

Animal Health Through Vaccination

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“If pro is opposite of con,
then what is the opposite of progress?

Congress??”

Men's Restroom
House of Representatives
Washington, D.C.

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All of my health programs
start with nutrition.

-Tim Richards, DVM, Kamuela, HI

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Health Programs for Weaned Calves

- Worming
- Lice and mange
- Vaccinations
- Methaphylaxis
- Sick pens
- Biosecurity

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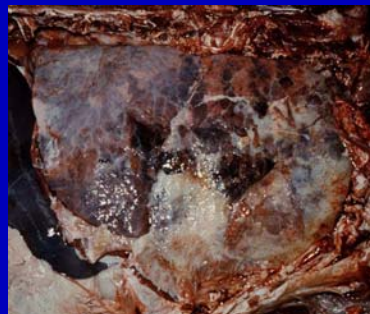
Percent of all cattle experiencing health problems at feedlots after arrival

- | | |
|--------------------------|------|
| • Respiratory disease | 14.4 |
| • Digestive problems | 1.9 |
| • Bullers | 2.2 |
| • Lameness | 1.9 |
| • Central Nervous System | 0.4 |

-NAHMS Feedlot Study, 1999

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Bovine Pneumonia



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Preventing Disease

- Preventing exposure
- Preventing infection
 - Passive immunity (colostrum)
 - Acquired immunity
 - Natural exposure
 - Vaccination
 - Efficacious vaccine
 - Immunocompetent animal

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Respiratory Illness Prevention

- Pre-weaning vaccination program
 - Vaccinate 45 days prior to weaning
 - Re-vaccinate at weaning
- Bunk trained before weaning
- Single source, reduce commingling
- Source verification
- Observe new arrivals closely
- Good nutrition
- Provide a sick pen/treatment regimen

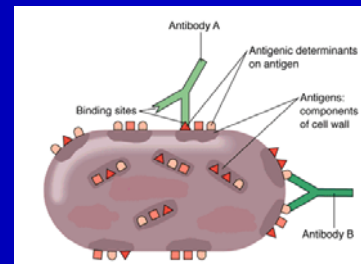
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Vaccinations

Risk Management

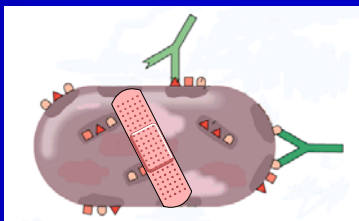
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Wild-type Virus



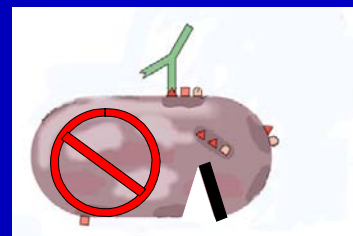
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Modified-Live Virus



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Killed Virus



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Type of Vaccine

- Modified Live
 - Strong immune response
 - Fewer doses required
 - Interferon production
 - Cell mediated immunity
 - Resemble pathogenic form more closely
- Killed
 - More stable in storage
 - Unlikely to cause disease due to residual virulence or reversion of virulence

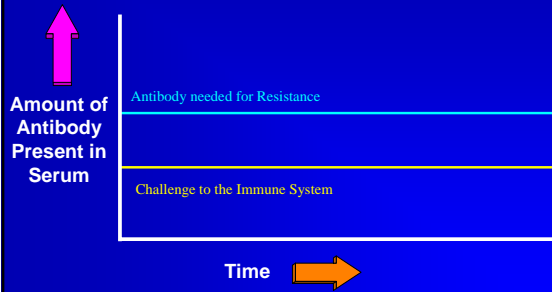
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The Future of Vaccines

- Recombinant Vaccines
 - “All dressed up with nowhere to go!”
- DNA Vaccines
 - “The enemy is among us!”

