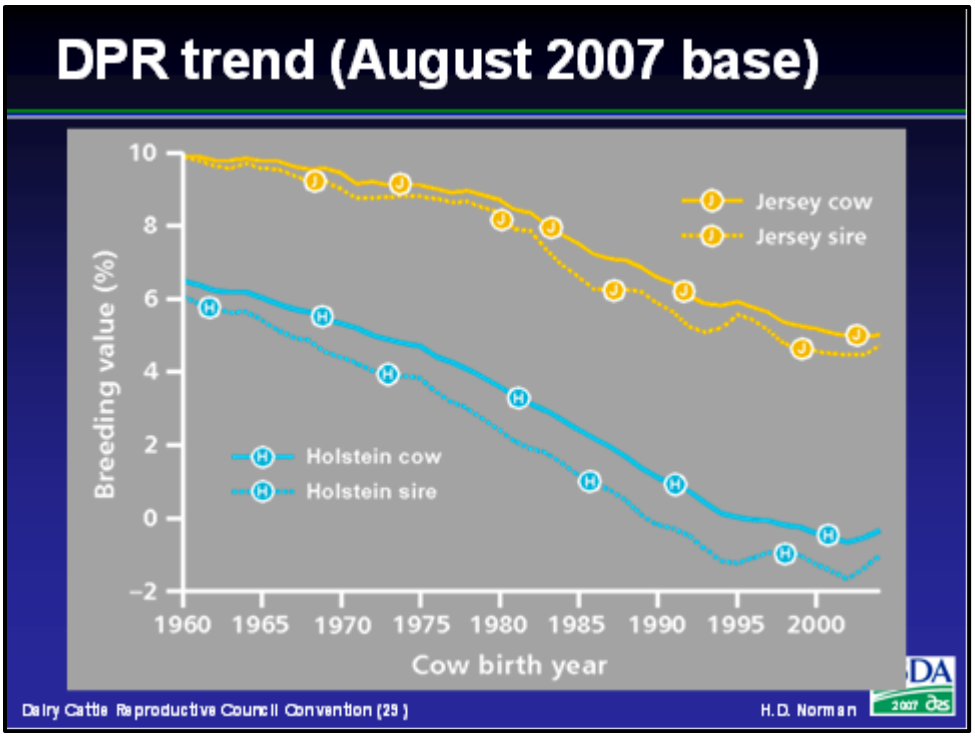


Table 1. Calves born a live

The number of calves born alive as a percentage of cow inventory decreased from 93.4 percent in 1996 to 86.0 percent in 2007.

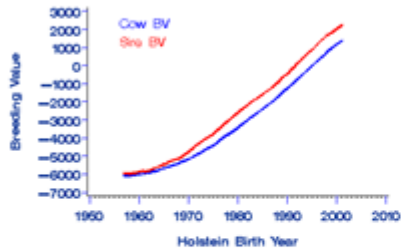
Number of calves born and alive*, as a percentage of January 1 cow inventory					
Dairy 1996		Dairy 2002		Dairy 2007	
Pct	Std. Error	Pct	Std. Error	Pct	Std. Error
93.4	0.5	88.8	0.5	86.0	0.6

*** In Dairy 2007, included "alive at 48 hours".**

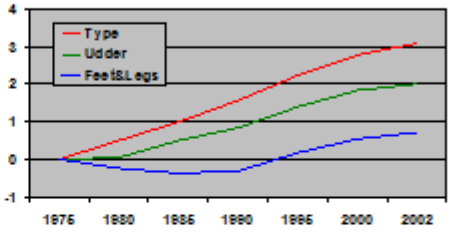
Source: Management, NAHMS Population Estimates –D. Heifer Health

Genetic Trends

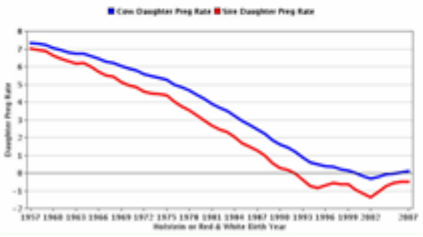
PTA - Milk



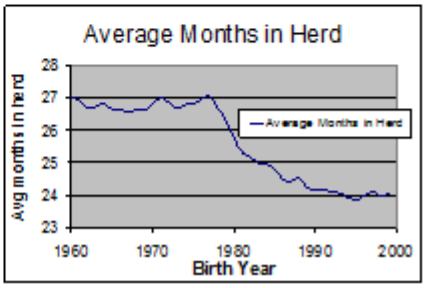
Conformation



Daughter fertility



Average Months in Herd



Typical comments from large herd operators

- We need more pregnant cows and heifers
- Heifers and cows that have live calves without problems
- More live calves, less stillbirths, especially in heifers
- Cows that maintain body weight in early lactation while producing at a profitable level
- Fewer dead cows, cows with more vigor-fire in the belly
- Healthy udders, low SCS
- Mobile cows
- Trouble free cows

Health Traits

- P.L.- Productive Life
- SCS- Somatic Cell Score
- Fertility- DPR
- Calving Ease- Sire CE & Daughter CE
- Still Births

When this is all evaluated and compared on an apples to apples basis, it becomes clear that the primary difference between TPI and NM is that PTAT (and therefore stature) gets a heavy positive weight in TPI, and Body Size (and therefore PTAT) gets a negative weight in NM$.

Therefore biggest problem I see with the TPI index, is the high correlation of Stature with PTAT. Among the 871 active daughter proven bulls in the industry, PTAT has a correlation of 0.74 with stature.I I've included these correlations below for reference. Some of them are quite appalling. For example that Foot Angle has a correlation of .44 with Stature. This .51 correlation between stature and UDC, and .56 between stature and FLC, means that simple selection for these traits, without negative selection on Stature, will make our cows bigger – fast!

PTAP:	-.09 (this means the larger the cow, the less protein she produces)
PTAF:	-.09
FL:	-.29
DPR:	-.21
SCS:	.04
CE	.29 (taller cows are linked with bigger calves)
DCE	.00
SB:	.19
DSB:	.09
PTAT:	.74
UDC:	.51
FLC:	.56
Strength:	.66
Body Depth:	.78
Foot Angle:	.44
RLHV:	.28
Fore Udder:	.41
Rear Udder:	.41
Udder Cleft:	.55
Udder Depth:	.42
Teat Place	.22
Teat Length	.18

That brings me to my biggest problem with the Holstein cow today – stature, and more specifically its high correlation with other traits, which has led to indirect selection for bigger cows. A bigger cow has led to more injury problems, more fertility issues, more calving problems, less productive life and generally higher maintenance animals.

