

Overview of California study

- **Six cooperating dairies in central California**
 - plus a 7th dairy for calving difficulty and stillbirth
- **Holstein cows bred to A.I. sires from numerous breeds**
 - **Holstein**
 - **Normande**
 - **Montbeliarde**
 - **Scandinavian Red (Swedish Red and Norwegian Red)**

Calving difficulty and stillbirth for Holstein dams at 1st calving

Breed of sire	Calves	Calving difficulty	Stillbirth
		----- (%) -----	
Holstein	371	16.4	15.1
Montbeliarde	158	11.6	12.7
Scandinavian Red	855	5.5 **	7.7 **

All dams of calves were 1st calf Holsteins

** p < .01

Calving difficulty and stillbirth for Holstein dams at 2nd to 5th calving

Breed of sire	Calves	Calving difficulty	Stillbirth
		----- (%) -----	
Holstein	303	8.4	12.7
Normande	326	8.7	7.3 *
Montbeliarde	2,373	5.4	5.0 **
Scandinavian Red	515	2.1 **	4.7 **

** p < .01, * p < .05

Calving difficulty and stillbirth for breed of dam at 1st calving

Breed of dam	Number of calves	Calving difficulty	Stillbirth
		----- (%) -----	
Holstein	676	17.7	14.0
Normande-Holstein	262	11.6 *	9.9
Montbeliarde-Holstein	370	7.2 **	6.2 **
Scandinavian Red-Holstein	264	3.7 **	5.1 **

Breeds of sire of calves were Brown Swiss, Montbeliarde, and Scandinavian Red.

** p < .01, * p < .05

Number of cows

Breed	Original cows	Revised cows	Sires
Holstein	380	416	71
Normande-Holstein	242	251	24
Montbeliarde-Holstein	491	503	23
Scandinavian Red-Holstein	314	321	13
Total cows	1,427	1,491	131

All cows have sires and maternal grandsires with A.I. codes in the U.S.

Deaths during first lactation

Breed	Cows	Prior to 1st milk recording	Calving to 305 days
		----- (%) -----	
Holstein	416	3.6	5.3
All Crossbreds	1075	0.9 **	1.7 **
Normande-Holstein	251	0.8 *	1.2 **
Montbeliarde-Holstein	503	1.0 **	2.0 **
Scandinavian Red-Holstein	321	0.9 *	1.6 **

**** p < .01, * p < .05**

Total removals during first lactation

Breed	Cows	Prior to 1st milk recording	Calving to 305 days
		----- (%) -----	
Holstein	416	8.7	15.9
All Crossbreds	1,075	2.6 **	7.4 **
Normande-Holstein	251	3.6 *	9.6 *
Montbeliarde-Holstein	503	2.4 **	7.0 **
Scandinavian Red-Holstein	321	2.2 **	6.2 **

**** p < .01, * p < .05**

Percentage of cows starting a 2nd lactation within fixed intervals

Breed	Cows	14 mo	17 mo	20 mo
		----- (%) -----		
Holstein	416	40	58	65
Normande-Holstein	251	60 **	78 **	84 **
Montbeliarde-Holstein	503	65 **	80 **	87 **
Scandinavian Red-Holstein	321	59 **	73 *	80 *

** p < .01, * p < .05

Survival

	Pure Holstein	Normande- Holstein	Montbeliarde- Holstein	Scand. Red- Holstein
	----- (%) -----			
1st lactation	(416) ---	(251) ---	(503) ---	(321) ---
2nd lactation	(322) 77	(221) +11 **	(441) +10 **	(275) +8 **
3rd lactation	(244) 59	(175) +11 **	(353) +12 **	(223) +11 **
4th lactation	(148) 36	(127) +15 **	(263) +17 **	(161) +15 **

Number of cows in parentheses.

2 Holstein and 2 Scandinavian Red-Holstein were pregnant with 4th calf and included.

** p < .01

Days to first breeding

	Pure Holstein	Normande- Holstein	Montbeliarde- Holstein	Scand. Red- Holstein
	----- (days) -----			
1st lactation	(373) 72	(237) -5 **	(486) -5 **	(310) -3 †
2nd lactation	(300) 69	(207) -3 *	(416) -6 **	(266) -4 *
3rd lactation	(209) 70	(156) -6 **	(323) -8 **	(199) -4 *
4th lactation	(112) 67	(107) -0	(222) -7 **	(131) -3
5th lactation	(49) 71	(54) -7 †	(105) -8 *	(59) -4

Number of cows in parentheses.

