Vaccination: What the Heck am I doing?

Range Beef Cow 2011

Introduction

- Stewardship
- Technology
- Vaccinology

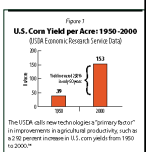
Definition

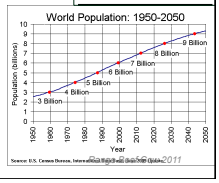
Stewardship:

Careful and responsible management of something entrusted to one's care (noun, Webster)

Stewardship & Animal Agriculture

Feeding the world by caring for animals through responsible resource management and the prudent use of technology





Stewardship & Technology

Stewardship & Technology: Are we keeping up with the Grain Cart?

- Precision Agriculture -
  - Seed -
  - Fertilizer
  - Herbicide/Insecticide
  - Crop Insurance
  - ??
  - ??

Beef Production

Genetics

Growth enhancement

Antibiotics, Endo/Ecto parasiticides

Vaccines

Behavior modification

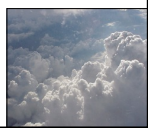
Estrus synchronization

Economic forces

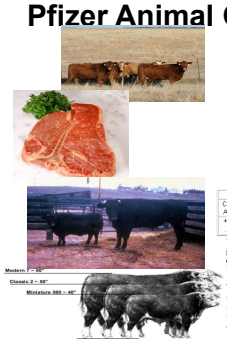
- Return/unit - /bushel, acre, cow
  - Corn – Direct & Indirect costs $366/acre inputs, $5.50 X 100 = $550.00
  - Beef cattle –Variable + Fixed costs $520/cow, 581 pound blk steers X $158.10/cwt = 918.56. Plus heifer calves, open heifers and cull cows.
    - Price from Napoleon Livestock October 10/13/2011
    - Input prices NDSU Ag Econ

http://www.ag.ndsu.edu/cropeconomics

http://www.ag.ndsu.edu/livestockeconomics/cool



Technology and Seed/Genetics Pfizer Animal Genetics



- Visual
- Performance Data ***
- EPDs**** AI use
- Pedigree
- *DNA Marker Information*
- Modeling
- Economic Indexes

Production						Maternal				
CED Acc	BW Acc	WW Acc	YW Acc	YH Acc	SC Acc	CEM Acc	Milk Acc	MkH M/D	MW Acc	MH Acc	$EN
+11 .65	+1.0 .85	+48 .85	+82 .78	- .5 .53	- .76 .66	+6 .22	+13 .48	2 3			+10.31

Carcass						Ultrasound			
Cwt Acc	Mrb Acc	RE Acc	Fat Acc	Grp Prog		%IMF Acc	RE Acc	Fat Acc	Grp Prog
+1 .10	+ .09 .11	+ .29 .10	- .009 .09	1 1		- .85 .74	+ .09 .75	+ .018 .75	.36 .117

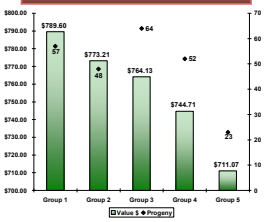
$Values					
$W	$E	$G	$Grid	$YG	$B
+27.96	+22.58	+6.25	+3.73	+2.52	+26.07

SireTRACE

Australian Case Study (USD)

- ***Real world Data***
  - *Large, Multi Sire Pasture*
  - *15 Sires produced 244 Calves*
- ***Calves per sire, ranged from 3 to 32***
  - *Libido*
  - *Dominance*
- ***Sires were put in Groups of Three based on Carcass Value of progeny***
  - *Single Year Difference in Value between Three Best Sires and Three Worst Sires is $78.53 per calf.*
  - *Lifetime Difference in Value between Three Best Sires and Three Worst Sires is ~$5800 per Sire.*
  - *Doesn't include differences in the number of calves per Sire*
- ***Additional value will be derived or lost from heifers that are retained in the base herd.***

Average Carcass Value Per Sire in Multi-Sire Herd



*Currency Conversion Feb 04, 2009 using Universal Currency Converter™ Results

Production Data Trends

*Price premiums per hundredweight for Progressive **Genetics Program** qualified beef calves selling in Superior Livestock video auctions from 1995 to 2011*

Technology: Antibiotics – Herbicides

- Zactran
- Draaxin
- Baytril
- Nuflor/Resflor
- Micotil
- Excede

Technology and Growth Enhancement - Fertilizer

- Growth promoting Implants.
  - Implanted steers had a $77/animal lower cost of production than nonimplanted steers and a $349/animal lower cost of production than organically raised steers.
    - **Analysis of modern technologies commonly used in beef cattle production: Conventional beef production versus nonconventional production using meta-analysis, B. W. Wileman, D. U. Thomson, C. D. Reinhardt, and D. G. Renter JAS 2009**