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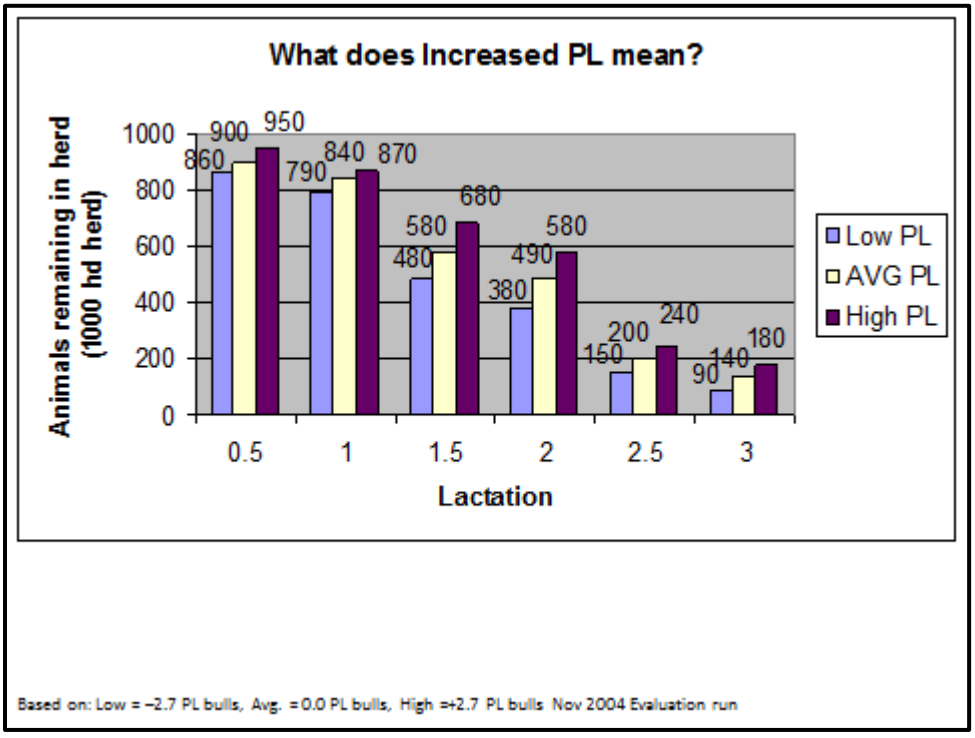
Alta Genetics
Sr. Manager US Sales & Advantage
608-658-0515

How much can we really tell about longevity by looking at a cow?

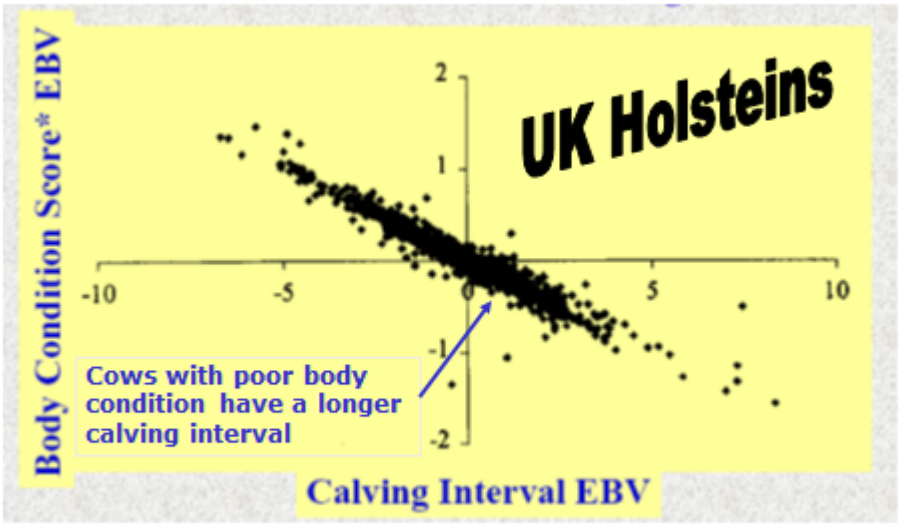
	PTAM	PTAF	PTAP	PL	DPR	SCS	CE	DSB	PTAT	UDC	FLC	STA	STR	BD	DF
PTAM															
PTAF	0.38														
PTAP	0.79	0.55													
PL	-0.21	-0.11	-0.18												
DPR	-0.41	-0.30	-0.34	0.63											
SCS	0.23	0.09	0.24	-0.39	-0.20										
CE	0.03	-0.05	-0.08	-0.29	-0.30	0.12									
DSB	0.10	0.09	0.10	-0.21	-0.21	0.08	0.10								
PTAT	-0.08	-0.14	-0.22	-0.30	-0.32	0.00	0.35	0.09							
UDC	-0.21	-0.26	-0.35	-0.11	-0.19	-0.06	0.27	0.10	0.85						
FLC	-0.12	-0.12	-0.16	-0.10	-0.15	-0.01	0.12	0.11	0.56	0.42					
STA	0.00	-0.07	-0.08	-0.44	-0.27	0.04	0.33	0.06	0.77	0.57	0.40				
STR	0.03	0.02	-0.01	-0.36	-0.18	0.02	0.23	0.08	0.52	0.27	0.37	0.67			
BD	0.10	0.06	0.01	-0.50	-0.35	0.07	0.31	0.09	0.68	0.36	0.36	0.78	0.87		
DF	0.23	0.10	0.10	-0.47	-0.50	0.15	0.31	0.06	0.66	0.40	0.20	0.59	0.18	0.57	
TW	0.03	-0.04	-0.07	-0.38	-0.24	0.06	0.29	0.08	0.63	0.45	0.26	0.64	0.61	0.66	0.45



Daughter Pregnancy Rate (DPR)

Amount by which daughters of a given sire will exceed or fall short of your herd's 21-day pregnancy rate.