** p < .01, * p < .05, † p < .10

1st service conception rate

	Pure Holstein	Normande- Holstein	Montbeliarde- Holstein	Scand. Red- Holstein
	----- (%) -----			
1st lactation	(373) 25	(237) +5	(486) +2	(310) -1
2nd lactation	(300) 21	(207) +10 *	(416) +11 **	(266) +7 †
3rd lactation	(209) 24	(156) -4	(323) +3	(199) +4
4th lactation	(112) 27	(107) +3	(222) +8	(131) -5
5th lactation	(49) 17	(54) +12	(105) +26 **	(59) +24 **

Number of cows in parentheses.

** p < .01, * p < .05, † p < .10

Days open

	Pure Holstein	Normande- Holstein	Montbeliarde- Holstein	Scand. Red- Holstein
	----- (days) -----			
1st lactation	(360) 148	(232) -21 **	(477) -16 *	(305) -14 *
2nd lactation	(275) 144	(196) -17 *	(396) -24 **	(254) -11 †
3rd lactation	(180) 146	(146) -14 †	(302) -16 *	(181) -14 †
4th lactation	(97) 147	(93) -16	(195) -27 **	(116) -1
5th lactation	(37) 157	(43) -34 *	(72) -48 **	(33) -19

Cows were required to have 250 days in milk.

Number of cows in parentheses.

** $p < .01$, * $p < .05$, † $p < .10$

Pregnancy rate

	Pure Holstein	Normande- Holstein	Montbeliarde- Holstein	Scand. Red- Holstein
	----- (%) -----			
1st lactation	(373) 16	(237) +7 **	(486) +3 †	(310) +2
2nd lactation	(300) 15	(207) +5 **	(416) +7 **	(266) +4 *
3rd lactation	(209) 14	(156) +4 †	(323) +5 **	(199) +4 *
4th lactation	(112) 15	(107) +0	(222) +5 *	(131) +1
5th lactation	(49) 12	(54) +7 *	(105) +14 **	(59) +4 †

Number of cows in parentheses.

** p < .01, * p < .05, † p < .10

Somatic cell score

	Pure Holstein	Normande- Holstein	Montbeliarde- Holstein	Scand. Red- Holstein
	----- (log of SCC) -----			
1st lactation	(380) 2.73	(242) -.06	(491) -.28 **	(314) -.20 *
2nd lactation	(310) 2.84	(215) +.22 *	(432) -.07	(269) -.03
3rd lactation	(220) 3.21	(164) +.13	(344) -.18 †	(213) -.10
4th lactation	(127) 3.57	(121) +.01	(247) -.33 **	(145) -.09
5th lactation	(63) 4.02	(65) -.44 **	(139) -.61 **	(76) -.32 *

Number of cows in parentheses.

** p < .01, * p < .05, † p < .10

Somatic cell count

	Pure Holstein		Normande- Holstein		Montbeliarde- Holstein		Scand. Red- Holstein	
	----- (thousands) -----							
1st lactation	(380)	83	(242)	-3	(491)	-15 **	(314)	-11 *
2nd lactation	(310)	90	(215)	+15 *	(432)	-4	(269)	-2
3rd lactation	(220)	116	(164)	+11	(344)	-14 †	(213)	-8
4th lactation	(127)	148	(121)	+1	(247)	-30 **	(145)	-9
5th lactation	(63)	203	(65)	-53 **	(139)	-70 **	(76)	-40 *

Number of cows in parentheses.

** p < .01, * p < .05, † p < .10

1st lactation 305-day production

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Cows	380	242	491	314
Milk (lb)	21,984	-2,308 **	-899 **	-828 **
Fat (lb)	787	-57 **	-34 **	-20 †
Protein (lb)	680	-46 **	-14	-8
Fat (lb) + Protein (lb)	1468	-103 **	-48 *	-28
% of Holstein		-7 %	-3 %	-2 %

- Records were projected to 305 days if less than 305 days
- No adjustment for days open (pregnancy)

** p < .01, * p < .05, † p < .10

2nd lactation 305-day production

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Cows	310	215	432	269
Milk (lb)	26,230	-4,100 **	-2,405 **	-2,298 **
Fat (lb)	928	-95 **	-34 **	-31 **
Protein (lb)	810	-87 **	-49 **	-41 **
Fat (lb) + Protein (lb)	1738	-182 **	-83 **	-72 **
% of Holstein		-10 %	-5 %	-4 %

