

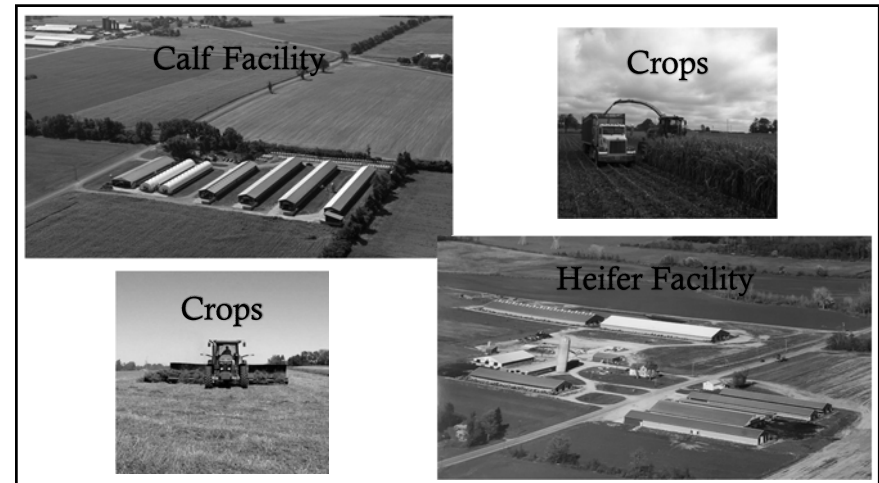
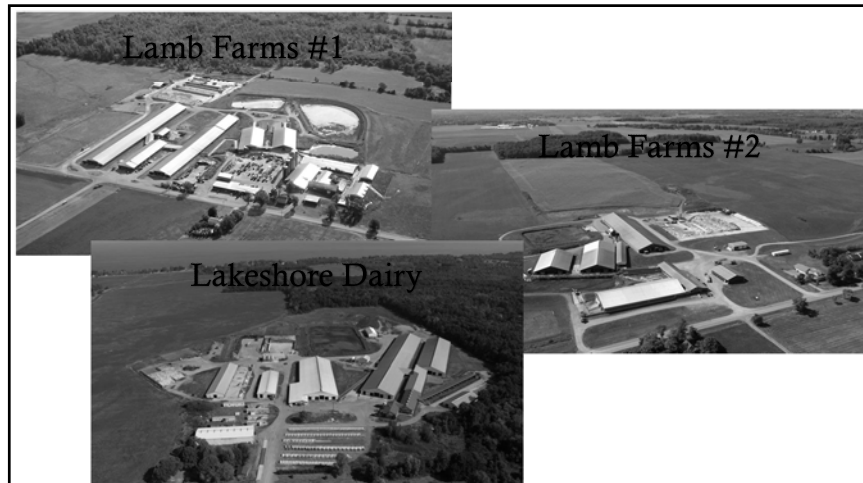
Applications of Genomic Technologies in Dairy Herds

Jonathan Lamb
Oakfield Corners Dairy/Lamb Farms, Inc.
December 7, 2016



Acknowledgments

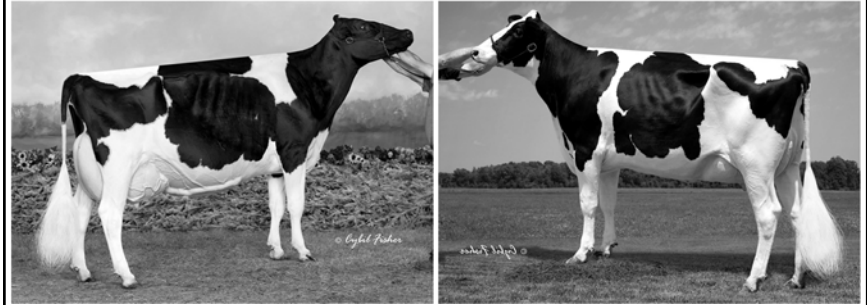
- ◆ Dr. Tom Lawlor, Holstein USA
- ◆ Dr. Dan Weigel, Zoetis
- ◆ Dr. Kent Weigel, University of Wisconsin
- ◆ David Hill, Alta Genetics
- ◆ Chuck Sattler, Select Sires, Inc
- ◆ Dr. George Wiggans, AGIL



