Proceedings of the

52nd Florida Dairy Production Conference

Wednesday, April 6, 2016

Alto Straughn IFAS Extension Professional Development Center
2142 Shealy Drive
Gainesville, FL 32608

MISSION STATEMENT

The mission of the Florida Dairy Production Conference is to create a program which brings together some of the newest research, innovations, recommendations and ideas for improving the sustainability and profitability of the Florida dairy industry. The presented information provides practical take-home messages for dairy farmers and highlights emerging trends in the dairy industry. The conference strives to provide a friendly learning and sharing atmosphere with networking opportunities for our target audience of dairy owners and employees, allied dairy industry professionals, students and dairy educators.

PLANNING COMMITTEE

Ricardo Chebel
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Proceedings compiled by Albert De Vries
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Program

52nd Florida Dairy Production Conference

Wednesday, April 6, 2016
Alto Straughn IFAS Extension Professional Development Center
Gainesville, Florida

8:30 AM **Registration**

9:30 **Welcome and IFAS dairy update**
- *Geoffrey Dahl*, University of Florida

9:40 **What dairy farmers should know about genetic selection**
- *Francisco Peñagaricano*, University of Florida

10:10 **Opportunity costs when choosing service sires**
- *Ole Meland*, past chair Council on Dairy Cattle Breeding

10:50 **Minimizing costs of mastitis through enhancing antimicrobial protein production in the udder**
- *Corwin Nelson*, University of Florida

11:20 **Improving milk quality: Troubleshooting high laboratory bacteria counts on the farm**
- *Jamie Cantrell*, Dairy Farmers of America

12:00 PM **Luncheon**

1:10 **Warm-season perennial grass management in Florida**
- *Joao Vendramini*, University of Florida

1:40 **Current strategies to increase nutritive value of corn silage**
- *Luiz Ferraretto*, University of Florida

2:20 **Economic evaluation of dairy cow stocking density**
- *Albert De Vries*, University of Florida

2:45 **Update on Florida environmental regulations, including BMP manual release**
- *Ray Hodge*, Southeast Milk

3:00 **Break**

3:30 **Opportunities for making milk in the Southeast: Full Circle Dairy, FL**
- *Eric Diepersloot*, Full Circle Dairy

4:00 **Overcoming challenges during the adoption of new technologies: Abel Dairy Farms, WI**
- *Steve Abel*, Abel Dairy Farms

4:30 **Producer Panel**
- *Moderator: Jose Santos*

5:00 **Reception**

What dairy farmers should know about genetic selection

Francisco Peñagaricano
Department of Animal Sciences
University of Florida

OUTLINE

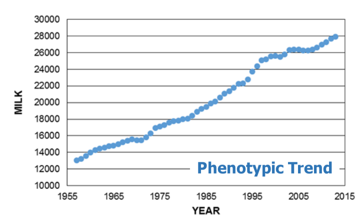
- **Introduction**
- **Sire summaries: three key concepts**
- **Selection for multiple traits**
- **Take home messages**

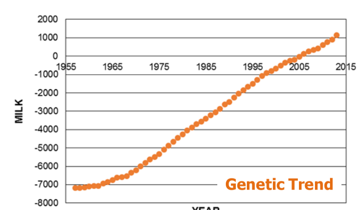
Genetic selection decisions

- one of the **most important decisions** that a dairy producer frequently makes
- represents a great opportunity to **improve the profitability** of the dairy production enterprise

Changes achieved through selection are:

❑ **cumulative** ❑ **permanent** ❑ **cost-effective**





Dairy bulls are genetically evaluated for several traits

- **Production traits**
- **Fertility traits**
- **Health traits**
- **Type traits**

This information is regularly compiled and published as **sire summaries**

What dairy farmers should know about genetic selection

Sire summaries

- There are at least **three key concepts that appear in the sire summaries** that we should consider in order to **make proper sire selection decisions**

Sire summaries: three key concepts

- **Predicted Transmitting Ability** (**PTA**; a measure of the genetic merit of the bull)
- **Reliability** (**REL** or **%R**; a measure of the degree of confidence in the PTA of the bull)
- **Percentile Rank** (a measure of the rank of the bull within the evaluated population)

What dairy farmers should know about genetic selection

Sire summaries: three key concepts

Predicted Transmitting Ability (PTA)

- **genetic prediction that we should always use when making sire selection decisions**
- estimate of the relative genetic superiority that a bull will pass to its offspring
- PTA value on one animal has no special meaning because PTA is not an absolute value
- PTAs are **exceptional tools for comparing and ranking available bulls**

What dairy farmers should know about genetic selection

Predicted Transmitting Ability (PTA)

- PTAs are **exceptional tools for comparing and ranking available bulls**
- the **difference between the PTAs of two bulls** is an estimate of the **difference we expect to observe in the performance of their progeny**

7HO11351 Supersire
+71 PTA Protein

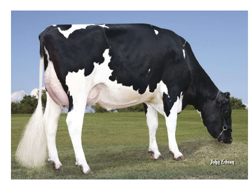
7HO11123 Wright
+17 PTA Protein

Supersire daughters will produce **54 more pounds of protein** than Wright daughters

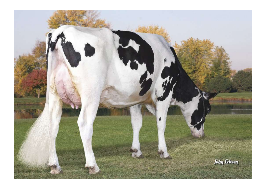
What dairy farmers should know about genetic selection

Predicted Transmitting Ability (PTA)

- PTAs are **exceptional tools for comparing and ranking available bulls**
- the **difference between the PTAs of two bulls** is an estimate of the **difference we expect to observe in the performance of their progeny**



7HO11351 Supersire
+7.0 PTA Productive Life



7HO11123 Wright
+8.6 PTA Productive Life

Wright daughters will survive **1.6 more months** than Supersire daughters

Sire summaries: three key concepts

Reliability (REL %R)

- it measures **the accuracy or degree of confidence in the PTA**
- it is expressed as percentages and range from 1 to 99
- REL is a function of the **heritability of the trait** and the **amount of information** available

  - **if heritability and the amount of information increase, then REL also increases**

  - bull has a **more reliable PTA for protein yield than for daughter pregnancy rate** because protein yield has higher heritability
  - bull with **many daughters has a more reliable PTA for any given trait** than a bull with no or just few daughters

Sire summaries: three key concepts

Reliability (REL %R)

- it measures the accuracy or degree of confidence in the PTA
- although **we should not select or exclude potential sires based only on reliability**, we can **use REL values as a guide to decide how intense** we want to use a bull.

we might choose to purchase:

120 units of semen from a **progeny-tested bull** with **95% REL**

OR

20 units of semen from each of **6 different young genomic-tested bulls** with **70% REL**

(young bulls with better genetic merit than the progeny-tested bull)

Reliability (REL %R)

- currently, the number of **young genomic-tested bulls** (G) available in the marketplace far exceeds the number of **progeny-tested bulls** (A)
- **young genomic-tested bulls** have in average **higher predicted genetic merits**; as a counterpart, they have **lower reliabilities**

- the **best strategy for managing the risk** associated with lower reliabilities of genomic-tested bulls is to **increase the number of young bulls** that are used:

No. genomic-tested bulls	**REL** (average) genetic merit
1	**70**
3	**90**
6	**95**
12	**98**

Sire summaries: three key concepts

Percentile Rank

- tables or graphs of PTA distributions
- useful information regarding **the rank or position** of a bull within the population evaluated
- interpretation:

if a bull ranks for a given trait at the **95th percentile**, this means that the bull is genetically superior to **95 percent of all the evaluated bulls** of its breed.