Technology & Growth Enhancement– Fertilizer + Herbicides

		Carcass Quality Grades (%)				
	HCW (lb)	Prime	Choice	Select	Std	Choice-Select
Untreated	730[a]	0	51.9	48.1	0	+3.8
Inj. dewormer	742[a]	1.3	60.8	35.5	2.5	+25.3
Implant	787[b]	0	47.4	50.0	2.6	-2.6
Inj. deworm + Implant	806[c]	0	52.0	46.8	1.3	+5.2

Technology & Behavior Modification

What is Improvest and How Does it Work? *IMPROVEST is a veterinary prescription product that is a* ***safe and effective alternative to surgical castration.*** *It's a* ***protein compound*** *that* ***works like an immunization*** *to protect against unpleasant aromas that can occur when cooking pork from some male pigs. FDA-approved, IMPROVEST is for the temporary immunological castration and reduction of boar taint in intact male pigs intended for pork. It uses the pig's own immune system to provide the same effect as surgical castration, but much later in the male pig's life.*

CONTROLS SEXUAL AND OR AGGRESSIVE BEHAVIOR

It works by suppressing the production of testosterone in bulls for a minimum of three to four months. In heifers, it interrupts the estrous cycle, measured by suppression of progesterone for a minimum of three months.

Technology & Crop Insurance/Vaccines

- Modified Live 5-way vaccines
  - IBR, BVD two strains, BRSV, PI3
  - Proven protection, duration of immunity
- Intranasal vaccines
  - IBR, PI3, BRSV
  - Proven protection
  - No interference with other vaccines
- New adjuvants
- New antigens
  - Lepto hardjo bovis
  - BRCV (respiratory corona virus)

The Holistic Approach to Vaccination

Vaccination

- The Health Equation
  - Genetics
    - Selection pressure
  - Nutrition
    - Fetal programming
  - Colostrogenesis & passive transfer
  - Stressors
  - Vaccination

Vaccination/Crop Insurance

- Philosophy
- Science
- Logic

Philosophy of Vaccination

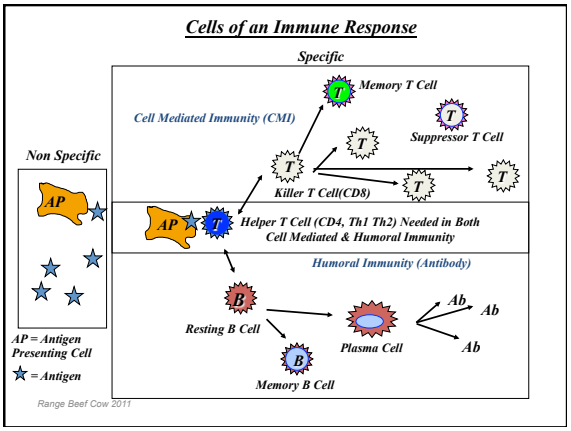
- Necessary – Reasonable risk of pathogen exposure
- Effective – The vaccine has been demonstrated to be effective.
  - Best, < Best, Better than nothing
- Safety – Minimal tissue reactivity, and systemic reactions.

Science:
Vaccinology & The Immune Response

Vaccination

- *Derived from the Latin term VACCA (cow).*
  - *The first vaccine was using Cow Pox Virus to vaccinate a human against Smallpox.*
  - *Expose the immune system to a to a disease causing pathogen, such as a virus or bacteria, so that the immune system learns to recognize it more quickly and with greater immune activity than if not previously exposed.*

Erskine, R. NMC Newsletter 23(6);3-4



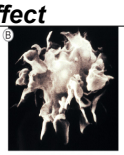
IMMUNOLOGY PRINCIPLES

- *INJECTION = VACCINATION*
- *VACCINATION ☒ IMMUNIZATION*
- *IMMUNIZATION REQUIRES….*

a. *Effective vaccine*
b. *Immunocompetent animal*

IMMUNOLOGY PRINCIPLES

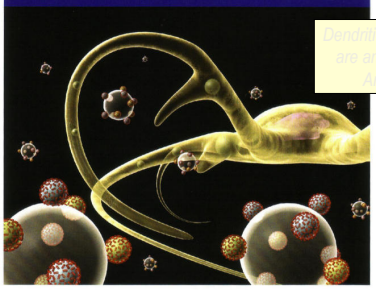
- *for VACCINATION = IMMUNIZATION, requires an IMMUNE RESPONSE*
- *IMMUNE REPONSE*
  - *cognition*
  - *activation*
  - *effect*



Immune Response to Viruses

Figure 2-7. Following vaccination, tentacled dendritic cells are attracted to sugar units bound in the adjuvant's nano-complexes, pick up antigen, and migrate to lymph nodes.

