

**ICC Index**  
Ideal Commercial Cows

# 为正在发展的奶业培育高效的商业奶牛

Breeding Efficient Commercial Cows for a Growing Industry



**Genex**  
**Cooperative, Inc.**

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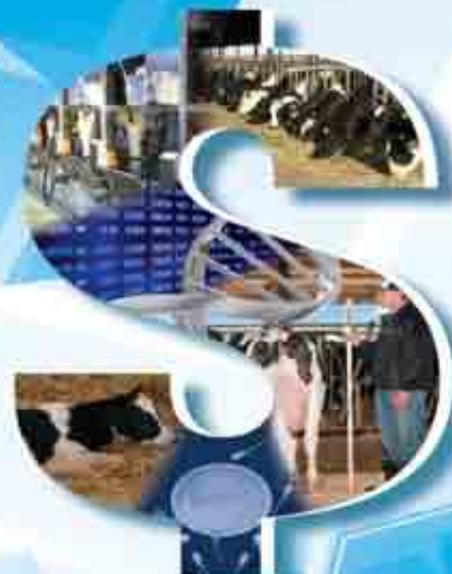
**丹 鲍尔，种公牛专家**

Dan Bauer, Sire Acquisition:  
CA, Eastern WI, Mid-East

# THE IDEAL COW REDEFINED

## 再定义 理想奶牛

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Ideal Commercial Cows



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# 为何设计商业奶牛指数？

## Why design ICC?

- 对产量和体型的集中选择已造成一些问题  
Intense selection for production and type has led to some troubling trends
- 基因组选择加快了遗传进展  
Faster genetic change resulting from genomic selection
- 需要建立不同的优秀家系用以维持遗传多样性  
Need to identify new and different elite bloodlines to maintain genetic diversity
- 现代化的生产模式需要更加高效的奶牛  
Modern production systems will require more efficient