What dairy farmers should know about genetic selection

Percentile Rank

- useful information regarding **the rank or position** of a bull within the population evaluated

Percentile	PY	PL	DPR
99th (TOP 01%)	49	7.3	4.6
95th (TOP 05%)	38	5.4	3.3
90th (TOP 10%)	32	4.6	2.7
80th (TOP 20%)	26	3.5	1.9
70th (TOP 30%)	21	2.6	1.2
50th (TOP 50%)	13	1.3	0.1

Twister
+24 PTA PY
+6.9 PTA PL
+1.7 PTA DPR

[1] Twister ranks in the **top 30%** for **PY**

[2] Twister ranks in the **top 5%** for **PL**

[3] Twister ranks in the **top 30%** for **DPR**

What dairy farmers should know about genetic selection

Percentile Rank

AVERAGE AND RANGE OF PROOFS FOR RECENTLY PROGENY-TESTED AI BULLS*

	PROTEIN		FAT					COMPOSITES					
Bulls	PTAP	PTA%P	PTAF	PTA%F	PTAM	NM$	PTAT	UDC	FLC	PL	DPR	SCS	TPI
TOP 1%	54 (49 to 72)	0.12 (0.11 to 0.16)	74 (66 to 110)	0.28 (0.25 to 0.38)	1915 (1718 to 2473)	655 (585 to 936)	2.72 (2.37 to 3.78)	2.57 (2.33 to 3.18)	2.48 (2.21 to 3.98)	8.0 (7.3 to 9.7)	5.2 (4.6 to 6.6)	2.54 (2.43 to 2.58)	2404 (2333 to 2719)
TOP 5%	44 (38 to 72)	0.09 (0.08 to 0.16)	61 (52 to 110)	0.22 (0.18 to 0.38)	1544 (1291 to 2473)	536 (458 to 936)	2.14 (1.80 to 3.78)	2.12 (1.80 to 3.18)	2.02 (1.70 to 3.98)	6.5 (5.4 to 9.7)	4.0 (3.3 to 6.6)	2.61 (2.43 to 2.66)	2266 (2173 to 2719)
TOP 10%	39 (32 to 72)	0.08 (0.06 to 0.16)	54 (44 to 110)	0.19 (0.15 to 0.38)	1354 (1068 to 2473)	481 (396 to 936)	1.89 (1.50 to 3.78)	1.87 (1.51 to 3.18)	1.79 (1.44 to 3.98)	5.7 (4.6 to 9.7)	3.5 (2.7 to 6.6)	2.66 (2.43 to 2.72)	2200 (2101 to 2719)
TOP 20%	34 (26 to 72)	0.06 (0.04 to 0.16)	46 (35 to 110)	0.15 (0.10 to 0.38)	1144 (816 to 2473)	418 (323 to 936)	1.62 (1.21 to 3.78)	1.60 (1.18 to 3.18)	1.52 (1.10 to 3.98)	4.8 (3.5 to 9.7)	2.9 (1.9 to 6.6)	2.70 (2.43 to 2.78)	2125 (2011 to 2719)
TOP 30%	30 (21 to 72)	0.05 (0.03 to 0.16)	41 (28 to 110)	0.13 (0.07 to 0.38)	1002 (625 to 2473)	378 (271 to 936)	1.43 (0.98 to 3.78)	1.42 (0.94 to 3.18)	1.33 (0.85 to 3.98)	4.2 (2.6 to 9.7)	2.4 (1.2 to 6.6)	2.74 (2.43 to 2.83)	2076 (1948 to 2719)
TOP 50%	25 (13 to 72)	0.04 (0.01 to 0.16)	34 (17 to 110)	0.10 (0.02 to 0.38)	785 (306 to 2473)	317 (184 to 936)	1.18 (0.62 to 3.78)	1.15 (0.55 to 3.18)	1.06 (0.47 to 3.98)	3.3 (1.3 to 9.7)	1.7 (0.1 to 6.6)	2.80 (2.43 to 2.92)	2003 (1839 to 2719)
ALL	12 (-64 to 72)	0.01 (-.15 to 0.16)	17 (-76 to 110)	0.02 (-.29 to 0.38)	298 (-2578 to 2473)	175 (-593 to 936)	0.61 (-3.52 to 3.78)	0.53 (-2.57 to 3.18)	0.46 (-2.77 to 3.98)	1.3 (-7.3 to 9.7)	0.1 (-6.5 to 6.6)	2.92 (2.43 to 3.63)	1838 (925 to 2719)
No. Bulls	7275	7275	7275	7275	7275	7275	5835	5835	5835	7273	7275	7275	5797

What dairy farmers should know about genetic selection

Sire selection for multiple traits

- there are a large number of traits, including **production traits** (such as milk yield and milk composition) and **fitness traits** (such as longevity, fertility, udder health, and calving ability) that **directly impact the profitability of the dairy production enterprise**
- different methods for selecting sires considering **multiple traits of economic importance**

What dairy farmers should know about genetic selection

Independent Culling or Rejection Levels

- first choose **minimum standards** or **cut-off values** for each of the traits undergoing selection
- then select only those bulls that **meet simultaneously** all these criteria

we might decide that we will only use bulls with PTAs that are at least:

+31 for protein yield, **+4.3** for productive life, and **+2.5** for daughter pregnancy rate

Independent Culling or Rejection Levels

- **simple method** that allows to select simultaneously for multiple traits using **simple rules**
- this method has **some important limitations:**

1. **minimum standards** are in general chosen **arbitrarily** without using any formal approach
2. these values **may vary over time** due to genetic progress and changes in the genetic base:
   - cut-off values that are appropriate today may be too liberal or too restrictive in the near future
3. this method ignores the **genetic relationships between traits of interest**
   - this impacts the efficiency of selection when we select for traits that are genetically correlated
4. the **effectiveness of the method decreases** as the **number of traits under selection increases**
   - fewer bulls meet all the criteria, and these bulls are only marginally superior for each trait

Economic Selection Index

- better approach for selecting sires considering multiple traits
- combines multiple traits into a single value, greatly facilitating the identification of the best bulls
- individual traits are weighted based on relevant genetic information and **economic importance**

✓ these **economic weights** are based on **current prices** for both **inputs** (e.g., feed and veterinary costs) and **outputs** (e.g., milk prices) of a dairy farm

✓ these values are **updated regularly** to reflect current trends in the price of feed and milk

Economic Selection Index

- Lifetime Net Merit (NM$), Cheese Merit (CM$), Fluid Merit (FM$), and Grazing Merit (GM$)
- **these indices consider simultaneously**:

✓ **production traits**
(including milk, fat, and protein yield)

✓ **female fertility traits**
(including daughter pregnancy rate, heifer conception rate, and cow conception rate)

✓ **productive life**

✓ **somatic cell score**

✓ **functional type traits**
(three composite traits, including udder, feet and legs, and body size)

✓ **calving ability**

Economic Selection Indices: relative weights

- Lifetime Net Merit (NM$), Cheese Merit (CM$), Fluid Merit (FM$), and Grazing Merit (GM$)

Trait	NM$	CM$	FM$	GM$
Protein	20	24	0	18
Fat	22	19	23	20
Milk	-1	-9	23	-1
PL	19	16	20	10
SCS	-7	-7	-3	-6
Udder	8	6	8	8
Feet/Legs	3	2	3	3
Body size	-5	-4	-5	-4
DPR	7	6	7	19
HCR	2	1	2	3
CCR	1	1	2	5
CA$	5	4	5	5

source: http://aipl.arsusda.gov

Lifetime Net Merit Index (NM$)

- probably the most popular index
- represents the most appropriate breeding goal for the vast majority of US dairy farmers

Trait	NM$
Protein	20
Fat	22
Milk	-1
PL	19
SCS	-7
Udder	8
Feet/Legs	3
Body size	-5
DPR	7
HCR	2
CCR	1
CA$	5

- **Protein** and **fat yield** receive the highest weights (20% and 22%)
- **Productive life** has the highest weight (19%) among the fitness traits
- **Female fertility** traits receive a relative weight of 10%

Overall, **NM$** has relative weights of

43% for **production traits**

41% for **health and fertility traits**

16% for **functional type traits**

Lifetime Net Merit Index (NM$)

- Correlations of PTAs between **NM$** and **some important traits**

Traits	MY	PY	FY	PL	SCS	DPR
NM$	0.537	0.679	0.650	0.806	-0.350	0.504

- **NM$ is highly correlated** with **protein and fat yield**, and also with **productive life**
- **Milk is positively correlated** with protein and fat yield, and hence, it is also correlated with **NM$**
- **High NM$ values** are associated with **low somatic cell counts**
- **High NM$ values** are associated with **high daughter pregnancy rates**

Alternative indices

- Three indices are available for producers with special milk markets or production systems

Trait	NM$	CM$	FM$	GM$
Protein	20	**24**	0	18
Fat	22	19	23	20
Milk	-1	**-9**	23	-1
PL	19	16	20	10
SCS	-7	-7	-3	-6
Udder	8	6	8	8
Feet/Legs	3	2	3	3
Body size	-5	-4	-5	-4
DPR	7	6	7	19
HCR	2	1	2	3
CCR	1	1	2	5
CA$	5	4	5	5

Cheese Merit Index (CM$)

For dairy farmers who are paid mainly for **milk components**

Alternative indices

- Three indices are available for producers with special milk markets or production systems