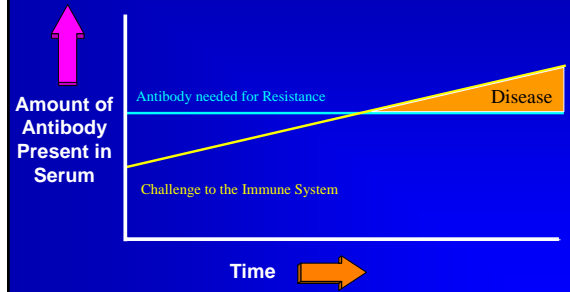
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Challenge vs. Resistance



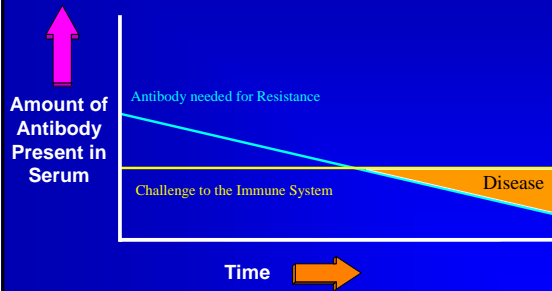
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Challenge vs. Resistance



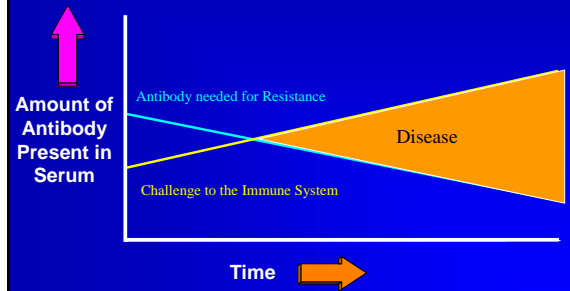
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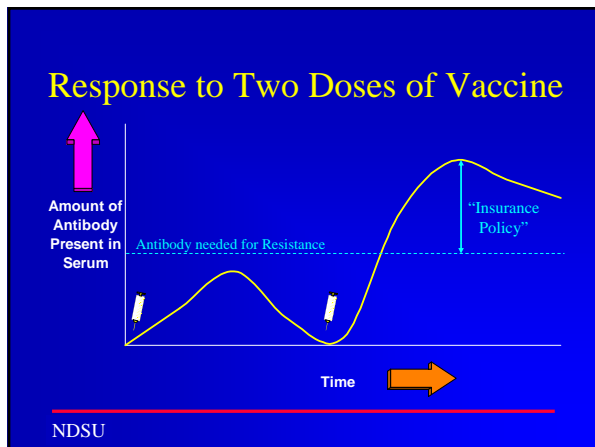
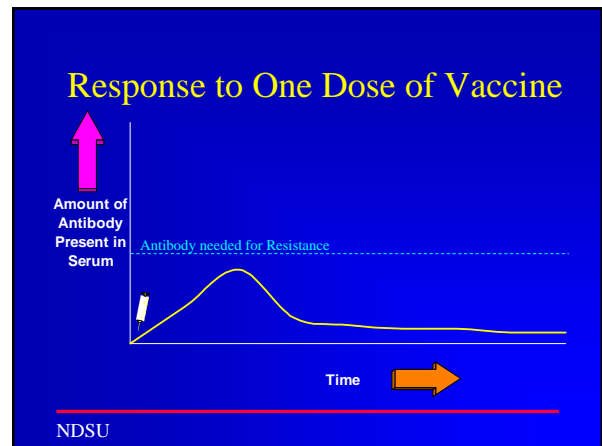
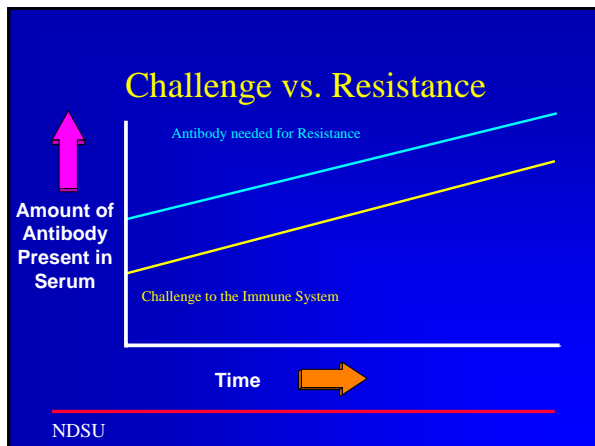