My Background in Genomics

- ◆ Member of Holstein Association's Genetic Advancement Committee since 2002
- ◆ Chairman of Genetic Advancement Committee 2011-2015
 - ◆ Make recommendations to the Holstein Board
 - ◆ Total Performance Index formula
- ◆ Board Member Holstein USA 2010-2015
- ◆ Early adopter of Genomics
 - ◆ Initial 50K test very expensive, used to identify elite cattle only
 - ◆ Now have Low Density test, \$45, used for more applications
- ◆ Extensive flush program
 - ◆ 4500 embryos transferred per year
 - ◆ ¾ index, ¼ show type

Registered Program



Budjon-JK Emilys Edair

EX-95-2E - EEEEE

Res All-American & Res All-Canadian Jr 3 Yr Old 2010

EDG Ruby Uno Rae 2054

+2580 GTPI - EX-90

From the Dellia Family



Lamb Farms # 2 Genetics Barn



Management of Type Cattle



Management of High GTPI Cattle



Lamb Farms # 3 Donor Facility



Embryo Transfer Program



Craigcrest Rubies Rachelle

EX-91 – EEVVE @ 3Y

2nd Place Jr 3 Yr Old, Int'l Holstein Show 2016

- ◆ IVF (In-Vitro Fertilization) vs Traditional Flushing
- ◆ Over 4500 embryos implanted past 12 months
- ◆ Overall conception rate: 50%
- ◆ IVF embryos: 45%
 - ◆ Frozen IVF embryos: 50%
- ◆ Conception rate quality #1 fresh conventional embryos in heifers: 64%
- ◆ Focus on pregnancy rate, not conception rate
- ◆ Cost difference IVF vs Traditional Flushing
 - ◆ ~\$300 per pregnancy IVF vs \$100 traditional

Embryo Transfer Program



*Dr. Tom Mercurio,
TransOva Genetics*



*Dr. Craig Lamb,
Perry Vet Clinic*



*Adam Dresser,
Lamb Farms Repro Mgr*

Marketing Cattle at Oakfield Corners Dairy



- ◆ High pedigreed registered cattle
 - ◆ High genomics
 - ◆ Show type/pedigreed
- ◆ Commercial cattle
 - ◆ Fresh 2 year olds
- ◆ Bulls to AI
 - ◆ ~30 sold 2016
- ◆ Genomically tested cattle for export

Value of Genetics



Do First Lactation Cows Milk as Expected by Sire PTA Milk?

SUM ME305 DOWNBY SPTAM\Q4 FOR LACT=1 SID>H

By Sire PTAM		%	Count	AvME305
Hi	1646	25	86	30728
	709	28	98	28139
	101	27	93	27371
Low	-444	20	68	27698
Total		100	345	28476

Expected difference in Sire PTAM = 2090

Actual difference in Sire PTAM = 3030

Do First Lactation Cows Conceive as Expected by Sire DPR?

SUM ... DOWNBY SDPR\Q4 FOR LACT=1 SID>H

By Sire DPR		%	Count	PR	HDR	CR
Hi	3.9	25	86	30	63	49
	1.9	26	88	30	55	55
	0.2	26	88	27	56	51
Low	-1.3	24	83	18	51	34
Total		100	345			

Expected difference in Sire DPR = 5.2%

Actual difference in Sire DPR = 12.0%

Does Productive Life Predict Metabolic Issues in First Lactation Cows?

SUM ... DOWNBY SPL\Q4 FOR LACT=1 SID>H

By Sire Productive Life	%	Count	Abort	Sold	Died	DA	Ket	Mast	RP	Total	
Hi	6.3	25	198	16	87	3	4	18	33	9	170
	4.7	28	221	22	84	2	1	20	32	17	178
	3.3	22	175	20	107	6	0	29	38	12	212
Low	0.7	25	197	28	145	5	4	30	41	20	273
Total	100	608									

Value of Genetics

- ◆ 6 units of semen to make a heifer
- ◆ 4.25 years before semen investment generates full returns. Net present value of \$100 in 4.25 years at 5% interest is \$81.26