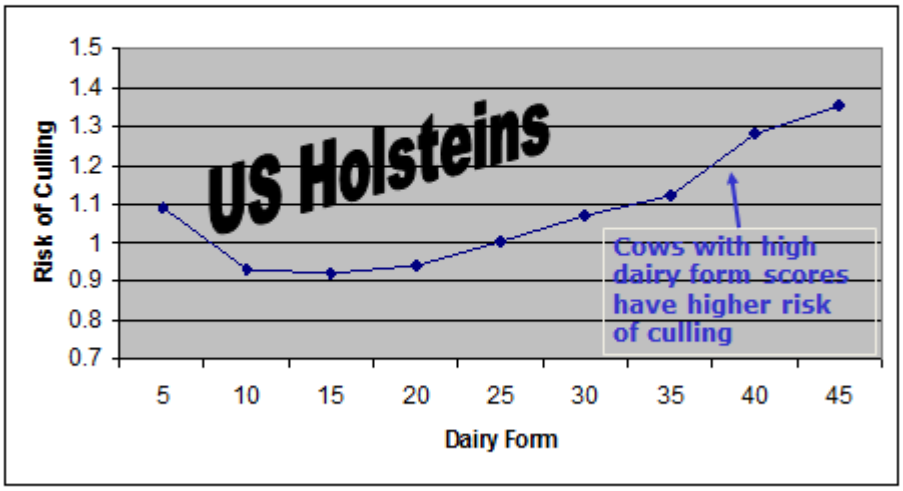
BCS vs, Cow Fertility



Body condition scores were measured on a 1-9 scale

Source: Dr. Kent Wiegel, U of Wisconsin –Cow mobility and fertility.

Dairy Form vs. Survival



The genetic correlation estimate between Body Condition Score and a composite of all diseases in the United States was -0.79. Dairy Form was positively correlated with a composite of all diseases in the United States (0.85).

Journal of Dairy Science 87: 3526 – 3533
Chad Dechow, Gary Rogers, Tom Lawlor, et al.

Swedish Hoof Health Study

20,000 Cows per month

Breeding Value

50% Sole Ulcer

20% Sole Hemorrhage

20% Heel Horn Erosion

10% Inter Digital Dermatitis

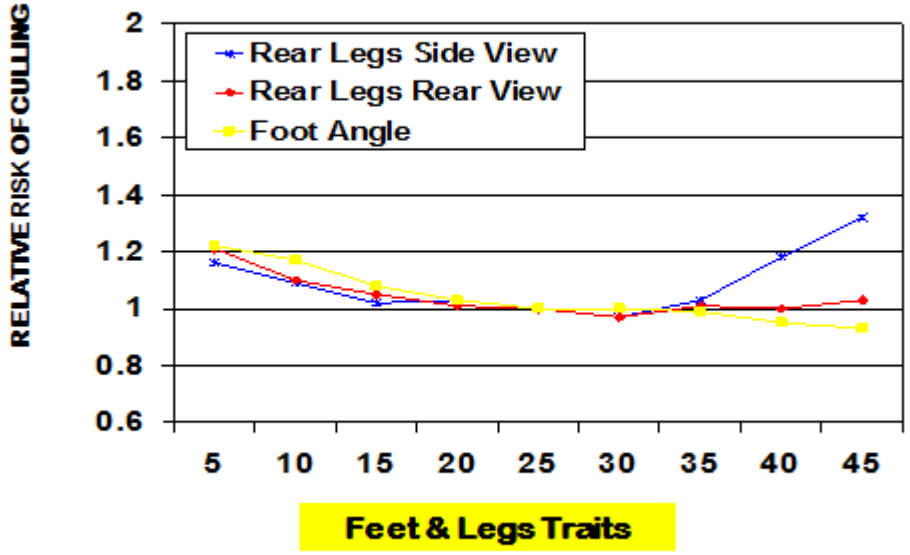
Table 1 – International bulls used in Sweden with their Swedish breeding values for hoof health (HH) and feet & legs (F&L).

NAME	PEDIGREE	HH	F&L
Aaron	Luke x Mascot	94	116
Addison	Mountain x Elton	106	71
Bojer	Juror x Acres	98	93
Calano	Juror x Cleitus	93	107
Cash	Sunny Boy x Cleitus	111	86
Champion	Rudolph x Horton	93	94
Dutch Boy	Bellwood x Laser	99	92
Ersgard	Lukas x Mascot	96	98
Forbidden	Emory x Mascot	108	109
Ford	Juror x Southwind	96	102
Heldostar	Aerostar x Baba	98	110
Iron	Bookie x Mark	71	89
Lancelot	Lukas x Tonic	99	102
Laudan	Lukas x Raider	85	117
Lee	Raider x Blackstar	98	129
Lord Lily	Blackstar x Rotate	100	108
Merdrignac	Labelle x Aerostar	104	100
Mtoto	Prelude x Blackstar	100	101
O-Man	Manfred x Elton	113	96
Outside	Storm x Blackstar	101	103
Ramos	Rudolph x Ambition	120	118
Roy	Juror x Aerostar	101	117
Skywalker	Leadman x Cleitus	101	121
Stormatic	Storm x Blackstar	100	128
Winchester	Aerostar x Cleitus	89	107
Wizard	Formation x Benchmark	118	87

Productive Life of Bulls
Ranked in order of Hoof Health

Bull	Hoof Health	Productive Life	Foot and Leg Compostion Score
Ramos	120	8.2	2.22
Wizard	118	6.7	0.07
Oman	113	6.1	1.58
Cash	111	1.1	-1.65
Forbidden	108	-1.3	0.21
Addison	106	-2.2	2.61
Roy	101	-1.3	0.75
Outside	101	5.1	1.64
Lord Lily	100	0.8	0.38
Stormatic	100	2.2	3.25
Mtoto	100	3.6	1.45
Dutch Boy	99	2.6	0.79
Lancelot	99	2.1	0.94
Lee	98	0.9	1.35
Ford [Juror Ford]	96	1.4	0.98
Aaron	94	-2.2	2.61
Champion	93	1.5	0.51
Winchester	89	-0.6	-0.54
Laudan	85	7.2	1.82
Iron	71	3.5	1.08