COWS

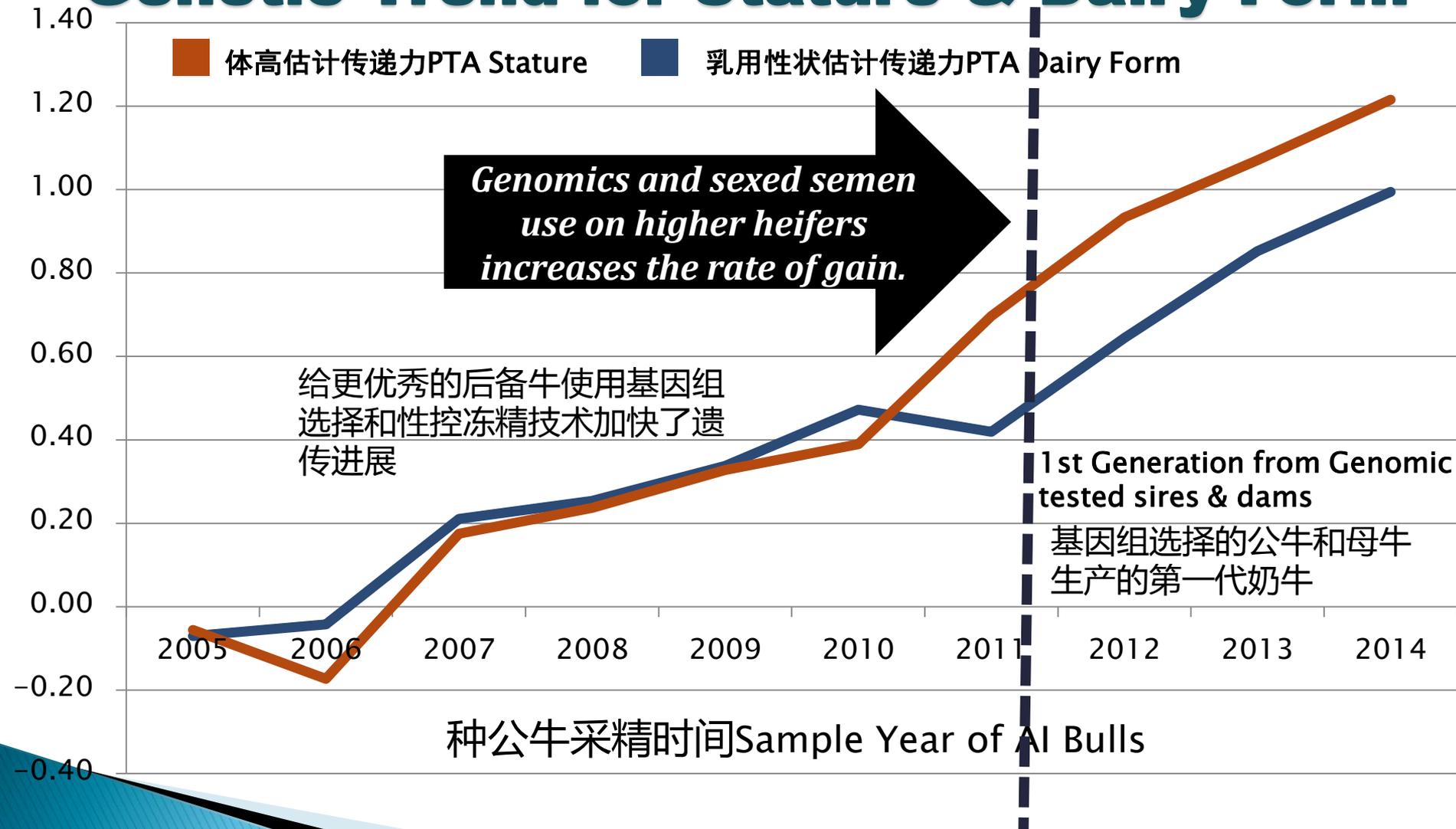
# 15年累积的遗传进展

## Cumulative 15yr Genetic Change



# 体高和乳用性状的遗传进展

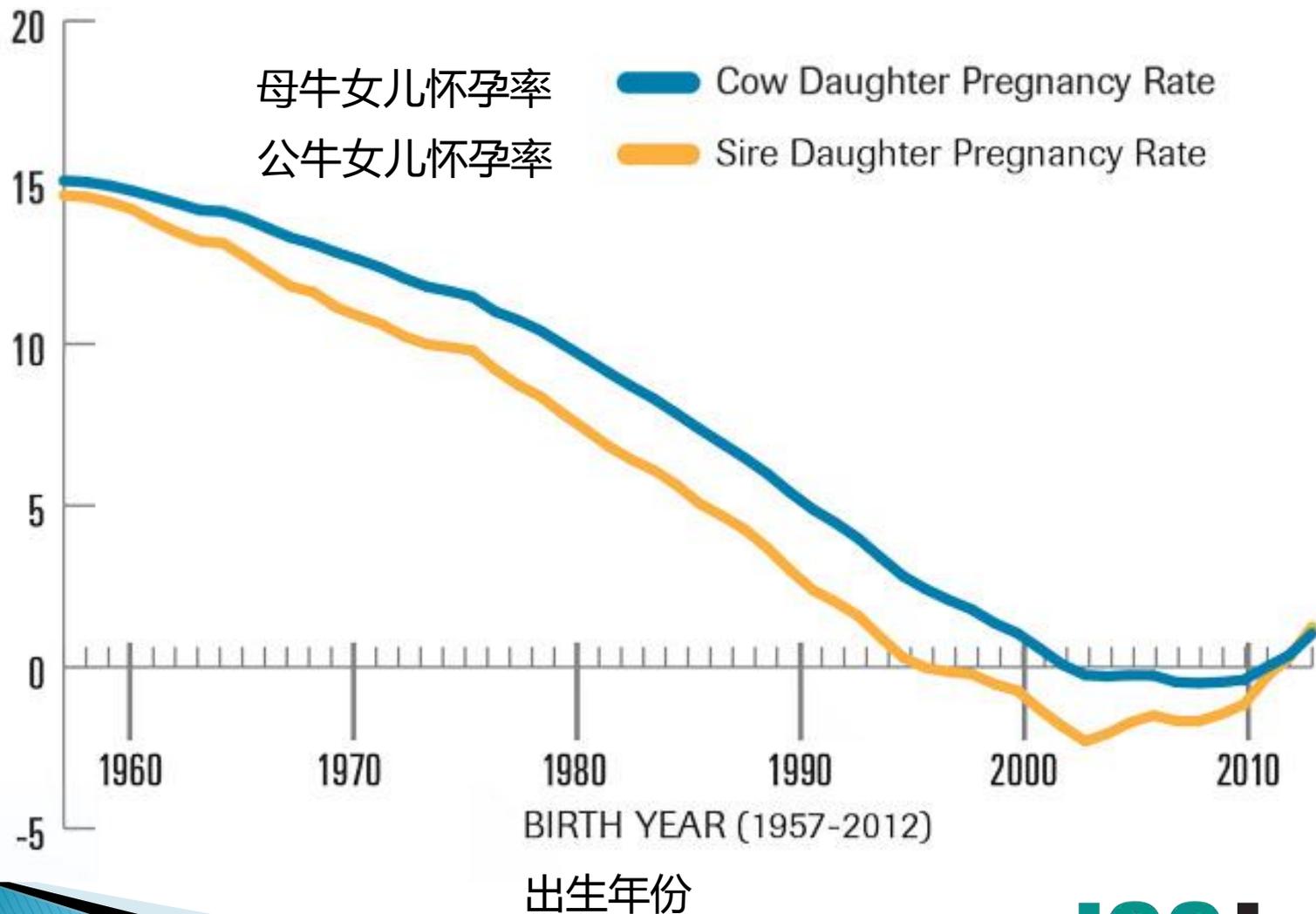
## Genetic Trend for Stature & Dairy Form





# 女儿怀孕率的遗传进展

## Genetic Trend for Daughter Pregnancy Rate





# 荷斯坦协会TPI指数

## Holstein Association TPI®

TPI	2014	2010
产量Production	46%	43%
健康Health	28%	29%
结构Conformation	26%	28%

	2014TPI	2010TPI
蛋白Pro	27%	27%
脂肪Fat	16%	16%
乳房结构UDC	11%↓	12%
体型PTAT	8% ↓	10%
女儿怀孕率DPR	8.32% ↓	11%
青年牛受胎率HCR	2.34%	
成母牛受胎率CCR	2.34%	
生产寿命PL	7%↓	9%
饲料效率FE*	3%	
肢蹄结构FLC	6%	6%
体细胞数评分SCS	5%	5%
女儿难产率DCE	2%	2%
乳用性Dairy Form	1%	1%
女儿死产率DSB	1%	1%

\*26% weighting to type traits that do not directly increase revenue or lower expenses, and because they are correlated to increased body size actually raise intake costs!

\*体型性状占26%权重，并不直接增加收入或降低成本，但是体型大的奶牛采食量相应升高

# 根据体型做选育会造成的影响

## How Does Breeding for PTAT affect our cows?

- 依据体型育种值（PTAT）做选育会提高总育种值，但是最终值并不会增加商业奶牛的终生效益

Breeding for PTAT will improve final score, unfortunately final score does not increase lifetime profit for a commercial herd not merchandising cattle

# 根据体型做选育会造成的影响

## How Does Breeding for PTAT affect our cows?

- 更糟糕的是，PTAT与体高（0.77）和乳用性（0.66）相关性极高；如果PTAT权重过高，会迅速造成奶牛更高大，棱角性更强，采食更多并难以管理

Worse yet because PTAT is highly correlated to stature (.77) & dairy form (.66); a high weighting for PTAT will quickly result in taller, sharper, more costly cows that can be harder to manage

# 根据体型做选育会造成的影响

## How Does Breeding for PTAT affect our cows?

- 研究发现选育更高的乳用性会造成奶牛消瘦并长期处于能量负平衡状态

Research is beginning to uncover some of the dangers of breeding for higher dairy form & therefore thinner cows who spend more time in negative energy balance:

- 降低繁殖效率 Decreased fertility
- 增加蹄病 Increased lameness
- 增加代谢疾病 Increased levels of metabolic transition issues