◆ **\$13.54 more value**
per unit for every \$100 of PTA NMS



Genomics in Practice



With Genomics, we're able to determine if an offspring received good or bad alleles from its parents

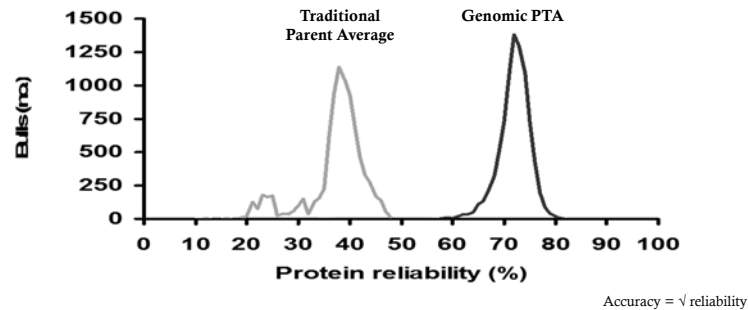


chromosome
from her sire

chromosome
from her dam

A genomic test gives you a more accurate prediction of genetic merit

Reliabilities for Young Animals



Genomics in Practice

- ◆ Introduced commercially in 2008
- ◆ No one predicted its rapid adoption
- ◆ Increase use of young sire “genomic” bulls
- ◆ Increased cost of semen of elite bulls
- ◆ Rapid rise in values of genomic index animals



Genomics in Practice

- ◆ Reasons to test
 - ◆ Determine the **genetic merit** of elite animals at a young age
 - ◆ Cull low end replacement heifers
- ◆ Secondary reasons
 - ◆ Verify or discover **Parentage**
 - ◆ Track **haplotypes** or **single genes**
 - ◆ Manage the rate of **Inbreeding**



Genomics in Practice

- ◆ Identifying Elite Cattle
 - ◆ Very exciting aspect of genomics!
 - ◆ For Dairymen wanting to propagate top genetics, they must start with elite stock (top 2% of the breed)
 - ◆ Dairymen with access to recipients have a competitive advantage
 - ◆ Takes a high level of management to run a successful large ET program
 - ◆ Homeruns are few and far between, but pay off well when they come



WCD-ZBW Supersire Lavage
+2560 GTP1 - VG-85 - DOM

Oakfield Corners Dairy Spring Sensation Sale 2015



\$14,509 Average
74 Full Lots
\$1,117,400 gross

High Sellers:

OCD SS Free Willy 4224-ET \$175,000 and
OCD Delta Missy 4252-ET \$190,000

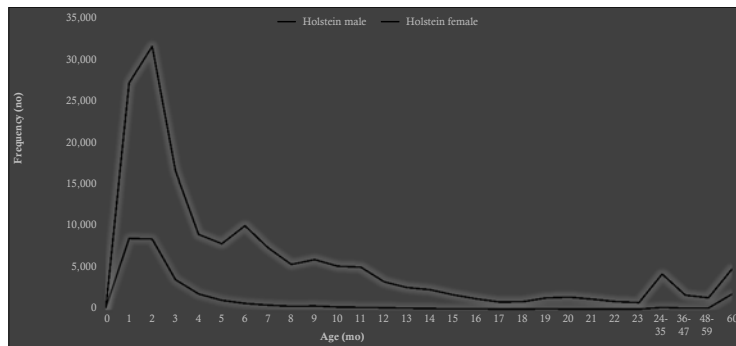


Genomics in Practice

- ◆ Breeding With Genomic Young Sires
 - ◆ We have entered a new era of genomic progress
 - ◆ We identify top genetics earlier than ever before



Most Animals are Tested Less Than Four Months of Age



Genomics in Practice

- ◆ Breeding With Genomic Young Sires
 - ◆ We have entered a new era of genomic progress
 - ◆ We identify top genetics earlier than ever before
 - ◆ Reducing generation interval allows for greater progress