Culling Risk in US Holsteins



Caraviello et al. 2003

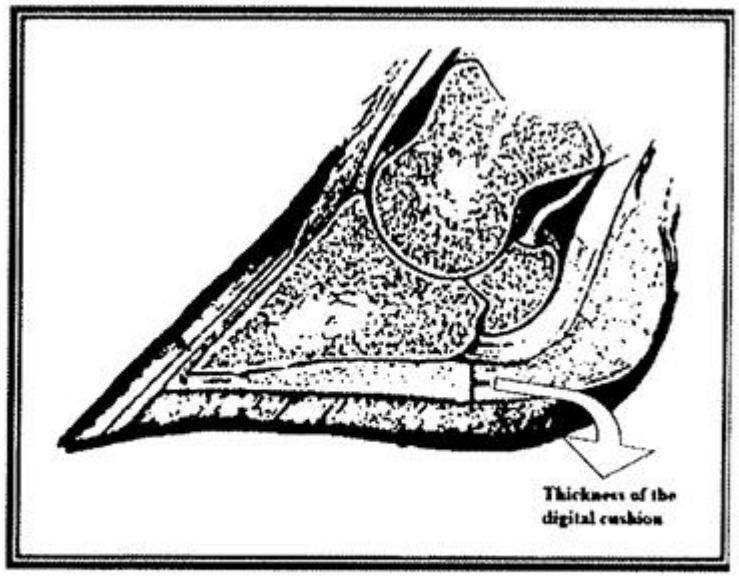
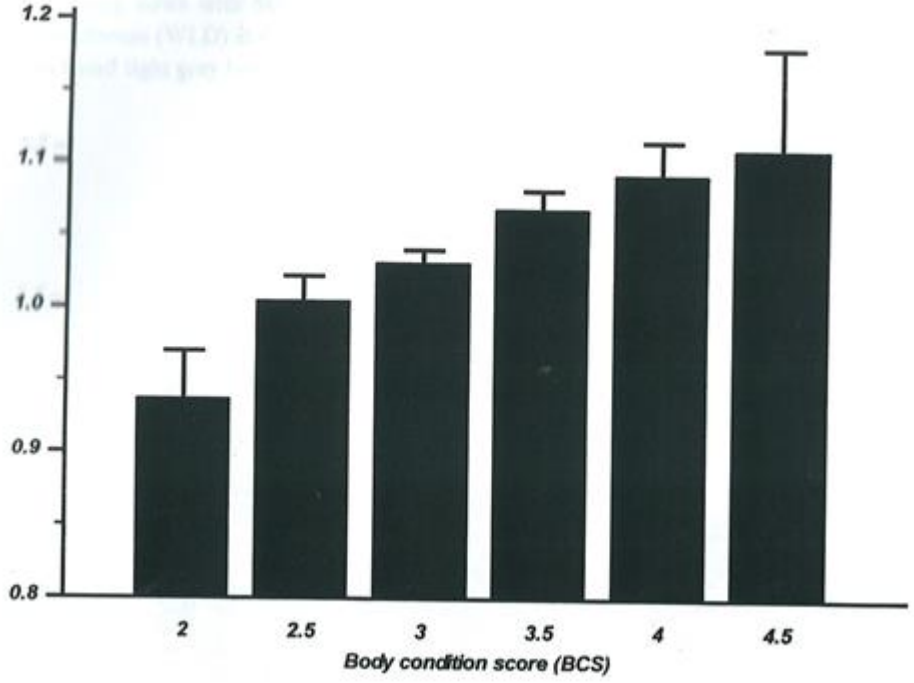
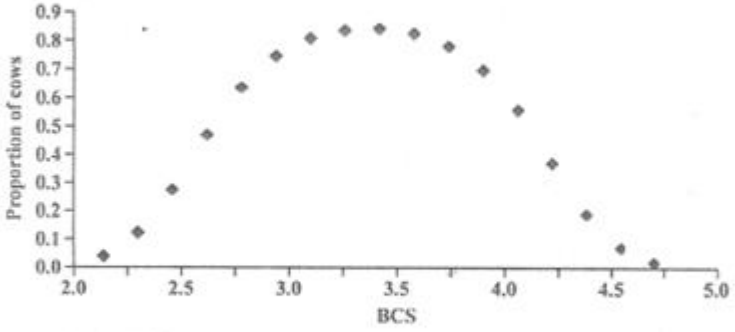


Figure 2. Sagittal section of the bovine digit illustrating the site of ultrasonographic measurement of digital cushion thickness. Figure courtesy of Zinpro Corporation (Eden Prairie, MN).





Association between BCS (5-point scale) at planned start of mating and the proportion of cows detected in estrus before planned start of mating. Source: Roche et al. (2007c).

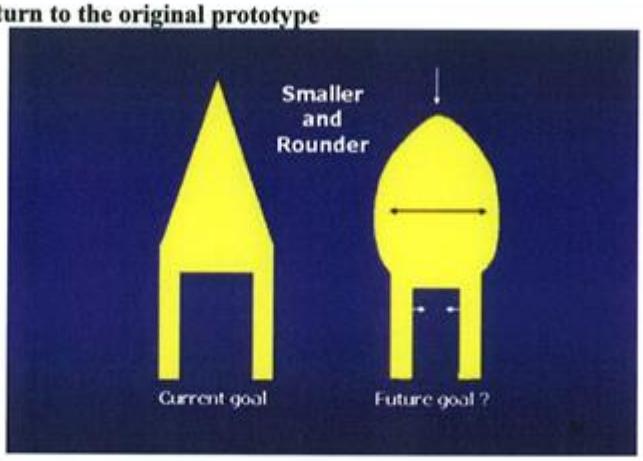
Genetic correlations of productive life with other traits

	USDA genetic evaluations		Research of cows in Wisconsin	
	Previous	Updated	1979	1993
Milk yield	0.08	...	0.26	-0.03
Body size composite	-0.16	-0.26	0.12	-0.19
Udder composite	0.30	0.15	0.40	0.29
Feet and legs composite	0.19	0.08	...	...
Daughter pregnancy rate	0.51	0.60	...	...
Somatic cell score	-0.38	-0.45	...	...

*These correlations are used to evaluate productive life for bulls with no daughters.

Hoards Dairyman : January 25, 2013 – Chad Dechow

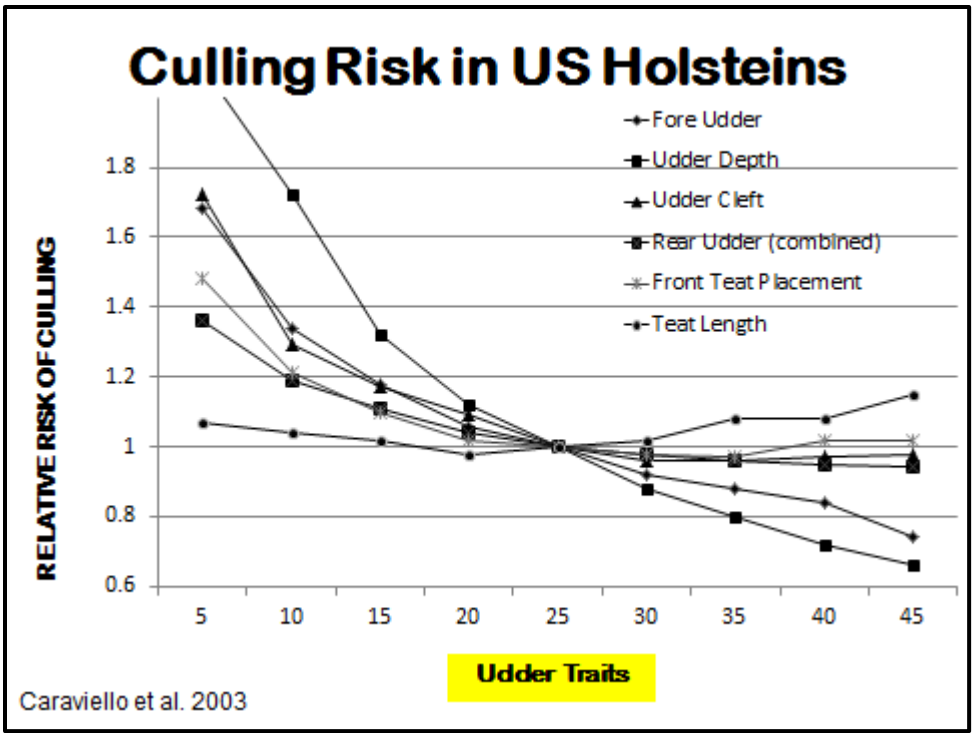
Fig. 14. A return to the original prototype