Dendritic cells and Macrophages are antigen presenting cells. Antigen is processed



Mike Huether MS PhD – Pfizer Animal Health Group

IMMUNOLOGY PRINCIPLES

- *mounting an immune response is complicated & **TAKES TIME***
- *Immune response takes 3 to 10 days to kick in. Longer with naive animals.*
- *Peaks in 2 to 4 weeks.*

IMMUNOLOGY PRINCIPLES

Because of

IMMUNOLOGIC MEMORY

multiple doses of vaccine

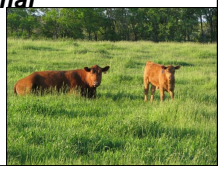
SHORTEN THE TIME, RAISE THE IMMUNITY LEVEL &REDUCE SHEDDING

IMMUNOLOGY PRINCIPLES

- *IMMUNIZATION REQUIRES….*

a. *Effective vaccine*

b. *Immunocompetent animal*



Assessing Different Vaccines, BVDV MLV vs. Killed (Inactivated)

- 4 Tx groups
  - Control
  - MLV 1 – type Ia & type II cytopathic
  - MLV 2 – type Ia & type II cytopathic
  - Killed 1 – type Ia cytopathic, type I ncp, type II ncp
- Calves vaccinated 4 times
  - Weaning and 4 weeks post weaning
  - 1 year of age and boostered 4 weeks later
- 3 PI calves infected with type I, Ib and type II commingled with pregnant heifers from day 68-126 post AI

Results

- Antibody titers (measurement of the amount in the bloodstream).
  - MLV 2 vaccinated cattle had highest neutralizing antibody titers.
  - Killed 1 was second with MLV 1 third.
- Viremia & PI's
  - Control 10/10, 10 PI's
  - Killed 1 10/20, 3 type 1a, 3 type 1b, 4 type 2.
    - 2 PI's
    - 2 abortions
  - MLV 2 1/20, 1 type 2. 2 abortions.
  - MLV 1 0/20. 1 abortion.
    - Rodning, SP Givens, MD et al AABP abstract submitted for 2008

VACCINE MANAGEMENT FACTORS:

Vaccine Handling

- ***Temperature abuse***
- ***Ultraviolet light (sunlight)***
- ***Disinfectants***

Logic & Application

- Risk & Herd Immunity
  - IBR (Red Nose) – abortions
  - BVDV – abortions, stillbirths, weak calves, PI animals
  - Leptospirosis – abortions, stillbirths, weak calves
  - Trichomoniasis
  - Vibriosis (Campylobacter)

Logic & Application

- Heifer development vaccination
  - MLV vaccination for IBR, BVD
    - Pre-weaning, weaning, pre-breeding
  - Leptospirosis
    - Pre-breeding following a priming dose
  - Vibriosis
    - Pre-breeding following a priming dose

Logic & Application

- Cowherd
  - Annual pre-breeding vaccination, MLV IBR, BVDV, inactivated Lepto and Vibrio
  - Vaccination at preg check
    - Follow label recommendations!
  - Killed to MLV

Logic & Application

- Herd Bulls
  - Annual pre-breeding MLV IBR, BVD, inactivated 5-way Lepto and Vibrio.
  - Young bull development

Logic & Application

- Calves
  - Branding age – MLV respiratory virus (intranasal or parenteral), 7-way Clostridial.
  - Pre-weaning – 5-way MLV respiratory virus, 7-way Clostridial, Mannheimia hemolytica.
    - Optional – Histophilus somnus
  - Weaning – 5-way MLV respiratory, Mannheimia hemolytica
    - Optional – Histophilus somnus

While the affluent nations can certainly afford to adopt ultra low-risk positions , and pay more for food produced by the so-called "organic" methods, the one billion chronically undernourished people of the low income, food-deficit nations cannot. -Norman Borlaug, Father of the real "Green Revolution"

"Agriculture is a business. Farming without a financial motive is gardening." Russ Parsons, Food editor, LA Times.

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The Beef Industry: Are we keeping up?

- Summary
  - Stewardship
  - Technology
  - Vaccinology

Beef Business

- "In this business of cattle raising, we exert our will, We take a calf off a poor cow and graft it onto a good one. We hobble a reticent cow until she lets her calf suck. We midwife these calves into existence, we care for them, sometimes we even risk our lives for them, and they are ultimately slated for slaughter. In this fact lies the essential irony of our work. No one forgets that a live calf is money in the bank. And yet a reverence remains. John Bell and Hungry and the calf in the cab of the pickup are not merely units of production; our connection to them is more than economic. Day in and day out we confront the messiness of this business of living; if we live with slaughter, we also live with nurture, with seasons and cycles, with birth and with death."
  - Riding the White Horse Home, Teresa Jordan, 1993 Vintage Books, pg 108