Friday, March 6<sup>th</sup>, 2015

The **Bullvine**

# GENETICS IN THE AGE OF GENOMICS

*SEMINAR RECORDINGS AND RECAP*



# 基因组时代的遗传学



**Genex**  
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丹 鲍尔&乔恩 兰特兹

Seminar Summary Prepared by:  
Dan Bauer & Jon Lantz

# 关注商业效益的育种先行者们

## Progressive Commercial-Focused Breeder Panel

唐 本宁克，4800泌乳牛，北弗罗里达州

Don Bennink, North Florida, 4,800 cows, FL

格里格 安德森，海鸥湾，2200泌乳牛，爱荷华州

Greg Anderson, Seagull Bay, 2,200 cows, ID

格里格 科因，科因牧场，900泌乳牛，纽约州

Greg Coyne, Coyne Farms, 900 cows, NY

乔恩 安德森，双A牧场，14000泌乳牛，爱荷华州

Jon Anderson, Double A, 14,000 cows, ID



# 育种者们选择的育种指标

## Breeder Panel: Selection Criteria

育种者Breeder	选择指标Selection Criteria
唐Don Bennink	蛋白和健康性状Protein, and health traits
安德森Greg Anderson	脂肪&蛋白适当，繁殖力&产犊能力，不重视体型，但限制最大体高 Fat & protein with adequate fitness, fertility & calving ability, 0% emphasis on linear type, except for a maximum stature criteria
格里格Greg Coyne	TPI，体型，高乳脂&乳蛋白，和无角性 TPI, type, high fat & protein, and polled
乔恩Jon Anderson	健康性状，长寿性，女儿怀孕率，体细胞数，但正在向产奶量&蛋白产量调整 Health traits, longevity, DPR, SCS, but starting to trend toward production & protein yield

# 育种者们：TPI

## Breeder Panel: TPI

一致认为体高是一个大问题并且不能再被提高了

Panel unanimously agrees stature is a big problem and cannot be increased

相信在TPI中给予PTAT过高的权重

Believe TPI rewards PTAT too much

面临挑战，按照合适的条件和体高给奶牛分群

Challenges facing classification program are cows with optimum condition and stature do not score high

# 育种者们：TPI

## Breeder Panel: TPI

认为TPI计算公式并不是使用它最频繁的牧场主们设计的

Concern that formula is not designed by those producers who use it most

对生产寿命做选育远比直接选育肢蹄和乳房结构更有效

Comment made that breeding for PL may improve feet & legs and udders more than breeding directly for UDC & FLC

# 从美国育种规划里我们学到了什么？

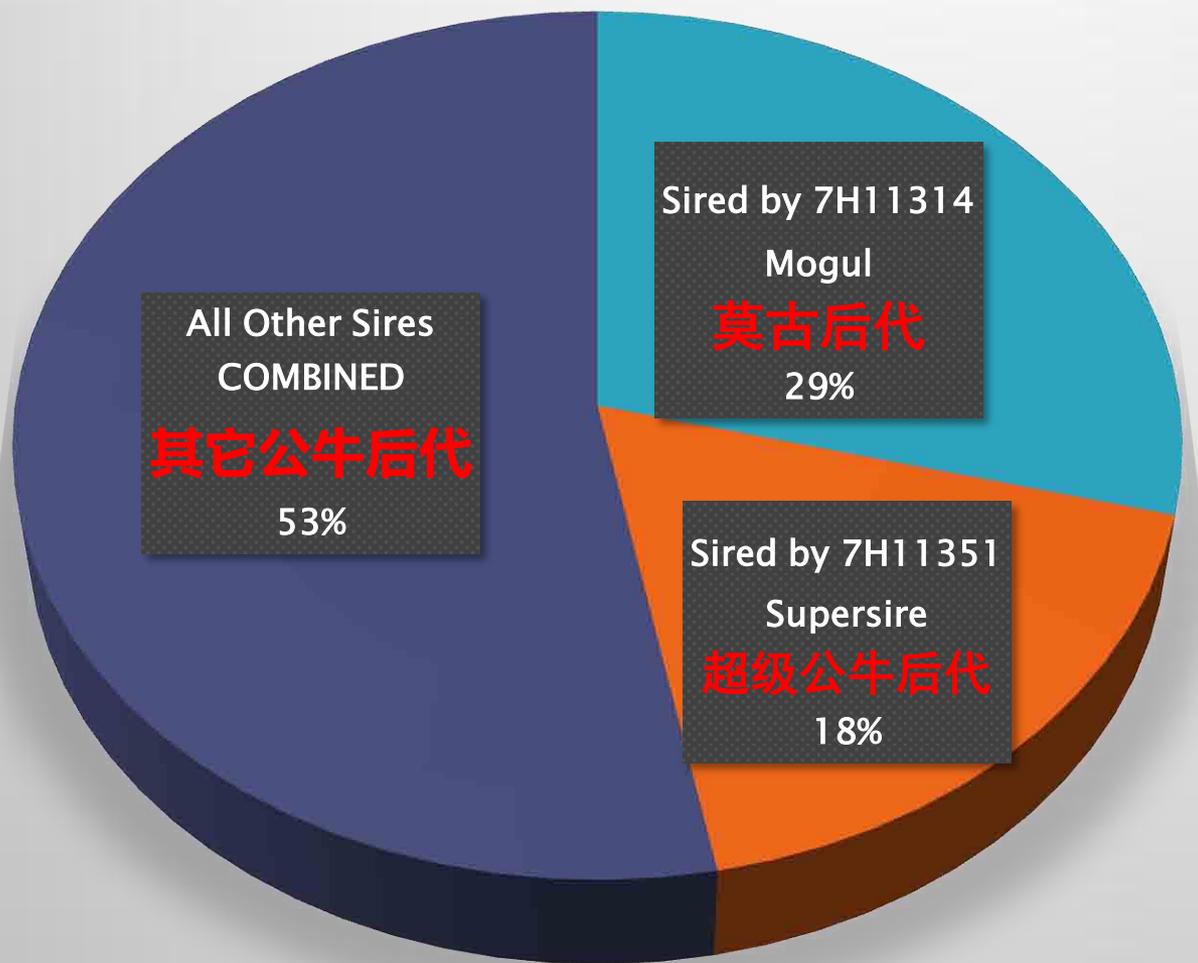
## US Genetic Programs: What Have We Learned?

- 为了维持遗传多样性我们要关注多种性状  
Imperative to focus on a variety of traits in order to maintain genetic diversity
- 如果某一性状权重设定过高，不知不觉就会集中到相同的公牛家系  
If trait thresholds are set too high we can unknowingly box our selves into the same sire stacks and bloodlines



# GTPI排名前100的公牛多样性如何？

## Are the Top 100 GTPI® Bulls Diverse?



- Sired by 7H11314 Mogul 莫古
- Sired by 7H11351 Supersire 超级公牛
- All Other Sires COMBINED 其它

**基因组TPI排名前一百的公牛有接近一半仅仅来自两头公牛**  
-Nearly half (47%) of the top 100 GTPI® bulls are out of just 2 different sires!

# CRI未来如何做基因选择？

What Does Genetic Selection Future Look Like at CRI?