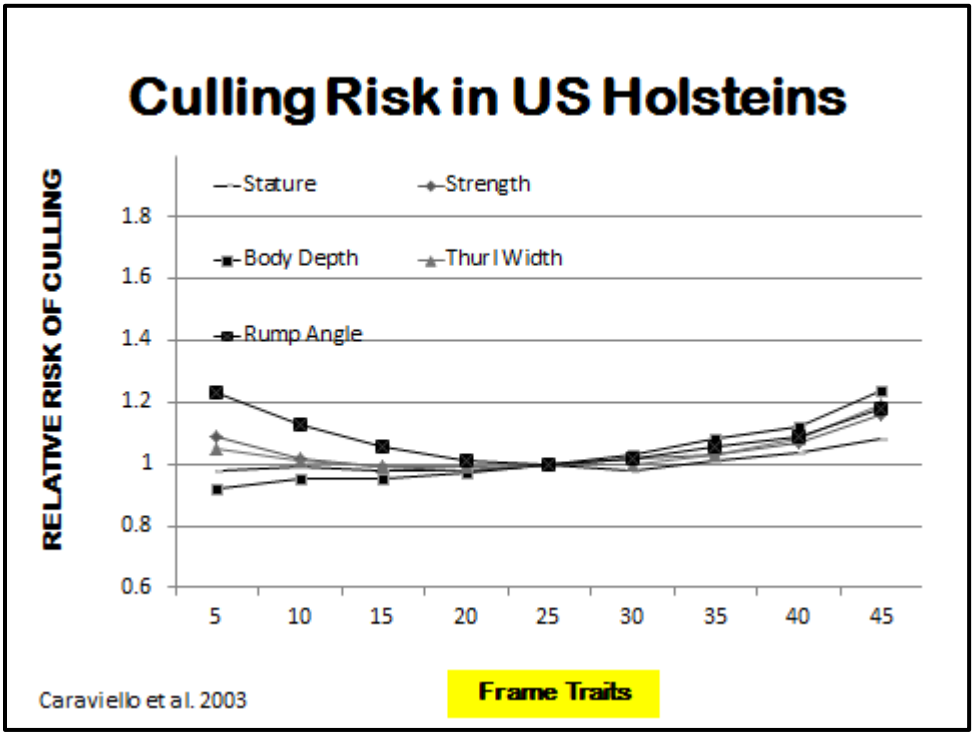


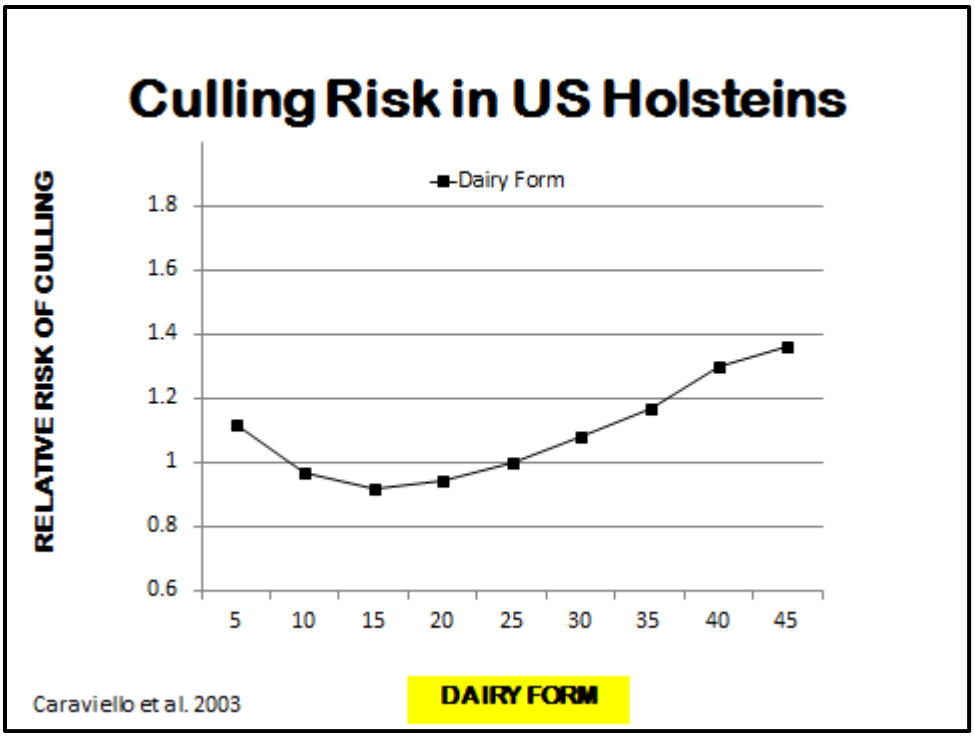
Source: http://www.milkproduction.com/Library/Articles/default.htm