Trait	NM$	CM$	FM$	GM$
Protein	20	24	**0**	18
Fat	22	19	23	20
Milk	-1	-9	**23**	-1
PL	19	16	20	10
SCS	-7	-7	-3	-6
Udder	8	6	8	8
Feet/Legs	3	2	3	3
Body size	-5	-4	-5	-4
DPR	7	6	7	19
HCR	2	1	2	3
CCR	1	1	2	5
CA$	5	4	5	5

Fluid Merit Index (FM$)

For dairy farmers who are paid mainly for **milk volume**

Alternative indices

- Three indices are available for producers with special milk markets or production systems

Trait	NM$	CM$	FM$	GM$
Protein	20	24	0	18
Fat	22	19	23	20
Milk	-1	-9	23	-1
PL	19	16	20	**10**
SCS	-7	-7	-3	-6
Udder	8	6	8	8
Feet/Legs	3	2	3	3
Body size	-5	-4	-5	-4
DPR	7	6	7	**19**
HCR	2	1	2	3
CCR	1	1	2	5
CA$	5	4	5	5

Grazing Merit Index (FM$)

pasture-based dairy producers

Take Home Messages

Key points to consider when making selection decisions

- Sire selection represents a great opportunity to improve the profitability of the dairy enterprise

"If breeding for profit is not your objective then I wish you all the very best with your hobby"

- Sire selection decisions should be based on PTA information
- The selection of sires considering multiple traits should be based on economic selection indices
- The percentile rank helps to see how genetically superior the bull in question is compared with the rest of the available bulls
- The reliability should be used for managing the risk associated with the imprecision in the estimate of the genetic merit

Thanks for your attention!

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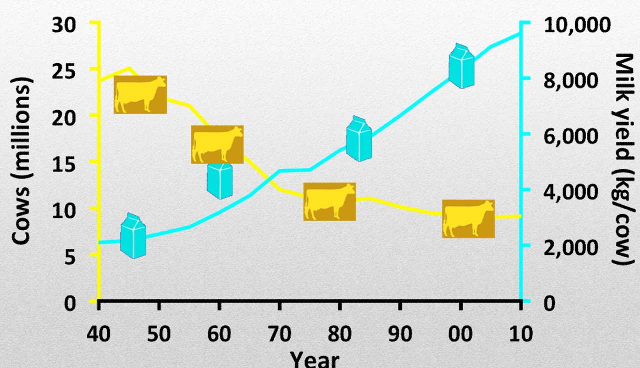
NOTES

Opportunity Costs When Choosing Service Sires 2016 Florida Dairy Production Conference University of Florida April 6, 2016

Dr. Ole Meland

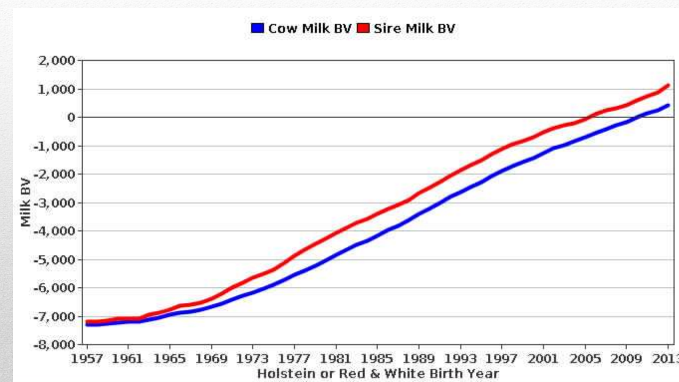
Chairman of the Council on Dairy Cattle Breeding 2010-2015
Chairman of the National Association of Animal Breeders 2011-2013
Vice President of Genetics Accelerated Genetics 1984-2012
Director of Business Development Accelerated Genetics 2012-2014
Genetics Consultant World Wide Sires 2015-present

U.S. dairy population and milk yield

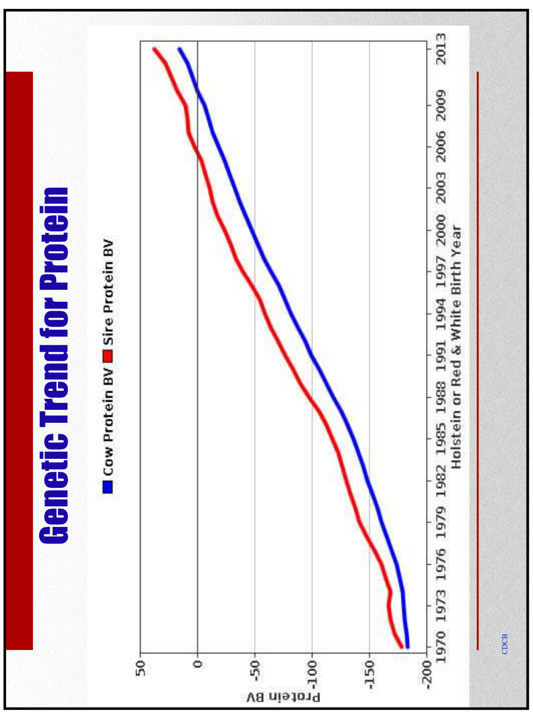


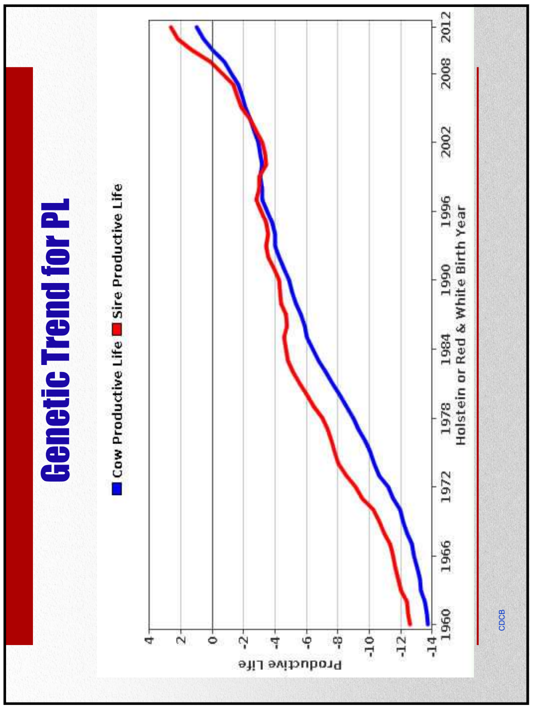
Wiggans

Genetic Trend for Milk



Council on Dairy Cattle Breeding (CDCB)


Genetic Trend for Protein
Cow Protein BV
Sire Protein BV
Protein BV
Holstein or Red & White Birth Year
CDCB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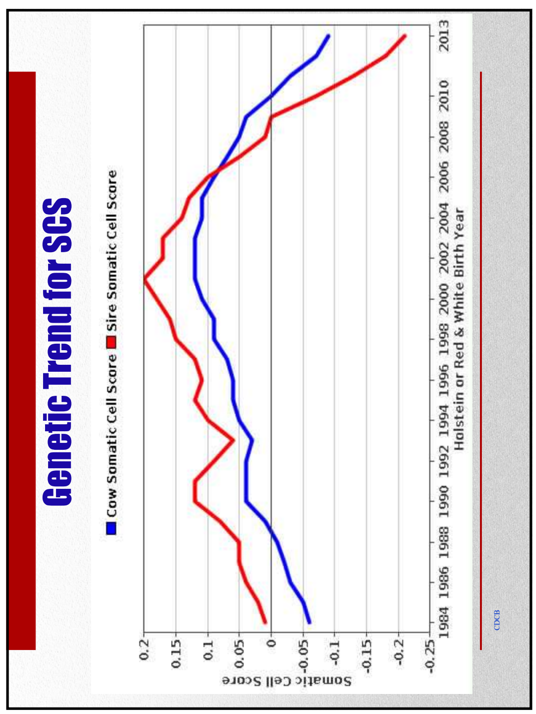
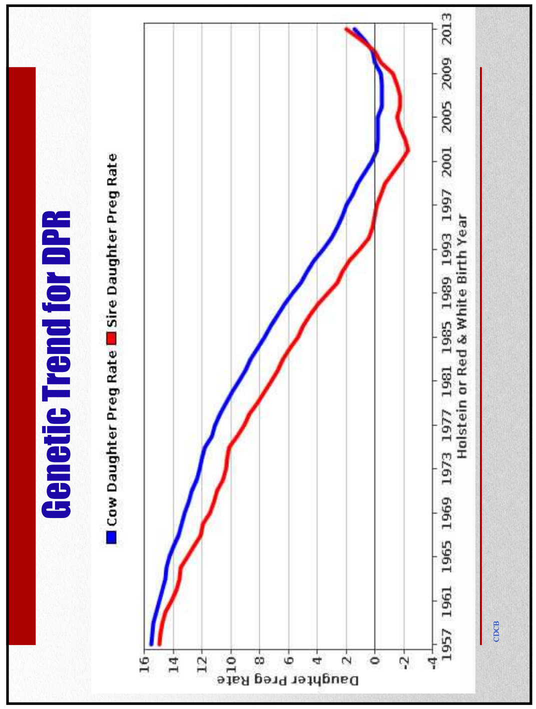