- 发展自己的多性状选择指数，即商业奶牛指数（ICC）

Has developed its own multiple-trait selection index termed the Ideal Commercial Cow Index (ICC)

- ICC关注终身效益，增加了与效率，持续性和管理相关的性状的权重

ICC is focused on lifetime profit with added weightings on traits correlated to efficiency, sustainability, & stewardship

**ICC Index**  
Ideal Commercial Cows



# THE INDUSTRY INNOVATOR DELIVERS AGAIN!

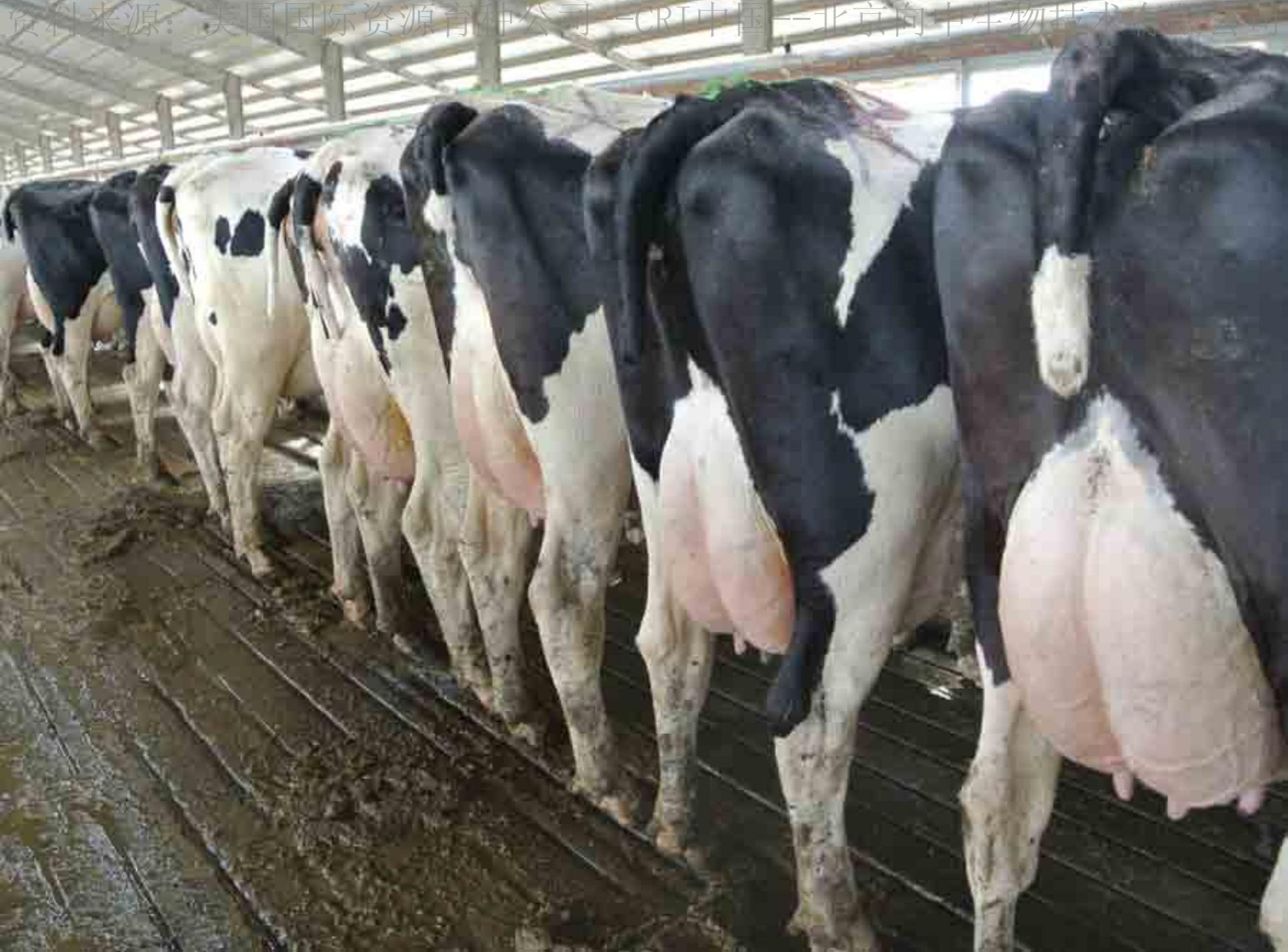
INTRODUCING

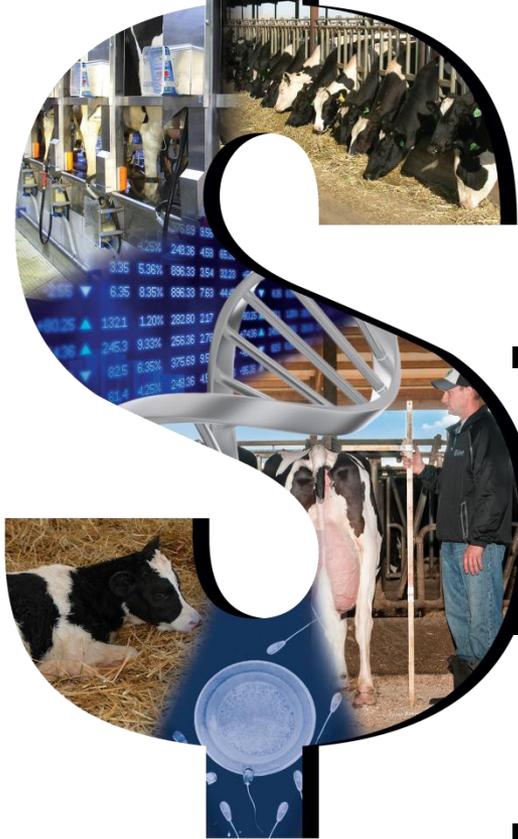
再次成为行业的  
创新者！

# ICC Index

Ideal Commercial Cows







# ICC Index

## Ideal Commercial Cows

- 根据经济效益选择利润高效益好的性状  
Economic-based, selecting for profitability and efficiency
- 主要性状的评估不仅仅来自美国的数据  
Key traits not part of U.S. evaluations
- 分项性状针对性选择  
Sub-indexes for targeted use
- 随时根据遗传趋势和经济做出调整  
Quickly address genetic trend or changing economics
- 更加科学 Scientifically sound

# ICCS\$的优点

## What Makes ICCS\$ Different?

**一个针对商业奶牛设计的全球性指数**  
A Global Index Designed for the Commercial Cow

从多个国家收集基因组信息，选育高利润且高效的奶牛  
Incorporates genomic information from multiple countries to breed for complete profit and efficiency.