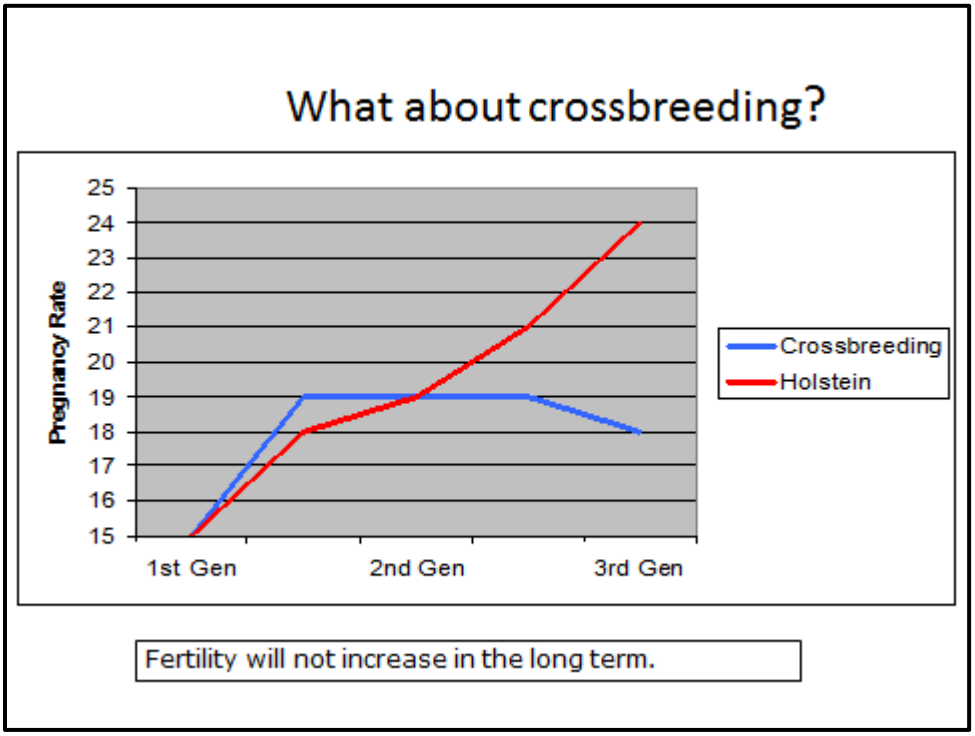
Conclusions

- 40 years of selection on production and type has led to higher culling and lower fertility in today's cows
- We have tools available to fix the problem within our breed
- Selection on PL,DPR,SCS,DCE should achieve the same goals as crossbreeding in the short term and more progress in the long term.


Culling Risk in US Holsteins
RELATIVE RISK OF CULLING
Fore Udder
Udder Depth
Udder Cleft
Rear Udder (combined)
Front Teat Placement
Teat Length
1.8
1.6
1.4
1.2
1
0.8
0.6
5
10
15
20
25
30
35
40
45
Udder Traits
Caraviello et al. 2003


Culling Risk in US Holsteins
RELATIVE RISK OF CULLING
Stature
Strength
Body Depth
Thurl Width
Rump Angle
1.8
1.6
1.4
1.2
1
0.8
0.6
5
10
15
20
25
30
35
40
45
Frame Traits
Caraviello et al. 2003


Culling Risk in US Holsteins
RELATIVE RISK OF CULLING
Dairy Form
1.8
1.6
1.4
1.2
1
0.8
0.6
5
10
15
20
25
30
35
40
45
Caraviello et al. 2003
DAIRY FORM


What about crossbreeding?
Pregnancy Rate
25
24
23
22
21
20
19
18
17
16
15
1st Gen
2nd Gen
3rd Gen
Crossbreeding
Holstein
Fertility will not increase in the long term.

Bigger

Taller

Sharper

Bigger and Taller

A. Trials indicate

1. Higher rate of culling
   [lower PL]
2. Higher Health Costs
   DA's, locomotion, respiratory and udder

Bigger and Taller

B. Higher injury rate
    1. To themselves
    2. To herdmates

C. Lower Feed efficiency

Large Cows –

300 # more body weight means 4 # more dry matter per day on cows giving 80 # of 3.5 milk –

16¢ / pound of dry matter = 64¢

18¢ / pound of dry matter = 72¢

Use 60¢ difference

Number of cows	Difference per day	Per year
1	60¢	$219
100	$60	$21,900
1000	$600	$219,000
5000	$3,000	$1,095,000

Sharper

1. Lower Herd Life
2. Higher disease level
3. Lower conception
4. Higher Anestrus
5. More locomotion problems
6. Higher Somatic Cell
7. Less return when culled

WHAT'S

HAPPENING

3% of Herds Make Half the Milk

5 or 6 Herds over 30,000 Cows

Today

9.1 Million Dairy Cows

15% Jersey and Jersey Cross

10 years ago – 3%

Herefords

9.1 Million Cows

7.735 million Holsteins 360,000 head registered last year

4.65% of the cow population

1.365 million Jersey and Jersey Crosses

96,000 Registered

7% of the Cow Herd

We need to breed the most profitable cow for the commercial dairyman

We have the genetic diversity

Feed efficiency

Low maintenance

High production

High components

High fertility

If we stay with

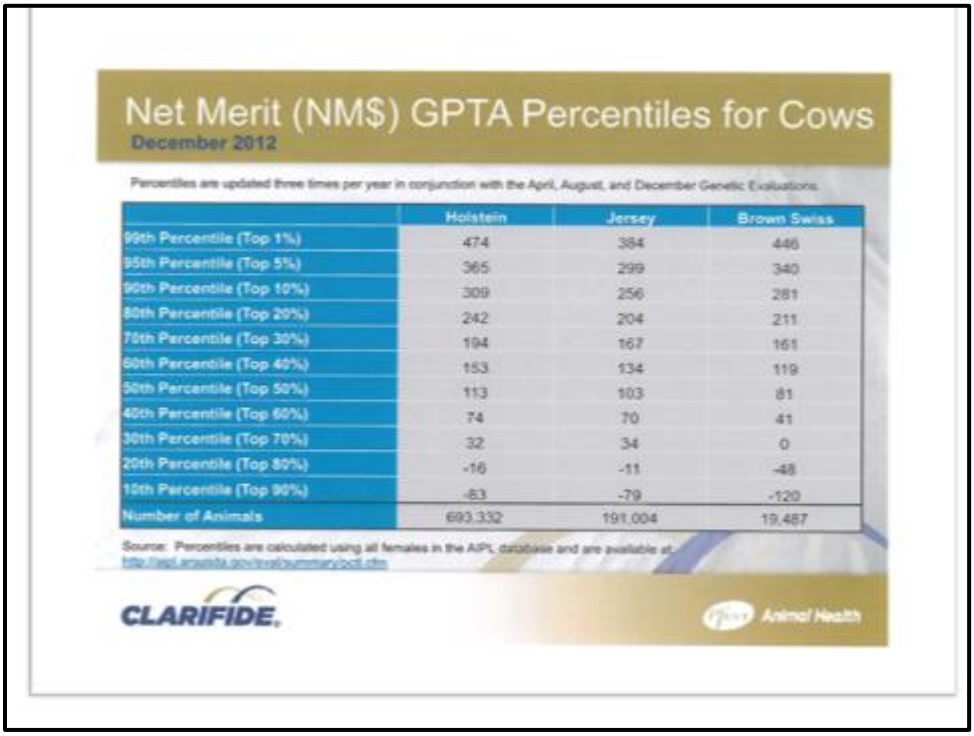
Bigger

Taller

Sharper

The guy paying his bills – is going to milking brown cows

How far can we go?