Genetic Trend for SCS
Cow Somatic Cell Score
Sire Somatic Cell Score
Somatic Cell Score
Holstein or Red & White Birth Year
CDCB


Genetic Trend for DPR
Cow Daughter Preg Rate
Sire Daughter Preg Rate
Daughter Preg Rate
Holstein or Red & White Birth Year
CDCB

Dairy cattle traits evaluated by USDA/CDCB

Year	Trait	Year	Trait
1926	Milk & Fat Yields	2006	Stillbirth Rate
1978	Conformation (type)	2006	Sire Conception Rate[2]
1978	Protein Yield	2009	Cow & Heifer Con Rate
1994	Productive Life, NM$	2012	Mobility for Brown Swiss
1994	Somatic Cell Score (mastitis)	2012	Rear Leg Rear View and Milking Speed for Milking Shorthorn
2000	Calving Ease[1]		
2003	Dau Pregnancy Rate	2014	Grazing Merit (GM$)

2016, 2018, 2020 what will be the next traits added?

[1] Sire calving ease evaluated by Iowa State University (1978-99)
[2] Estimated Relative Conception Rate evaluated by DRMS@Raleigh (1986-2005)

George Wiggans USDA/AGIL

Inheritance of traits of economic importance

- Most traits of economic importance in dairy cattle are controlled by additive genetics.
- You must continue to add superior genes ever generation to keep genetic trend moving up.

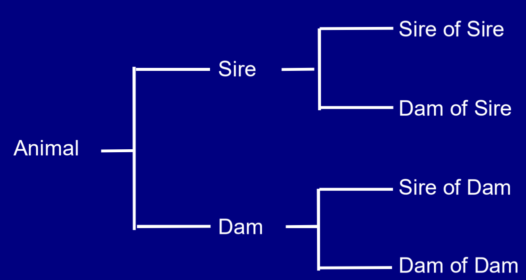
Opportunity costs when choosing service sires

- Why the service sires you choose for use in your herd, matters more now, than ever before.
- It is because, in the era of genomics, the rate of genetic gain is increasing at an increasing rate.

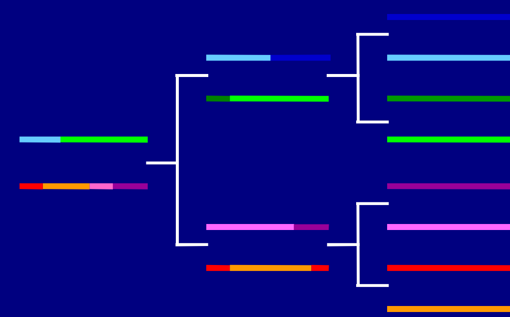
Opportunity costs when choosing service sires

- There are four pathways to increase genetic merit.
- Dam of Sons
- Sire of Sons
- Dams of Daughters
- Sire of Daughters

Traditional Pedigree



Genomic Pedigree



One Millionth genotype received

May 15, 2015 the <u>one millionth</u> genotype was received into the genotype table in the US.

As of August 2015 there were 184,659 sires that had a US genomic evaluation and 829,685 females for a total of 1,014,344.

George Wiggans USDA/AGIL

Four major factors that affect the rate of genetic change in a population

1) Selection Intensity (SI)
2) Accuracy of Selection (AS)
3) Generation Interval (GI)
4) Additive Genetic Standard Deviation (AGSD)

With genomic selection, breeders are able to greatly affect 3 of the 4 factors.

Rate of Genetic Change = (SI x AS x AGSD)/ GI

Rate of Genetic Change in a Population

1) Selection Intensity : from moderately low to extremely high

2) Accuracy of Selection : from 35%R to 75%R

3) Generation Interval : from 85 months on sires and 48 months on females in 2007 to around 33 months for both sires and females in 2013.

With more extensive genomic selection in 2014 the age of parents will continued to decline in the future.

George Wiggans USDA/AGIL

Rate of Genetic Gain is increasing at an increasing rate

Genetic merit of marketed Holstein bulls

Year	Ave NM$ gain per year
2000-2004	$19.42
2005-2009	$47.95
2010-2014	$87.49

George Wiggans USDA/AGIL

Rate of Genetic Gain is increasing at an increasing rate

In the Holstein breed the rate of genetic change from 2008-2013 was around twice the rate it was from 2005-2008 for milk, fat, protein yields and the three lifetime indexes (NM, FM, CM).

The rate of change was almost three times for some lower heritable traits like Productive Life (PL).

Duane Norman CDCB consultant

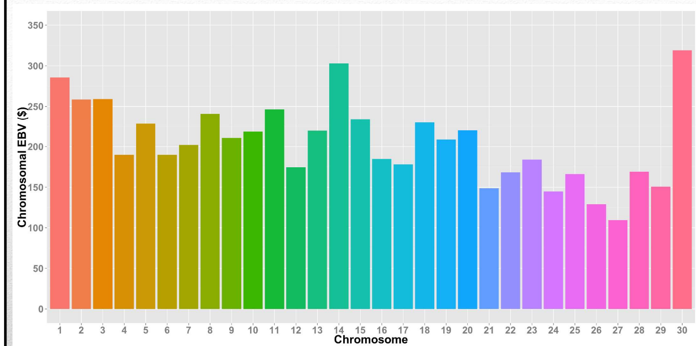
The level of US genomic evaluations for Young Genomic Holstein Sires

	1st eval April, 2015	1st eval Dec, 2015
Number 1 sire for Milk	+2691 M *	+3327 M*
Number 1 sire for Fat	+109 F *	+121 F*
Number 1 sire for Protein	+83 P *	+83 P*
Number 1 sire for NM$	+951 NM$ *	+991 NM$*
Number 1 sire for GTPI	+2825 GTPI *	+xxxx GTPI*

*These animals are too young to produce semen at this time

What is possible?

"Super cow"



A "Super Cow" constructed from best haplotypes in the Holstein population would have a GEBV NM$ value of $6173

John Cole USDA-AGIL March 29, 2016

What traits do you need in your cow herd to be most profitable?

Produce high volumes of fat and protein with relatively low SCS.

Medium sized

Well attached capacious udder

Mobile and trouble free feet and legs

Easy calving and breed back on time

Cows that maintain adequate body condition

What is the goal of sire selection?

To efficiently select a group of service sires to use in your herd that will meet the goals you have established for your herd.

How do I go about choosing service sires for my herd?

Clearly the best and most efficient way to select service sires for your herd is to use a selection index that maximizes your herds profit potential 4-7 years from now.

Selection index properly weights the value of all economical important traits.

Are there any conditions that are likely to change in the next 4-7 years that you need to take into account when choosing a selection index that best fits your herd?

2014 Indexes From CDCB

Trait	Relative Value (%)			
	LNM$ 2014	LCM$ 2014	LFM$2014	LGM$2014
Protein	20	24	0	18
Fat	22	19	23	20
Milk	-1	-9	23	-1
PL	19	16	20	10
SCS	-7	-7	-3	-6
UDC	8	6	8	8
FLC	3	2	3	3
BC	-5	-4	-5	-4
DPR	7	6	7	19
HCR	2	1	2	3
CCR	1	1	2	5
CA$	5	4	5	5

What can the use of a group of elite genomic young sires do for your herd?

Clearly, the use of a group of elite genomic young sires can greatly increase the genetic merit of your herd when compared to a group of top proven sires or even a group of not so elite genomic sires that were available to use at the same time.

Change in use of genomic young sires over time in US herds on DHIA test

Young sire usage in 2006 was less than 30%

Young sire usage in 2010 was more than 42%

Young sire usage in 2012 was more than 50%

On average in 2012, herds of 50-99 cows in Southwest region of the US exceeded 65% use of genomic young sires.

Jan Hutchison USDA/AGIL

Accuracy of an individual compared the accuracy of a group average

Reliability of an individual genomic young sire is 75%R.

Reliability of a group average of 10 genomic young sires is 97.5%R.