# ICC\$的优点

## What Makes ICC\$ Different?

### 与终身效益指数LNM相比

ICC\$ Compared to Lifetime Net Merit

在不影响产奶和乳房性状的情况下，更加强调长  
寿性和健康性 Greater emphasis on longevity and health  
without sacrificing yield and udder traits.

### 与GTPI相比

ICC\$ Compared to GTPI®

选择更加健康的奶牛，高产、更好的乳房结构、理  
想的体型与体况 Improved selection for healthier cows with high  
yield, great udders and optimal body size & condition

# Genetic Evaluation Summary **遗传评估小结**

**HOUSAM60996956**      **BADGER-BLUFF FANNY FREDDIE**      **FREDDIE**  
 0001HO08784      BW BYF CVF BLF      Born 31-OCT-04      8.17%INB      12%R

<b>FUNCTIONAL</b>	Rating	Rel	Difference from Breed Average (SD)	Breed Avg.

**功能**      育种值    可靠性      育种值平均标准差      平均育种值

Mastitis Resistance	乳房炎抗性	102G	82%	Susceptible   易感		Resistant   抵抗	100
Milking Speed	挤奶速度	107G	97%	Slow   慢		Fast   快	100
Milking Temperament	挤奶情绪	103G	97%	Nervous   紧张		Calm   平静	100
Body Condition Score	体况评分	114G	98%	Low   低		High   高	100



# 五个 ‘容易使用’ 的分项性状

## 5 “Easy to Use” Sub-Indexes



### 生产效率指数

Production Efficiency(PREF\$)

高产且饲料消耗少，重点强调乳蛋白量

High yield adjusted for income over feed cost and with emphasis placed on protein.



### 健康指数

Health (HLTH\$)

将长寿性，体细胞，体况评分结合新的步态指数一起综

合考虑 Combines Longevity, Somatic Cell and Body Condition Score with a new Locomotion Index.



# 繁殖指数

Fertility & Fitness(FYFT\$)

测量奶牛和后备牛多项繁殖性状和无角基因的附加经济效益Multiple measures of cow and heifer fertility plus added economic value for polled.



# 泌乳指数

Milking Ability(MABL\$)

高效泌乳，包括正确的乳房结构，低乳房炎发病率，理想的泌乳速度和情绪High milking efficiency through correct udder conformation, low mastitis incidence, and optimal milking speed and temperament.



# 产犊指数

Calving Ability(CABL\$)

生产健康犊牛，减少助产和最大限度减少犊牛和奶牛的产科外伤。Produce live calves with reduced assistance and minimal trauma to the calf or the cow.

5% Calving Ability (CABL\$)

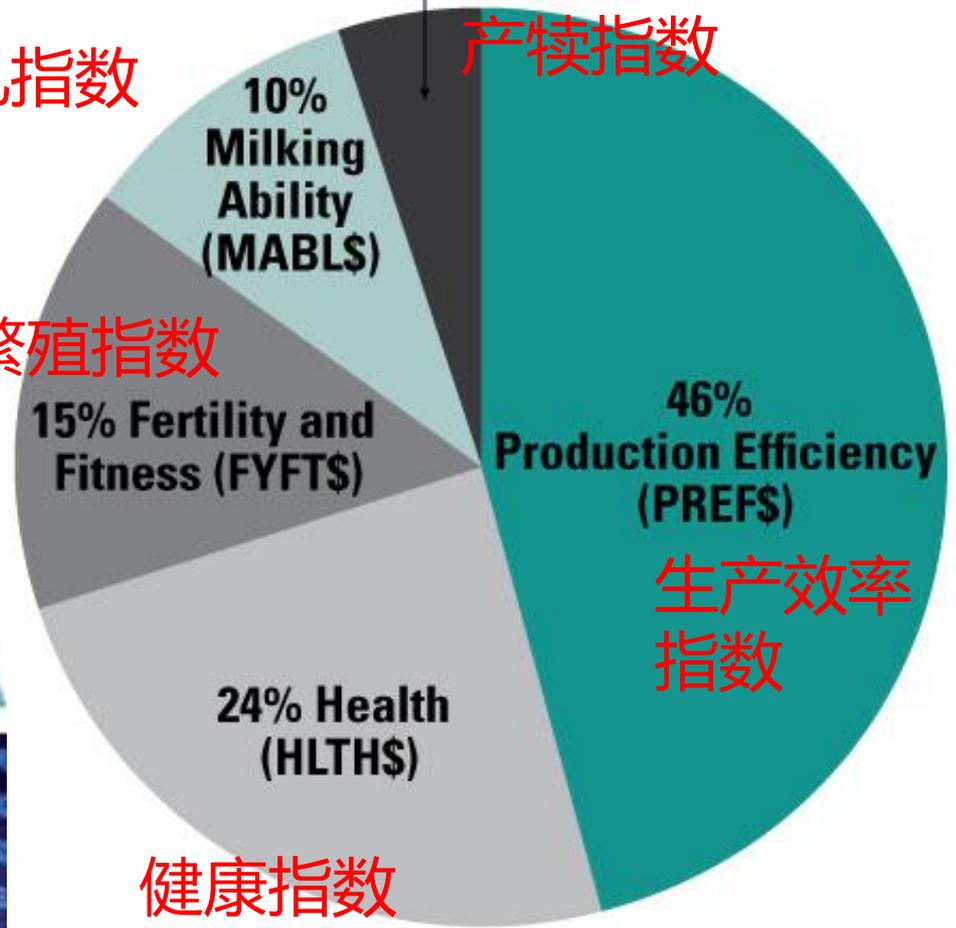
泌乳指数

产犊指数

繁殖指数

生产效率  
指数

健康指数



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# 2014年12月百分位数水平

## December 2014 Percentile Levels

<i>%ILE</i>	<i>ICCS</i>	<i>PREFS</i>	<i>HLTHS</i>	<i>FYFTS</i>	<i>MABLS</i>	<i>CABLS</i>	<i>LNMM</i>	<i>TPI®</i>
95%	565	332	254	120	130	43	497	2184
90%	497	292	212	94	111	33	444	2140
85%	447	251	179	77	99	27	407	2089
80%	407	230	161	64	91	22	387	2059
75%	376	209	147	54	81	17	357	2034
70%	358	182	131	43	74	12	336	2005
60%	294	145	104	23	67	3	301	1945
50%	234	111	72	7	59	-5	261	1889