- Records were projected to 305 days if less than 305 days
- No adjustment for days open (pregnancy)

** p < .01

3rd lactation 305-day production

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Cows	220	164	344	213
Milk (lb)	26,008	-3,629 **	-1,654 **	-1,967 **
Fat (lb)	944	-101 **	-32 **	-40 **
Protein (lb)	802	-73 **	-27 **	-32 **
Fat (lb) + Protein (lb)	1746	-175 **	-60 **	-72 **
% of Holstein		-10 %	-3 %	-4 %

- Records were projected to 305 days if less than 305 days
- No adjustment for days open (pregnancy)

** p < .01

4th lactation 305-day production

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Cows	127	121	247	145
Milk (lb)	26,010	-4,076 **	-1,493 **	-2,024 **
Fat (lb)	939	-123 **	-28 †	-46 **
Protein (lb)	800	-84 **	-19	-35 **
Fat (lb) + Protein (lb)	1739	-208 **	-47 †	-81 **
% of Holstein		-12 %	-3 %	-5 %

- Records were projected to 305 days if less than 305 days
- No adjustment for days open (pregnancy)

** p < .01, † p < .10

5th lactation 305-day production

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Cows	63	65	139	76
Milk (lb)	25,615	-3,228 **	-966 †	-1,587 **
Fat (lb)	913	-90 **	-11	-29
Protein (lb)	791	-64 **	-11	-31 *
Fat (lb) + Protein (lb)	1704	-154 **	-22	-60 †
% of Holstein		-9 %	-1 %	-4 %

- Records were projected to 305 days if less than 305 days
- No adjustment for days open (pregnancy)

** p < .01, * p < .05, † p < .10

Weighted average of all 305-day lactations

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Lactations	1,100	807	1,653	1,017
Milk (lb)	24,658	-3,222	-1,364	-1,545
Fat (lb)	883	-82	-23	-26
Protein (lb)	761	-64	-21	-23
Fat (lb) + Protein (lb)	1644	-146	-44	-49
% of Holstein		-9 %	-3 %	-3 %

- Records were projected to 305 days if less than 305 days
- No adjustment for days open

Total lifetime production

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Cows	380	242	491	314
Milk (lb)	62,665	+59	+9,239 **	+3,856
Fat (lb)	2,273	+93	+421 **	+218 *
Protein (lb)	1,974	+77	+335 **	+170 †
Fat (lb) + Protein (lb)	4,247	+170	+756 **	+389 †
% of Holstein		+4 %	+18 %	+9 %

Production within the 4-year period (1,461 days) after first calving.

** p < .01, * p < .05, † p < .10

Input values for lifetime profit

- **\$1200** – replacement cost
- **\$250** – live heifer calf
- **\$100** – live bull calf
- **\$125** – dead cow disposal
- **\$525** – cull cow
- **\$40** – breeding cost
- Feed costs for **daily fat-corrected milk of each cow** with fixed body weight of 545 kg (first lactation) and 680 kg (later lactations)
 - **\$5.33** – average daily feed cost
- Actual value of all solids and SCC in milk for U.S. from 2007 to 2009
 - **\$15.61/cwt** – average milk price

Total lifetime profit (ignoring health costs)

Trait	Pure Holstein	Normande-Holstein	Montbeliarde-Holstein	Scand. Red-Holstein
Number of cows	416	251	503	321
All cows	\$3999	\$4285	\$5356 **	\$4843 **
Difference from Holstein		+\$286	+\$1357 **	+\$844 **

Unfortunately, estimates of profitability of cows usually exclude cows that die or are culled before first milk recording:

Number of cows	380	242	491	314
Cows with milk recording	\$4594	\$4510	\$5383 †	\$4906

Profit within only the 4-year period (1,461 days) after first calving.

** p < .01, * p < .05, † p < .10

Conclusions (California)

- **Scandinavian Red x Holstein** crossbred cows had **\$844** more profit (**21%**) than pure Holstein cows during their first 4 years of lifetime
- **Montbeliarde x Holstein** crossbred cows had **\$1357** more lifetime profit (**34%**) than pure Holstein cows during their first 4 years of lifetime