Dairy Bulls .com

2012 December Global Dairy Sire Genetic Evaluations

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Genetic Base United States 12/2012

Search Results: 15 record(s)

- For best results print this page in landscape mode.
- Click on any of the bull's names for a detailed report.

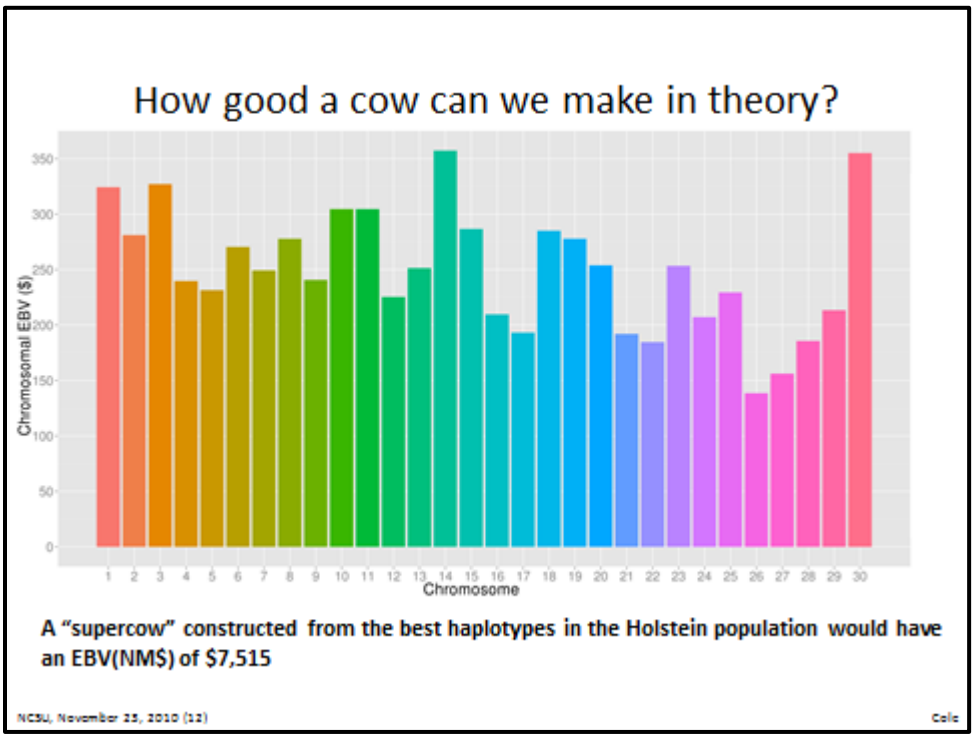
Page 1
Records 1 - 15

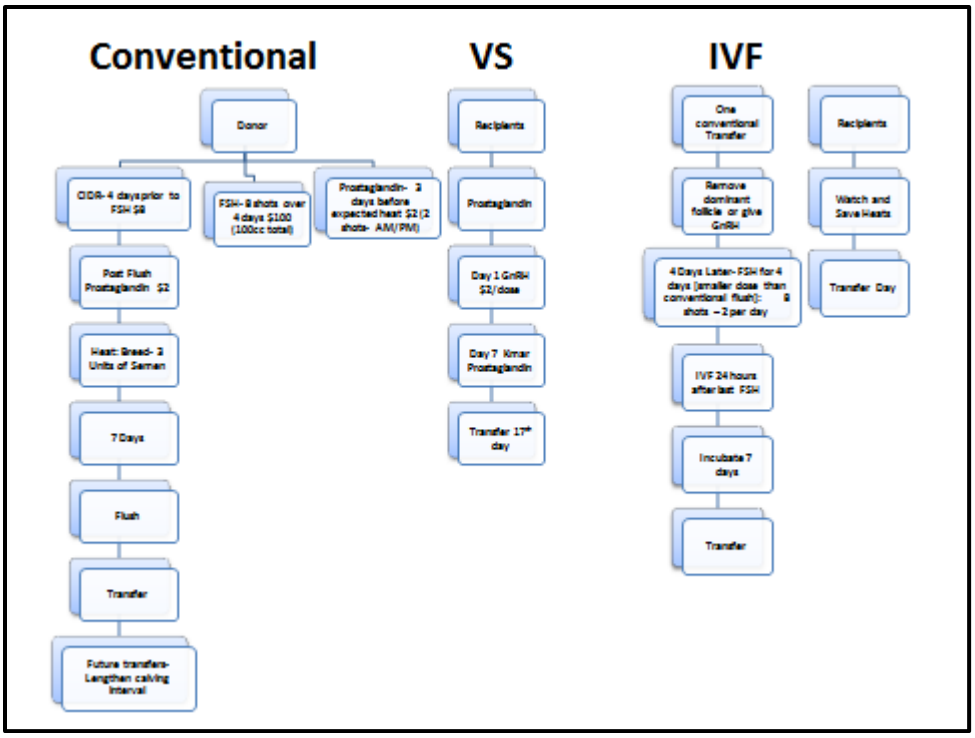
New Query

Breed: HO

NAAB	Interbull ID	Name	Lbs. Milk	% Fat	Lbs. Fat	% Prot	Lbs. Prot	PL	SCS	CE	NM$	FMS	CM$	MF Rel	GNM	GB Prod	PTAT	Type Rel	UDC	F&L C	GB Type	TPI
007HO11351	USAM000069981349	SEAGULL-BAY SUPERSIRE-ET	2463	0.08	110	0.01	76	6.7	2.75	8	942	923	971	74	G	USA-D	2.74	74	2.01	1.82	HA-	2530
001HO10396	USAM000069560690	CO-OP ROBUST CARNOLET-ET	1621	0.16	100	0.05	62	7.4	2.81	6	929	871	998	74	G	USA-D	1.65	74	1.21	1.23	HA-	2375
007HO11763	USAM000069177592	RICKLAND PREDESTINE 669-ET	1171	0.18	93	0.06	53	7.6	2.74	7	924	845	1013	74	G	USA-D	2.86	74	2.40	2.15	HA-	2491
151HO04098	NLDM000765206109	VEKIS CHEVROLET-ET	2427	-0.02	84	0.01	77	6.3	2.75	7	920	892	958	77	G	USA-D	2.66	76	1.83	1.73	HA-	2490
200HO03677	USAM000070801850	CDYNE-FARMS JABIR-ET	1428	0.16	96	0.04	54	6.3	2.49	6	909	826	969	74	G	USA-D	2.73	74	1.72	3.14	HA-	2515
	840M003004672706	S-S-I ROBUST TOPAZ-ET	1881	0.09	92	0.04	68	7.1	2.77	0	907	852	975	74	G	USA-D	1.88	74	1.33	1.08	HA-	0
200HO03878	USAM000070801849	CDYNE-FARMS JETSET-ET	1624	0.11	88	0.03	57	6.5	2.56	6	903	841	966	73	G	USA-D	2.42	73	2.06	2.51	HA-	2464
011HO11227	USAM000069990346	DE-SU ALTAWISEMAN-ET	1422	0.13	86	0.02	48	6.4	2.45	6	889	826	945	77	G	USA-D	1.49	77	1.37	2.06	HA-	2368
001HO10837	USAM000071088565	FARNEAR-TBR-SH LEWIS FLYN-ET	1734	0.07	82	-0.04	62	7.3	2.74	5	884	834	943	73	G	USA-D	1.91	73	1.65	1.42	HA-	2376