# ICC\$, LNM\$和TPI®的模拟比较研究

Simulation Study<sup>1</sup> to Compare ICC\$, LNM\$ and TPI®

ICC\$ 比较LNM\$ (2014) <sup>2</sup>	
一般优势 Moderate Advantage	健康性状 Health Traits 体高 Stature
较强优势 Strong Advantage	繁殖性状 Fertility Traits
超强优势 Extreme Advantage	后肢 Legs Rear 蹄角度 Foot Angle 乳房深度 Udder Depth
ICC\$ 比较TPI® (2014) <sup>2</sup>	
一般优势 Moderate Advantage	健康性状 Health Traits 繁殖性状 Fertility Traits
较强优势 Strong Advantage	产犊难易 Calving Ease
超强优势 Extreme Advantage	体型 Body Size

<sup>1</sup> Abdel-Azim, 2014; cumulative genetic response with multi-generation selection

<sup>2</sup> Based on December 2014 Revisions to index formulas

# 排名前10%的公牛相关性

Correlations for 90<sup>TH</sup> %ile Bulls

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	<i>ICC\$</i>
2014年总效益指数 TPI14	0.71
2014年效益净值 NM14	0.77



ICC\$ 4 TPI14

MILK产奶	0.22	0.31	0.33
FAT乳脂	0.29	0.56	0.47
PROTEIN乳蛋白	0.33	0.49	0.50
BODY COND SCORE体况评分	0.05	-0.09	-0.11
PRODUCTIVE LIFE生产寿命	0.51	0.37	0.34
SOMATIC CELL SCORE体细胞数评分	-0.18	-0.07	-0.14
DAUGHTER PREG RATE女儿怀孕率	0.25	0.09	0.13
COW CONCEPT RATE成母牛受胎率	0.36	0.22	0.22
HFR CONCEPT RATE青年牛受胎率	0.24	0.17	0.20
MASTITIS RESISTANCE乳房炎抗性	0.12	0.01	0.04
MILKING SPEED泌乳速度	0.17	0.08	0.12
MILKING TEMP泌乳情绪	0.10	0.12	0.16
SIRE CALVING EASE公牛难产率	-0.17	-0.11	-0.04
DAU CALVING EASE女儿难产率	-0.21	-0.24	-0.25
SIRE STILLBIRTH公牛死产率	-0.14	-0.13	-0.05
DAU STILLBIRTH女儿死产率	-0.24	-0.28	-0.29
UDDER COMP乳房结构	0.12	0.17	0.35
FEET/LEGS COMP肢蹄结构	0.18	0.15	0.30
STATURE体高	-0.18	-0.05	0.15

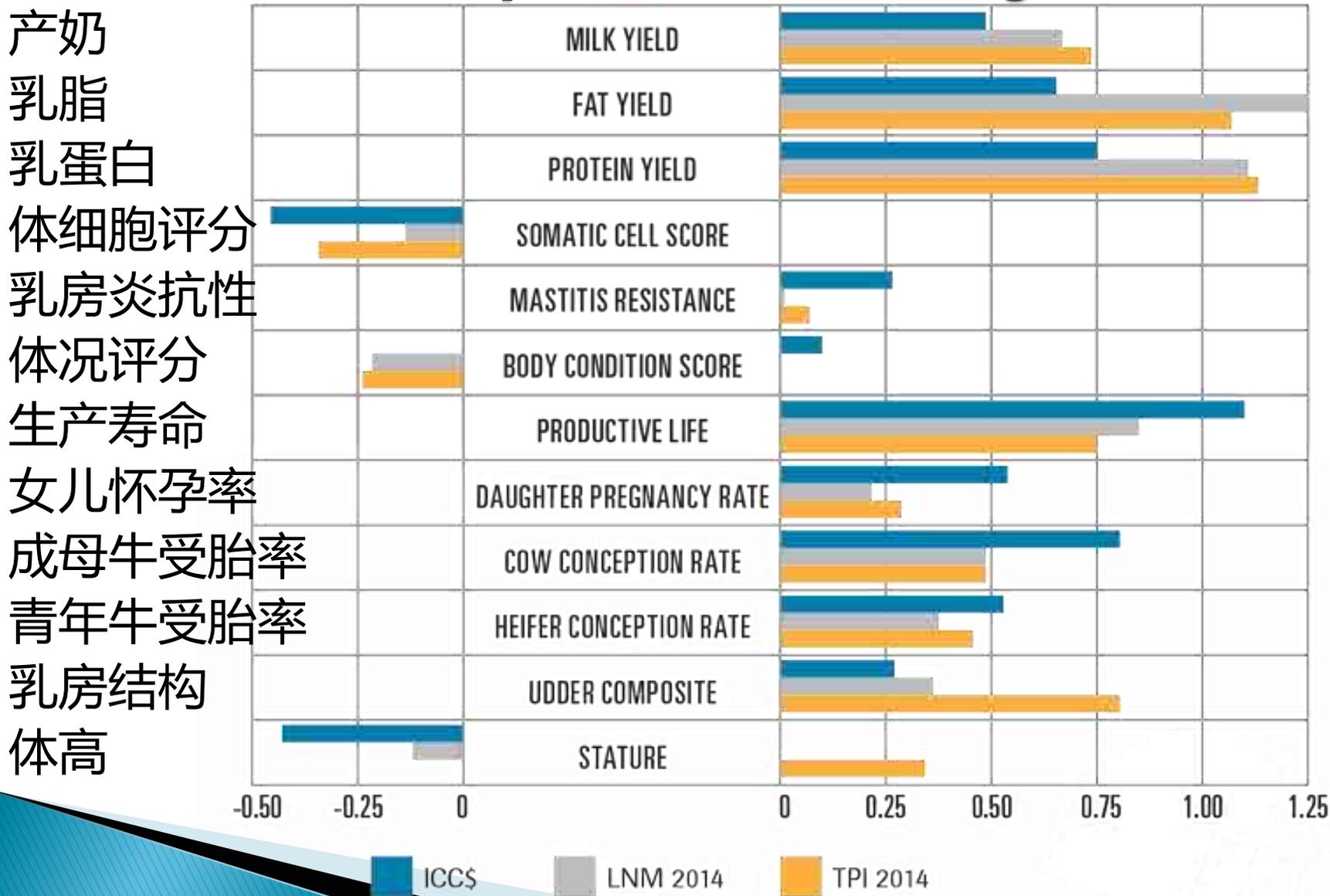
ICC在更多性状方面有更显著的提高  
 Improves More Traits in Greater Magnitude