In other words if the accuracy of an individual genomic estimate is 75%, the accuracy of a group average of 10 sires is much more accurate at 97.5%.

Group Ave R = 1- (1-Ave R of individual sire in the group)/# of sires in group)

Make sure you are using elite genomic sires

Just because a bull has a genomic evaluation, does not mean he is an elite genomic sire worthy of use in your herd.

How much can we pay for high-end bulls?

Chad Dechow reports in JDS (V 73:532-538) and Hoards Dairyman (p.130 February 25, 2016) for a herd with 35% CR they can justify the following semen price for a given NM$.

Genomic Young Sire	.1591/NM$	600 NM$ = $95.46
Dau-Proven Sire	.1731/NM$	500 NM$ = $86.55
No risk adjustment	.1872/NM$	600 NM$ = $112.32

How much can we pay for high-end bulls?

Based upon $.15 to $.20 value for every $ of NM$; on farms with reasonably high reproductive management, semen from elite sires is most often reasonably priced compared to bulls with lower genetic merit.

Chad Dechow Hoards Dairyman p. 130 Feb 25, 2016

Other considerations

- Many registered herds are using a combination of genomic testing, ET and IVF. Some are utilizing sexed semen.

- Can a commercial herd justify Genomic testing?
- Can a commercial herd justify Sexed Semen?
- Can a commercial herd justify ET or IVF?

Other considerations

- The higher the conception rates are in your herd the more you can justify paying for semen.
- Heifers are higher conception than cows.
- Given you have used elite service sires in your herd, your heifers will be the highest genetic valued animals in your herd.
- In order to create the truly elite animals of the next generation you need to breed the best to the best.

One area of concern in the genomics era is maintaining genetic diversity

Inbreeding in US Holstein cows in 2000 was 4.5%. In 2013 it was estimated to be around 6.25%.

The Expected Future Inbreeding in US Holstein cows was 4.8% in 2000. In 2013 it was estimated to be around 6.1. So the expected future inbreeding is not increasing as quickly as inbreeding and seems to be leveling off.

George Wiggans USDA/AGIL

An area of concern in the genomics era is maintaining the genetic diversity

The use a larger group of sires to sire the next generation as well as Genomic Mating programs will help manage genetic diversity and slow or possibly reverse the rate of genomic inbreeding in the future.

Recommendations

First step is to set your herd goals for the traits of economic importance that you want to improve in your herd. Consider the situation 4-7 years from now.

Remember the more traits you select, the less progress you will make in any one trait.

Use a selection index that includes economically important traits you want to improve in your herd.

Then, based on your selection index, choose elite genomic bulls to use in your herd for the next 3-6 months.

Recommendations

In 3-6 months repeat this sire selection process and choose a group of bulls you are going to use in your herd for the following 3-6 months.

Use a group of elite genomic young sires.

In herds with 1000 cows or more I would recommend the use of 10-15 bulls to breed your herd.

I would recommend using elite genomic young sires on at least 75% of your herd.

Recommendations

I believe strongly in mating programs, especially genomic mating programs. After you have chosen the bulls to use in your herd, you should use a mating program to select which bull to breed to which cow!

Regardless of your herd size the extensive use of a group of elite genomic young sires will make significant progress in the economically important traits in your herd and will result in greater profitability from your dairy herd.

Thank you

Any Questions !

NOTES

Enhancing Immunity Through Vitamin D

Outcomes of 2014-2015 Milk Check-Off Projects:

Minimizing Costs of Mastitis Through Enhancing Antimicrobial Protein Production in the Udder
-Awarded to Nelson and Santos

Use of 1,25 Vitamin D3 (Calcitriol) to Maintain Postpartum Blood Calcium (Ca) and Improve Immune Function in Dairy Cows
-Awarded to Santos and Nelson

Corwin Nelson, Ph.D.
Assistant Professor of Physiology
Department of Animal Sciences

Nelson, 2016 Florida Dairy Production Conference

Transition Cow Health

Our goal: Minimize incidence of transition cow diseases.

Disease risk is minimized through proper nutrition and management.

But, nutrition and management are not always enough.

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Transition Cow Health

Approach: Identify viable therapies that enhance immunity of transition cows.

Basic Research: Understand how the immune system works and what signals control immunity of the cow.

↓↑

Applied Research: Test the effectiveness of immune modulating therapies that have potential for on-farm use.

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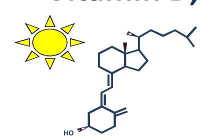
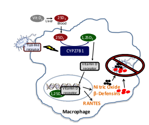
Vitamin D, Calcium and Immunity



Vitamin D_3

Calcium



Improved Immunity
↓
Disease Resistance

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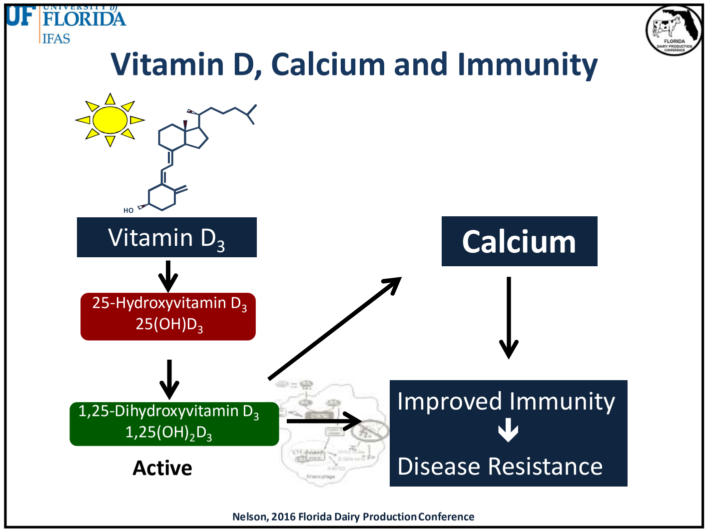
UF FLORIDA IFAS
Vitamin D, Calcium and Immunity
Vitamin D$_3$
25-Hydroxyvitamin D$_3$
25(OH)D$_3$
1,25-Dihydroxyvitamin D$_3$
1,25(OH)$_2$D$_3$
Active
Calcium
Improved Immunity
Disease Resistance
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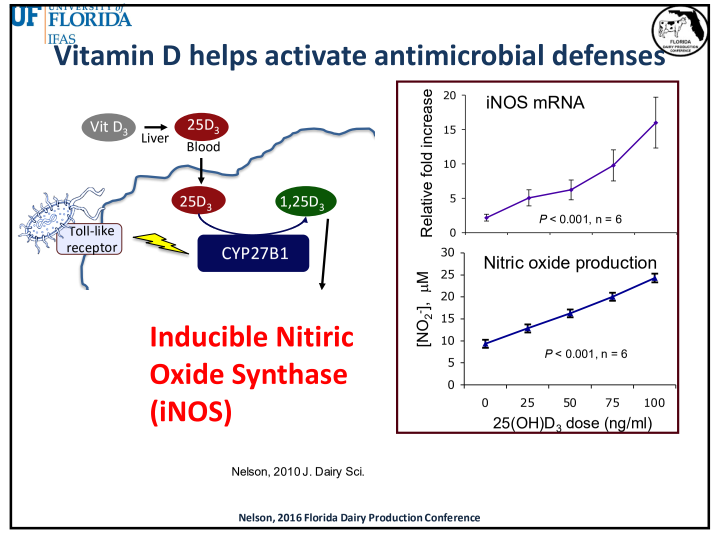
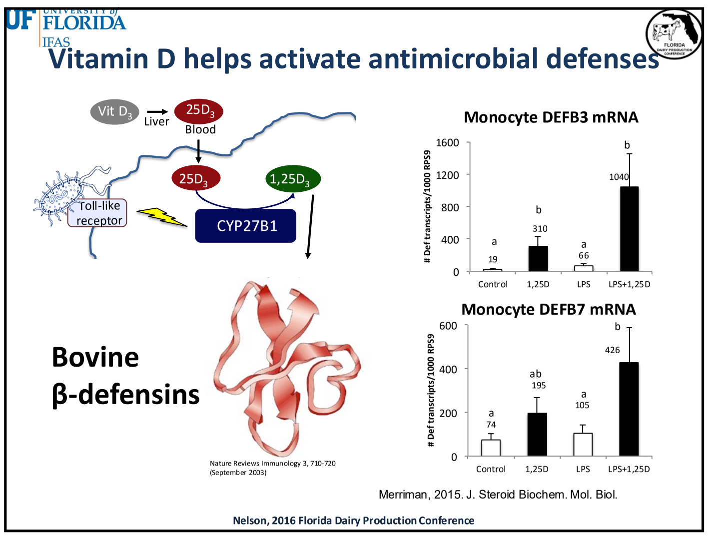