200HO03857	840M003008609210	NO-FLA DEBUT-ET	1706	0.06	75	0.01	56	7.5	2.77	4	884	852	924	75	G	USA-D	2.18	74	1.59	0.96	HA-	2387
007HO11833	USAM000070625775	DE-SU RENNIE 11023-ET	1781	0.12	97	0.01	55	7.5	2.77	7	881	860	907	74	G	USA-D	2.33	74	2.21	1.05	HA-	2365
007HO11700	USAM000070625790	DE-SU RB MOONRAY 11036-ET	1927	0.16	113	0.05	71	5.6	2.84	6	880	826	951	74	G	USA-D	1.79	75	1.16	1.59	HA-	2386
011HO11317	USAM000071074520	ROMAZ ALTAARMANI-ET	974	0.11	61	0.09	54	6.6	2.4	7	879	745	1014	74	G	USA-D	1.83	73	1.26	1.90	HA-	2362
011HO11249	840M003009524006	NO-FLA ALTASECURE-ET	732	0.09	52	0.03	31	9.1	2.64	4	878	816	937	75	G	USA-D	1.73	75	2.33	0.97	HA-	2350
007HO11599	USAM000069990354	DE-SU RB SKYLINE 1390-ET	1604	0.13	90	0.03	59	7.2	2.73	6	877	827	935	74	G	USA-D	2.70	74	2.52	1.68	HA-	2400

DairyBulls.com–Dec. Proofs 2012 Ranked By NM$





Current Problems with IVF for Commercial Dairyman

- Lack of people trained to aspirate
- Lack of facilities and training to incubate

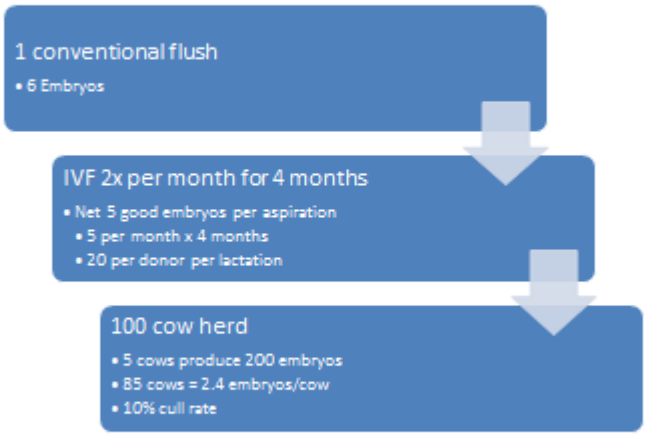
Advantages of IVF vs. conventional flush.

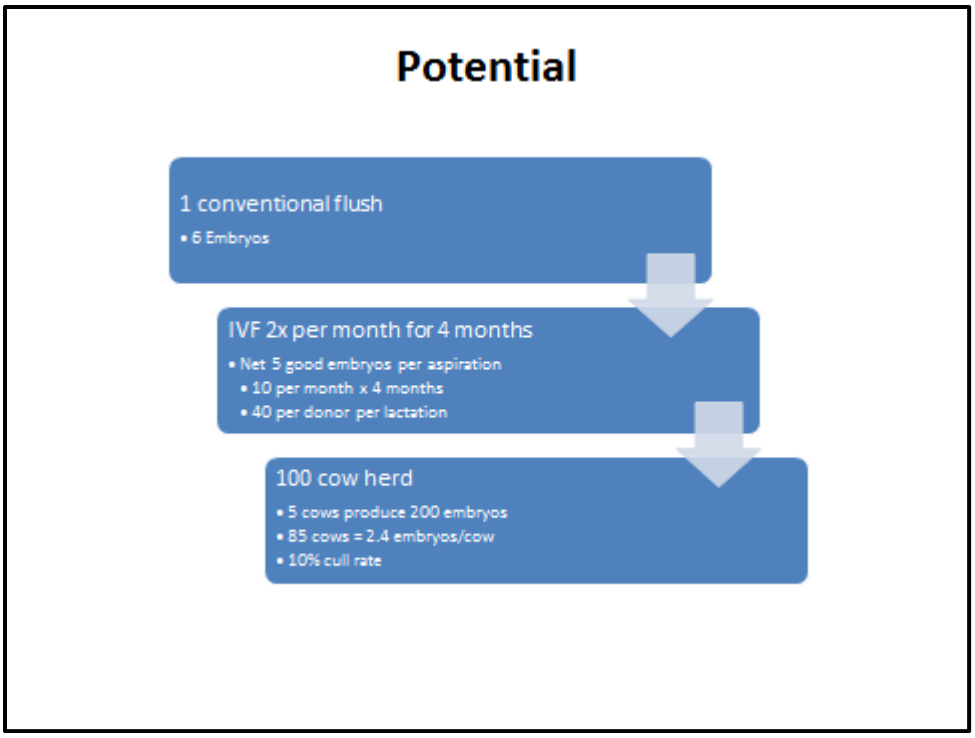
a) No breeding- [all done in lab]
   - Now 3x per cow conventional
b) 1 straw of semen can fertilize oocytes from 10 cows
   - Potential of real premium for super sires
c) No Heat watching of donors
d) No Kmars or prostaglandin less FSH
e) No injured cows from heats
f) Can use pregnant animals as donors

Regular Calving

1. Find out how cow really compares
   a) Fertility
   b) Production while carrying calf
   c) Real mastitis and disease resistance
   d) Longevity

Potential




Potential
1 conventional flush
• 6 Embryos
IVF 2x per month for 4 months
• Net 5 good embryos per aspiration
• 10 per month x 4 months
• 40 per donor per lactation
100 cow herd
• 5 cows produce 200 embryos
• 85 cows = 2.4 embryos/cow
• 10% cull rate

NOTES