GENOMIC IB%基因组近交系数IB% 0.18 0.27 0.31

GENOMIC FUTURE IB%未来基因组近交系数IB% -0.03 0.03 0.13

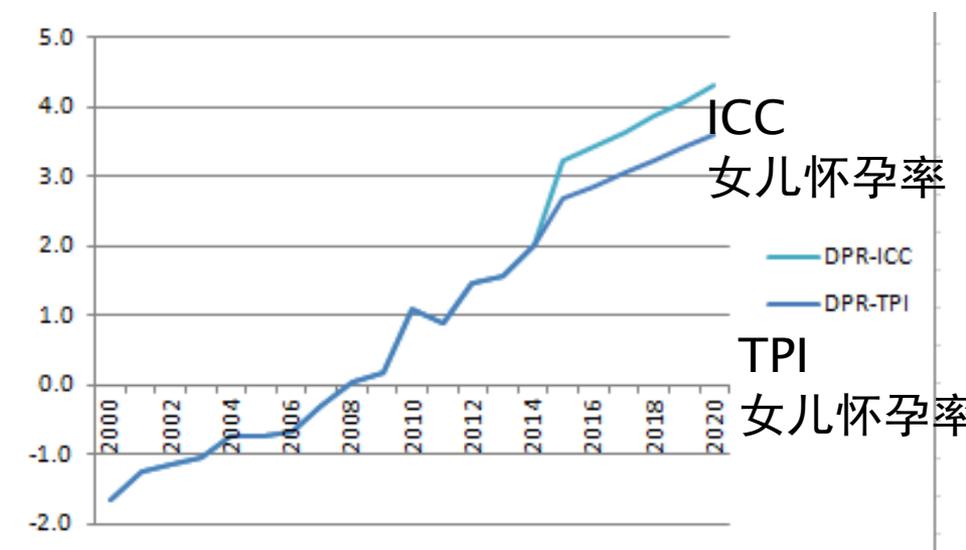
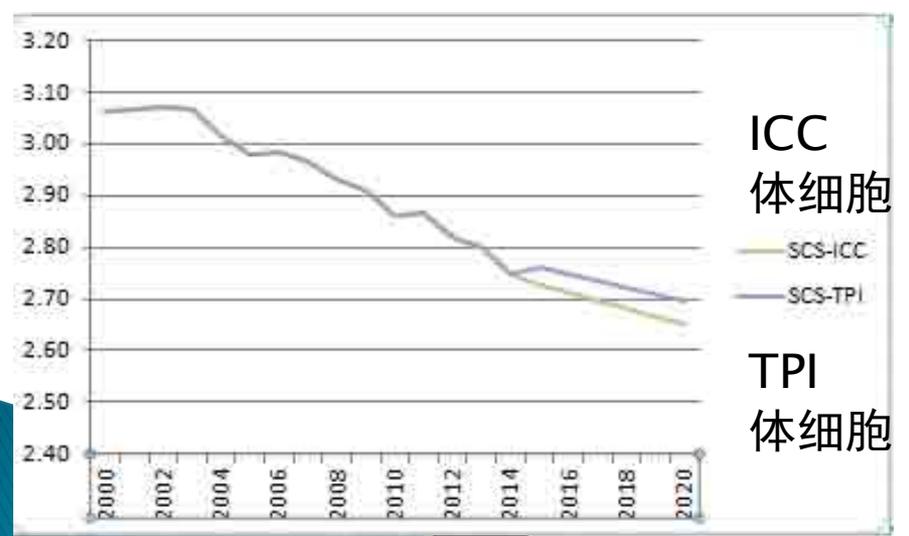
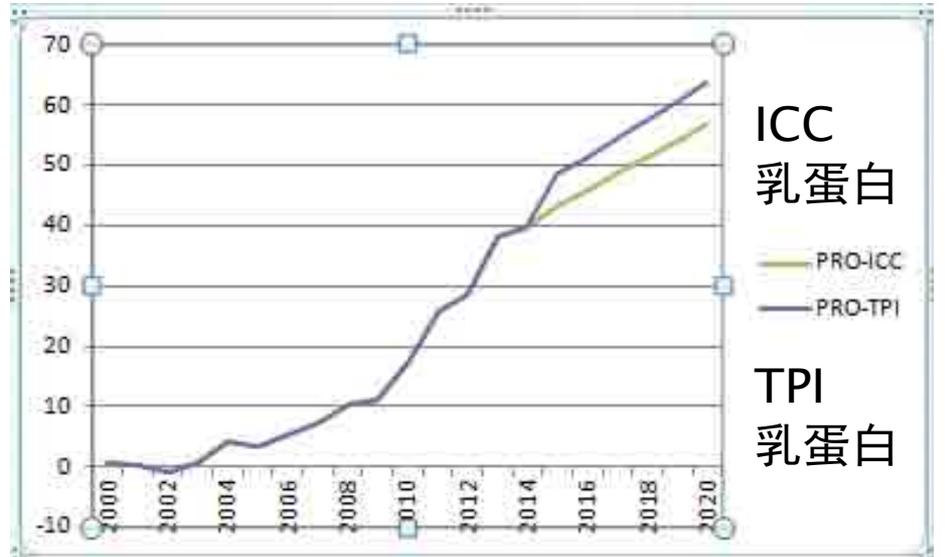
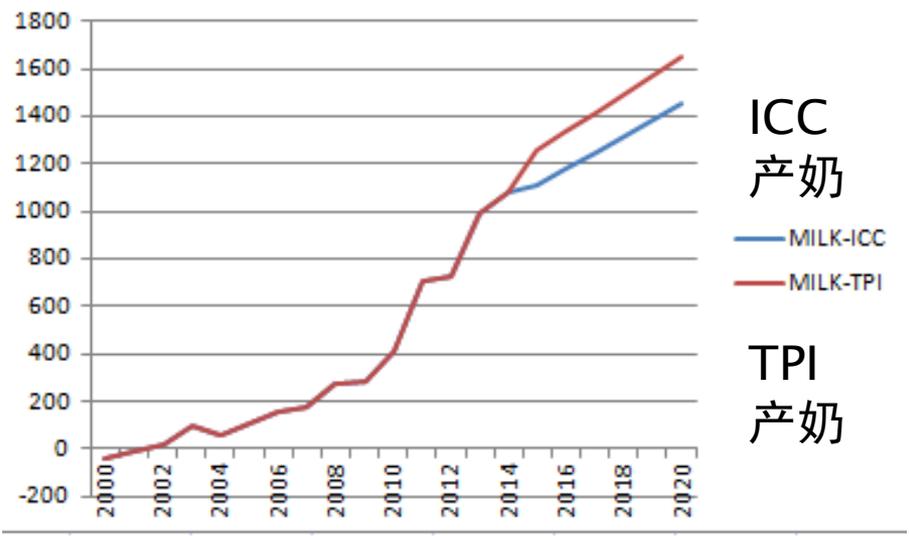
# 5年预期的遗传进展