UF FLORIDA IFAS
Vitamin D helps activate antimicrobial defenses
Vit D$_3$
Liver
25D$_3$
Blood
25D$_3$
1,25D$_3$
Toll-like receptor
CYP27B1
Inducible Nitiric Oxide Synthase (iNOS)
iNOS mRNA
Relative fold increase
P < 0.001, n = 6
Nitric oxide production
[NO$_2^-$], µM
P < 0.001, n = 6
25(OH)D$_3$ dose (ng/ml)
Nelson, 2010 J. Dairy Sci.
Nelson, 2016 Florida Dairy Production Conference


UF FLORIDA IFAS
Vitamin D helps activate antimicrobial defenses
Vit D$_3$
Liver
25D$_3$
Blood
25D$_3$
1,25D$_3$
Toll-like receptor
CYP27B1
Bovine β-defensins
Nature Reviews Immunology 3, 710-720 (September 2003)
Monocyte DEFB3 mRNA
Def transcripts/1000 RPS9
Control 1,25D LPS LPS+1,25D
a 19
b 310
a 66
b 1040
Monocyte DEFB7 mRNA
Def transcripts/1000 RPS9
a 74
ab 195
a 105
b 426
Merriman, 2015. J. Steroid Biochem. Mol. Biol.
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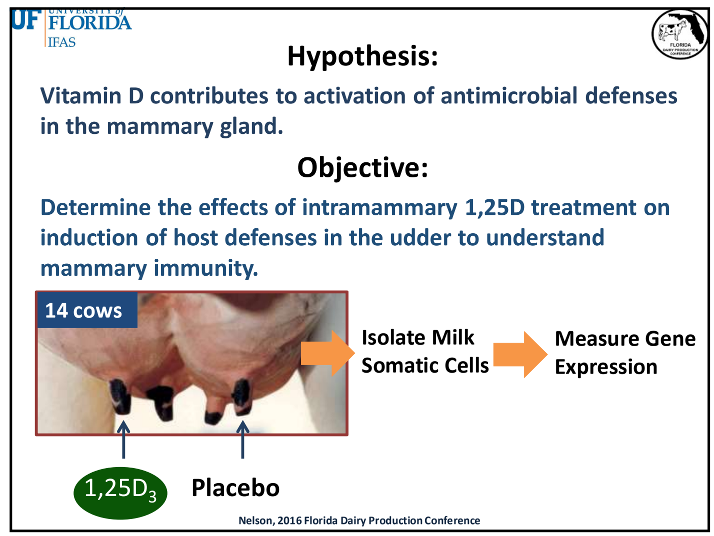
UF FLORIDA IFAS
Hypothesis:
Vitamin D contributes to activation of antimicrobial defenses in the mammary gland.
Objective:
Determine the effects of intramammary 1,25D treatment on induction of host defenses in the udder to understand mammary immunity.
14 cows
Isolate Milk Somatic Cells
Measure Gene Expression
1,25D$_3$
Placebo
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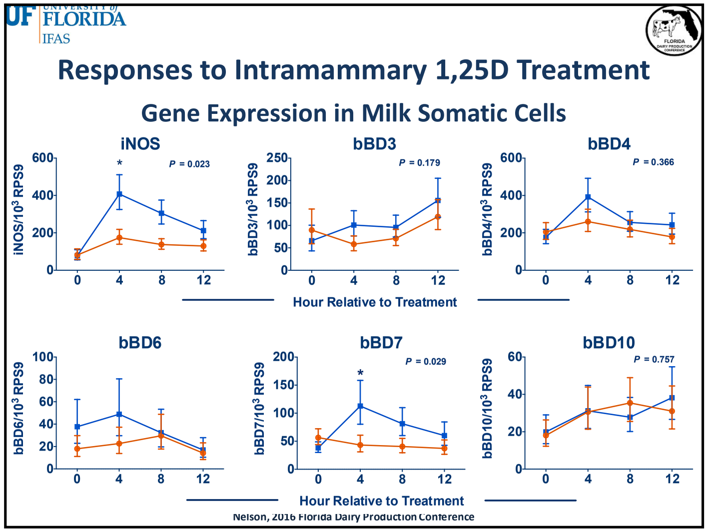

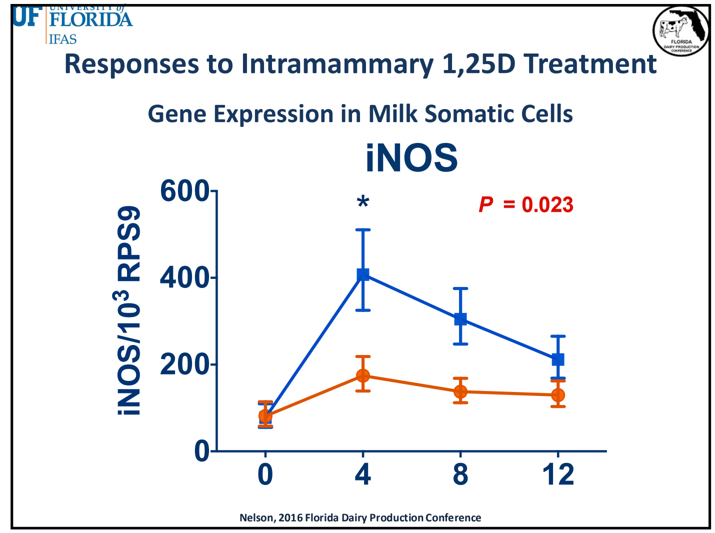

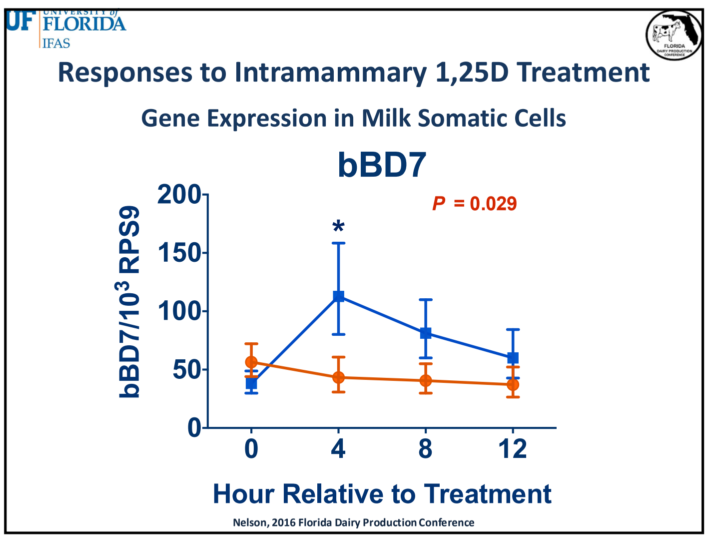

Hypothesis:

Vitamin D contributes to activation of antimicrobial defenses in the mammary gland… During mastitis

Objective:

Determine the effects of intramammary 1,25D treatment on induction of host defenses in subclinically infected glands.

Isolate Milk Somatic Cells → Measure Gene Expression

$1,25D_3$ or Placebo

Treatment repeated after each milking for 5 milkings (every 12 h)

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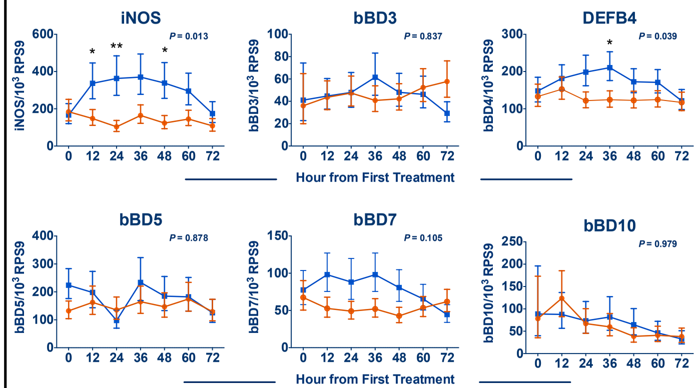
Responses to Intramammary 1,25D Treatment: During Subclinical Mastitis



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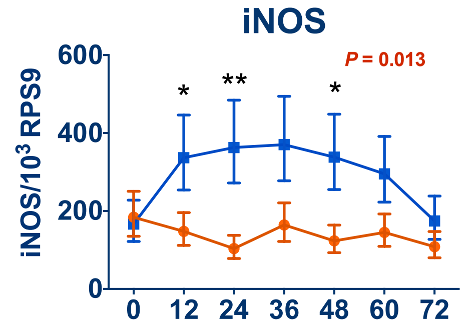
Responses to Intramammary 1,25D Treatment: During Subclinical Mastitis

Gene Expression in Milk Somatic Cells



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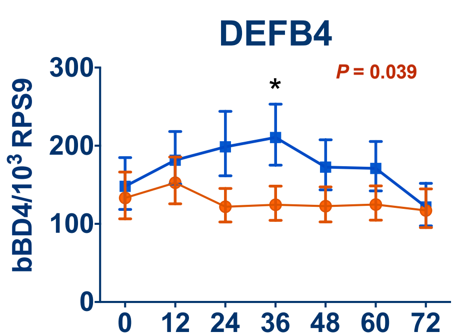
Responses to Intramammary 1,25D Treatment: During Subclinical Mastitis

Gene Expression in Milk Somatic Cells



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Minimizing Costs of Mastitis Through Enhancing Antimicrobial Protein Production in the Udder

Conclusions:

- Activated vitamin D stimulates antimicrobial responses of cattle.