Genetic Gain per Year

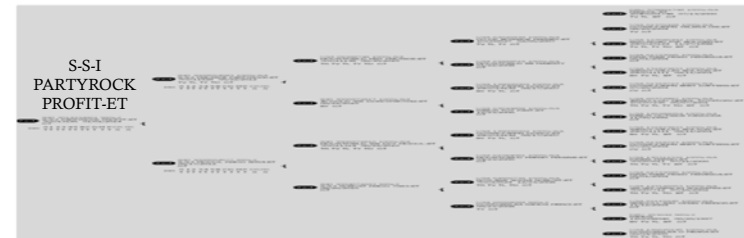
(Accuracy x Intensity x Genetic Variation)

Generation Interval

What we want to do

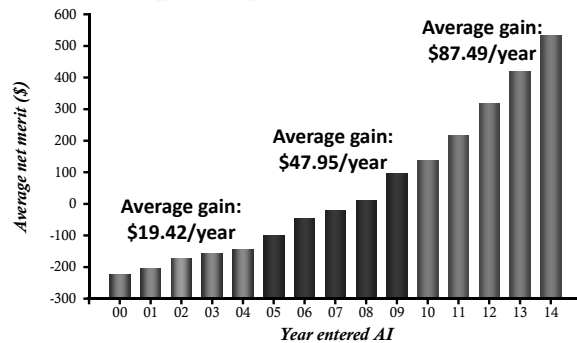
- ↑ Accuracy by using genotypic data
- ↑ Select more intensely
- ↓ Generation interval by obtaining evaluations earlier in life

Generation Interval



Age of Parents when he was born	Age of Grand Parents when his parents were born	Age of Great Grand Parents when Grand Parents were born	Age of Great Great Grand Parents when Great Grand Parents were born
20 months	22.5 months	33.8 months	62.1 months

Genetic Merit of Marketed Holstein Bulls Improving at a Faster Rate



Genomics in Practice

- ◆ Breeding with Genomic Young Sires
 - ◆ We have entered a new era of genomic progress
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- ◆ Using almost exclusively genomic bulls should be in the breeding plan of commercial dairies
 - ◆ Avoid risk of young bulls lowering over time by using a greater number of bulls

Genomics in Practice

◆ Test and Cull Commercial Heifers

◆ Strategy

- ◆ Test heifers soon after birth to identify those with poor genetic potential
- ◆ Cull the bottom 10-20%



Decision To Raise All Heifers

- ◆ Are all heifers needed?
- ◆ Plans for growth/expansion
- ◆ Sufficient land available for feed and manure application?
- ◆ Are heifer costs fixed or marginal?



Genomics in Practice

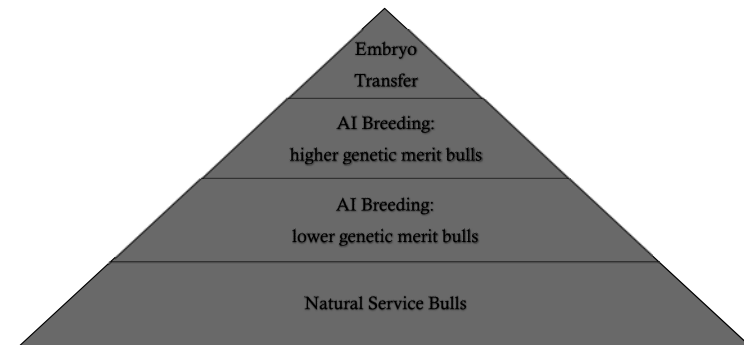
◆ Test and Cull Commercial Heifers

◆ Pitfalls

- ◆ Common sense must prevail
 - ◆ Heifers with challenges (i.e. damaged lungs) must go first
- ◆ Comprehensive breeding program must precede testing
 - ◆ Level of genetics used
 - ◆ Sexed semen usage
 - ◆ Consider on highest indexing heifers/cows
 - ◆ Embryo Transfer program



Genetic Levels in Dairy Herds



Take Home Messages

- ◆ Breeding to propagate top genetics using genomics
 - ◆ Should be done with elite stock only
 - ◆ Has the potential to add significant “non-milk income”
- ◆ Breeding heavily to genomic young bulls should be in every commercial farm’s breeding strategy
- ◆ Using genomics for a “test and cull” strategy should be done only after careful planning
- ◆ Breeding with the best genetics is a worthwhile investment!!!
 - ◆ Well thought out breeding plans take patience and discipline
 - ◆ Cattle will exhibit the traits they are bred for