## 5-YR Expected Genetic Change



# 使用ICC改变遗传进展

## Changing Genetic Trends with ICC



资料来源：美国国际资源育种公司--CRI中国--北京向中生物技术有限公司





TROY



AVENGER



TAMPA



MAGNATE



FREDDIE



DAY



MASSEY



GALAXY

	<u>Stud</u>	<u>Top 300</u>	<u>Top 100</u>
<b>Genomic-Proven</b>	CRI	55	20
	Select	42	17
	Alta	40	12
	Accel	19	8
	ABS	35	9
	CRV	6	1
	Semex	44	8
<b>Progeny-Proven</b>	CRI	41	19
	Select	51	17
	Alta	40	15
	Accel	22	6
	ABS	59	19
	CRV	11	2
	Semex	26	9

基因组测定

后裔测定

## THEIR RESUME:

- ▶ More Milk
- ▶ More Component Yield
- ▶ Enhanced Fertility
- ▶ Reduced Stature
- ▶ Better Body Condition
- ▶ Greater Herd Health
- ▶ More Mastitis Resistance

## ICC特点

更高产

更多乳成分

提高繁殖力

降低体高

更佳的体况

促进牛群健康

对乳房炎更好的抵抗力



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A profit-indicating measure to rank Holstein sires that puts greater emphasis on longevity, health, and optimal body size and condition without sacrificing yield and udder traits.



Health, Herd Health, Udder Health, Fertility, and Milk Production

# ICC Index = 创新 Innovation

Ideal Commercial Cows

ICC可以：ICC delivers!

- 响应CRI成员关注的问题
- Responds to concerns of CRI members
- 解决遗传进展的问题
- Addresses troubling genetic trends
- 关注可测量的重要的健康性状
- Incorporates key health elements available

根植于变化的数据 Positioned for Changing Demographics

- 大群体，以科技为导向
- Larger herds, technology driven

同时适合专有性状和新奇性状 Platform for Proprietary and Novel Traits

实时并且有针对性 Real-time & on-demand capability

“商业奶牛指数有可能是我们见过的最大进步，非常贴合商业奶牛场的需要”

唐 本宁克  
北佛罗里达荷斯坦牧场



*“The Ideal Commerical Cow Index is probably the largest step forward we have seen in meeting the commercial producers needs”*

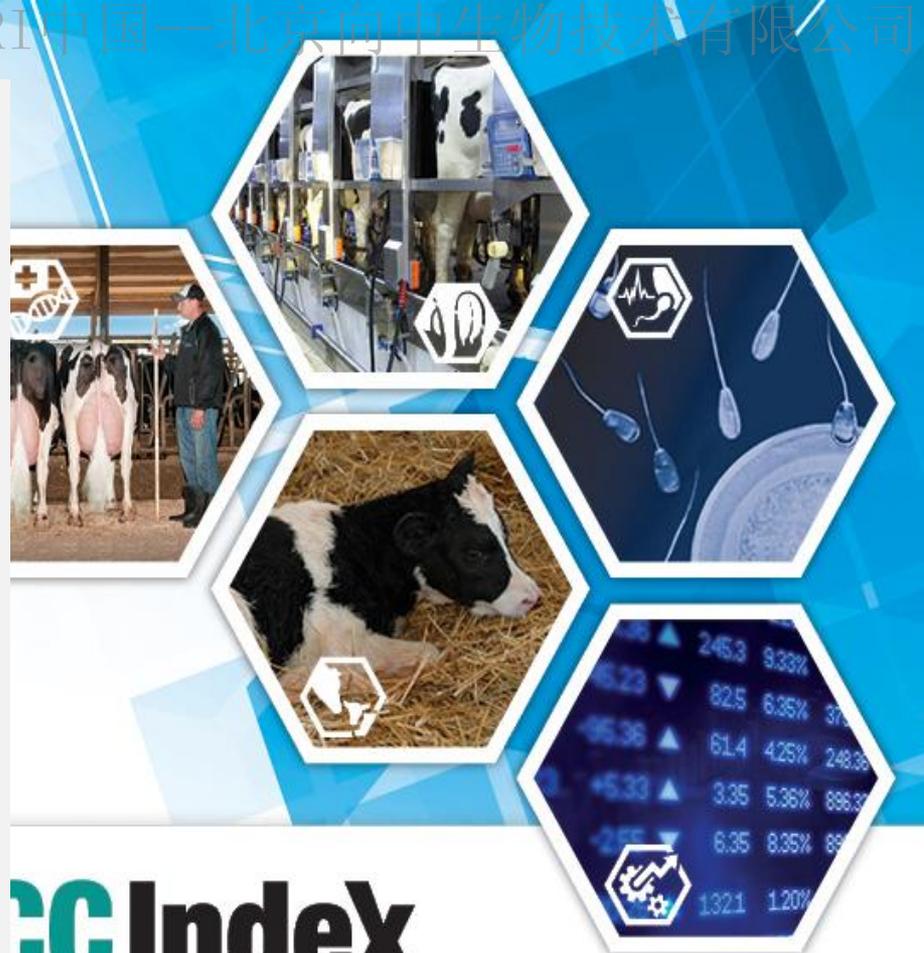
Don Bennink  
North Florida Holsteins; Bell, Florida

您好，Keith

早在一月份我就期待着为您和您的团队喝彩。你们在2014年12月的CRI期刊上提出了理想奶牛商业指数。如果我做奶牛育种，这就是我最希望使用的育种指标。我很喜欢你们提出的关注体况，降低体高，提高饲料报酬，减少体细胞，提高繁殖力和产犊表现等等指标。我万分赞同你们在这个指数中的创新。

诚挚的  
George

威斯康星大学麦迪逊分校奶牛科学院教授



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# ICC Index

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## 问题与讨论

### Questions & Discussion?



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