Implications:

- Vitamin D requirement for immunity
- Therapeutic potential for vitamin D compounds in treatment of mastitis

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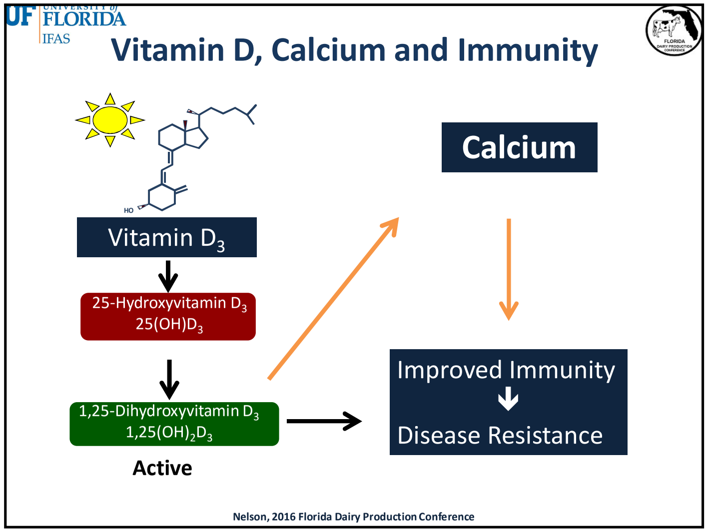
UF FLORIDA IFAS
Vitamin D, Calcium and Immunity
Vitamin D3
25-Hydroxyvitamin D3
25(OH)D3
1,25-Dihydroxyvitamin D3
1,25(OH)2D3
Active
Calcium
Improved Immunity
Disease Resistance
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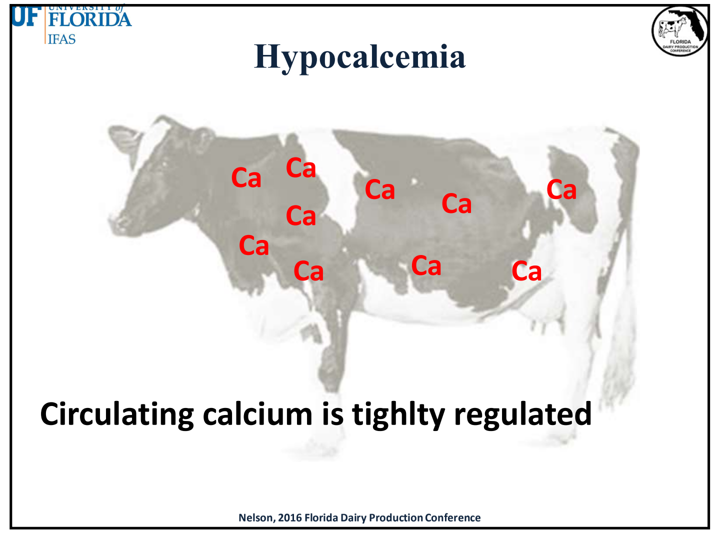
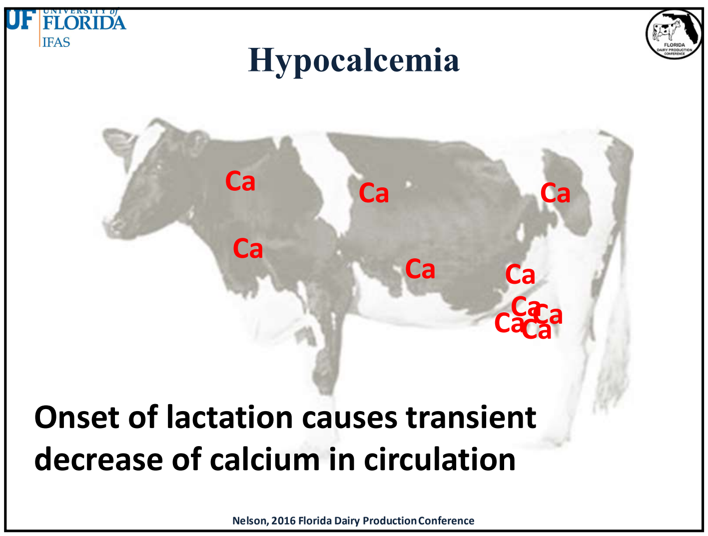

UF FLORIDA IFAS
Hypocalcemia
Ca Ca Ca Ca Ca Ca Ca Ca Ca Ca
Circulating calcium is tighlty regulated
Nelson, 2016 Florida Dairy Production Conference


UF FLORIDA IFAS
Hypocalcemia
Ca Ca Ca Ca Ca Ca
Onset of lactation causes transient decrease of calcium in circulation
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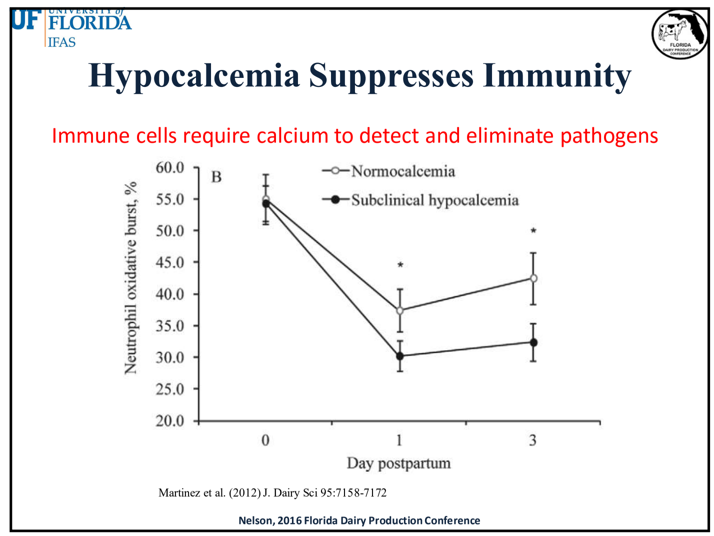
UF FLORIDA IFAS
Hypocalcemia Suppresses Immunity
Immune cells require calcium to detect and eliminate pathogens
B
Normocalcemia
Subclinical hypocalcemia
Neutrophil oxidative burst, %
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0
1
3
Day postpartum
Martinez et al. (2012) J. Dairy Sci 95:7158-7172
Nelson, 2016 Florida Dairy Production Conference

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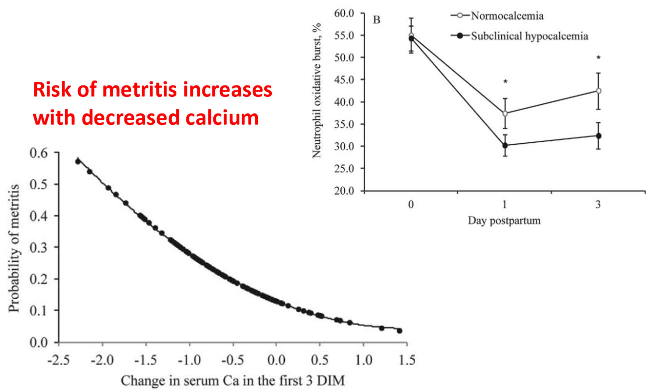
Hypocalcemia

Risk of metritis increases with decreased calcium



Martinez et al. (2012) J. Dairy Sci 95:7158-7172

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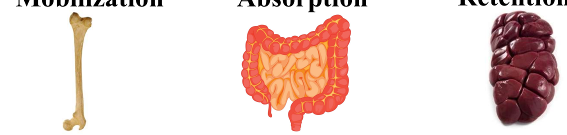
Solutions to Hypocalcemia

- Control of sustained circulating calcium is complex
  - Not as simple as providing more calcium
  - Tightly controlled endocrine mechanisms
- Requires increases in absorption, retention, and mobilization of calcium

↑ Calcium Mobilization | ↑ Calcium Absorption | ↑ Calcium Retention



Bone | Small intestine | Kidney

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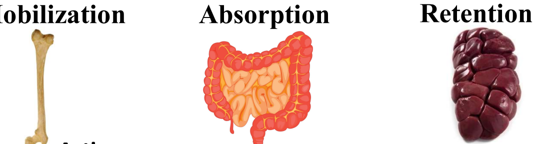
Solutions to Hypocalcemia

Role of Vitamin D

Impaired even with good management

25-vitamin D_3 Inactive → Low Ca → 1,25-vitamin D_3 Active

↑ Calcium Mobilization | ↑ Calcium Absorption | ↑ Calcium Retention



Active Bone | Small intestine | Kidney

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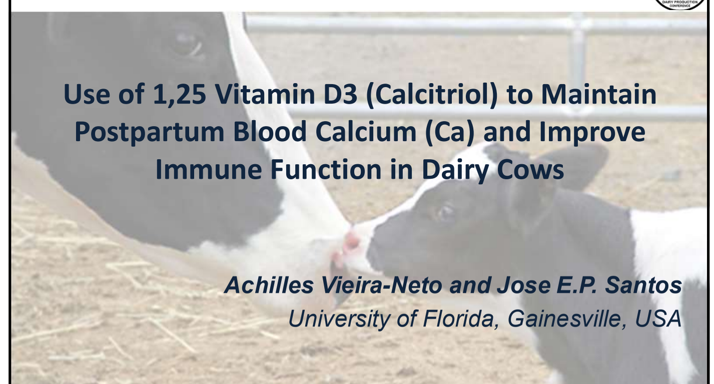

Use of 1,25 Vitamin D3 (Calcitriol) to Maintain Postpartum Blood Calcium (Ca) and Improve Immune Function in Dairy Cows

Achilles Vieira-Neto and Jose E.P. Santos

University of Florida, Gainesville, USA

UF UNIVERSITY of FLORIDA Dairy Science Research

2016 Florida Dairy Production Conference

UF FLORIDA IFAS

Experimental Design

- Fifty cows fed negative DCAD prepartum
- Randomized to receive subcutaneous
  - Placebo
  - 300 µg 1,25-vitamin D
- Treatments given within 12 h of calving
- Measured responses of:
  - feed intake,
  - milk yield,
  - energy balance,
  - blood minerals,
  - neutrophil function

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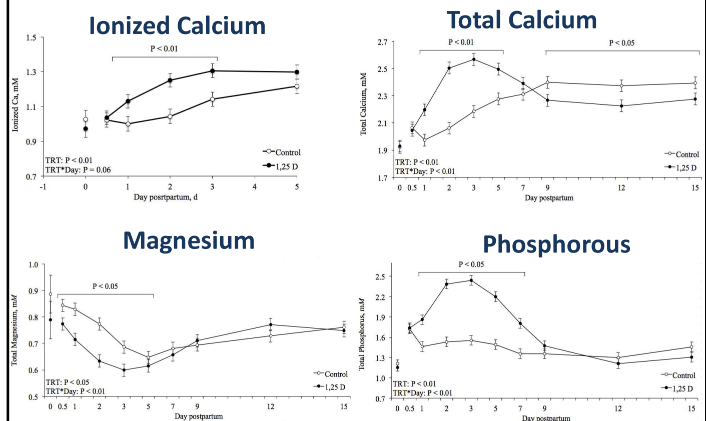
Effects of Post-Partum 1,25D on Minerals



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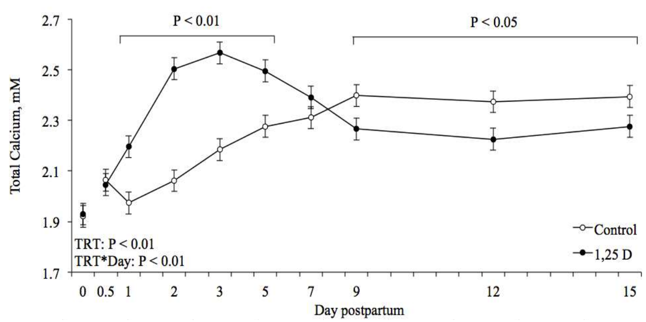
Effects of Post-Partum 1,25D on Minerals

Total Calcium



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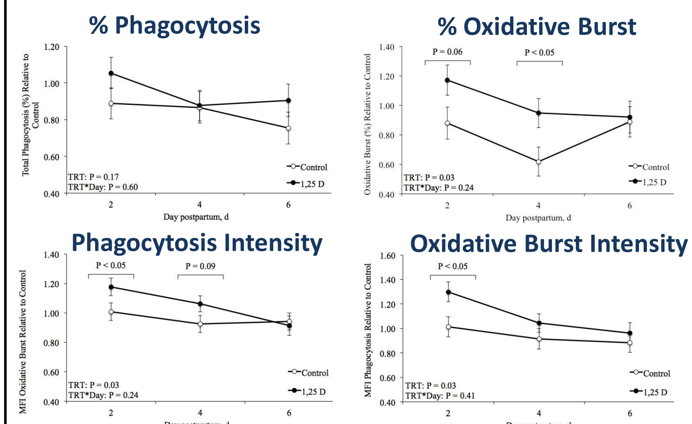
Effects of Post-Partum 1,25D on Neutrophils



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Use of 1,25 Vitamin D3 (Calcitriol) to Maintain Blood Calcium (Ca) and Improve Immune Function

Conclusions:

- 300 ug of 1,25D given immediately post-partum prevents subclinical hypocalcemia
- The 1,25D treatment increased neutrophil phagocytosis and oxidative burst

Implications:

- Improved calcium and immunity status will lead to decreased transisiton cow diseases
- Potential adjunctive therapy to good transition cow management

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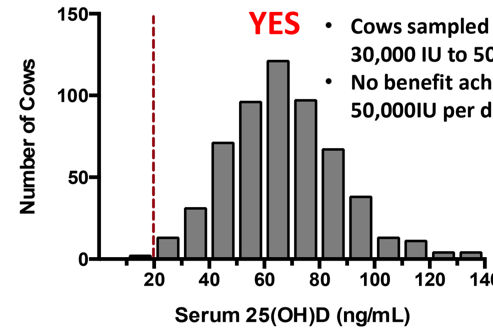
Vitamin D Status of Dairy Cattle

Do dairy cattle get enough vitamin D?

Distrubution of Serum 25(OH)D



YES

- Cows sampled from 10 herds fed 30,000 IU to 50,000 IU per day
- No benefit achieved beyond 50,000IU per day

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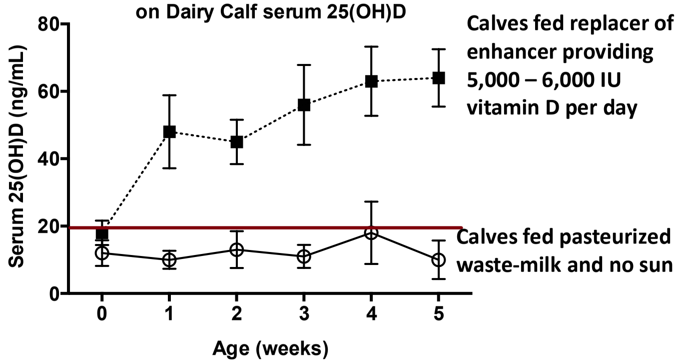
Vitamin D Status of Dairy Cattle

Except: Whole milk-fed calves may be deficient

Effect of Vitamin D supplementation on Dairy Calf serum 25(OH)D



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Summary

- Intramammary 1,25D treatment boosts immune responses of the udder
- Post-partum subQ 1,25D treatment prevents subclinical hypocalcemia and boosts neutrophil function
- Better knowledge of what factors contribute to a strong immune system

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Acknowledments

Funding: Southeast Milk Check-Off

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Fabio Lima
Leandro Greco
Leticia Sinedino
Camilo Lopera
I.R.P. Lima
Francisco R. Lopes Jr.
Roney Zimpel

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NOTES