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Challenge vs. Resistance



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- ### Vaccine Failure
- Animal already incubating the disease
 - Passive transfer interference
 - Wrong vaccine for condition
 - Vaccine administered incorrectly
 - Vaccine temperature abused
 - Vaccine outdated
 - Animal can not mount appropriate response
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- ### Animal Cannot Mount Response to Vaccine
- Pre-existing condition
 - Inappropriate age of animal
 - Number of doses
 - Stressed condition
 - Increased cortisol
 - Decreased immunity
 - Sub-optimal nutrition
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- ### Common Vaccines for Calves
- Clostridia
 - IBR
 - BVD
 - PI3
 - BRSV
 - Mannheimia
 - Pasteurella
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Clostridial Diseases

- *Cl. chauvoei* (blackleg)
- *Cl. septicum* (malignant edema)
- *Cl. haemolyticum* (red water)
- *Cl. novyi* (Black's disease)
- *Cl. sordellii* (sore head)
- *Cl. perfringens* C&D (and B)
(over eating)

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Infectious Bovine Rhinotracheitis

- Fever
- Lethargic - standing/lying in the corner
- Coughing
- Nasal discharge
- Open mouth breathing
- Hyperemic muzzle (red nose)

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Bovine Viral Diarrhea

- Immunosuppressive
- Associated with *Mannheimia haemolytica*

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Consequences of a PI

- Presence of PI in cattle feedyards adversely affects health and performance of pen-mates and cattle in nearby pens
 - 0.3% prevalence of PI in feedlot cattle
 - 2.6% of chronically ill and dead are PI
 - 15.9% of BRD attributed to PI exposure
- Beef cow herds with one or more PI calves present before breeding had a 5% lower subsequent pregnancy rate.

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Parainfluenza Type 3

- Fever
- Cough
- Nasal discharge (snotty nose)
- Ocular discharge (runny eyes)
- Increased respiration
- Predisposes animal to subsequent infection

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Bovine Respiratory Syncytial Virus

- Fever (104-108° F)
- Depressed
- Off feed
- Increased respiration
- Hypersalivation (drooling)
- Nasal discharge (snotty nose)
- Lacrimal discharge (runny eyes)

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Mannheimia and Pasteurella

- *Mannheimia haemolytica*
- *Pasteurella multocida*
- Severity of signs more pronounced
 - Nasal discharge (snotty nose)
 - Dyspnea (difficult breathing)
 - High fever
 - Depressed (head and ears held low)
 - Toxemia

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Vaccines for Cattle Entering Feedlot

- ESSENTIAL
 - IBR (modified live)
- Highly Recommended
 - BRSV (modified live)
 - BVD (modified live)
- May be useful
 - *Mannheimia sp.* (carefull!)
 - *Clostridium haemolyticum*
 - (red water)
 - Clostridial bacterins

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Metaphylaxis

- Treating animals with antibiotics at labeled rates before animal becomes ill
- Short term treatment
- Micotil®, Nulfor® Excede® and Tetradure®

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Effect of timing of Tilmicosin metaphylaxis on control of bovine respiratory disease and performance in feeder cattle

Item	Control	Preshipment	Postshipment
No Animals/Pen	100/10	100/10	100/10
BRD Morbidity	54	29	15
Days to 1 st BRD	3.5	10.3	15.3
Treat Succ. %	41/54 (75.9)	24/29 (82.8)	12/15 (80.0)
Treat Fail. %	13/54 (24.1)	5/29 (17.2)	3/15 (20.0)
BRD Mortality	2	0	0
Initial Weight	437.4	448.1	440.2
28 Day Weight	525.8	537.1	534.0
Weight Gain	88.5	89.0	93.9
ADG	3.16	3.18	3.35
DMI	11.4	12.3	12.4
Feed/Gain	3.70	3.98	3.93

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Elanco, 1999

Treating Disease

- Recognize sick animals
- Make the correct diagnosis
- Use the correct therapy
- Give the animals time to get well
- Get rid of the unproductive animals
- Learn from experience

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Recognizing Disease

- Appetite depression (not in the feed bunk)
- Increase in body temperature
- Generalized depression
- Stiff gait
- Cough
- Watery eyes, runny nose

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Correct Diagnosis

- Clinical observation
- Sampling of live animals
 - Nasal swab
 - Serology
- Necropsy of dead animals
 - Veterinarian
 - Feedlot personnel
- Analysis of records
- Diagnostic laboratory

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Respiratory Illness Treatment

- Develop treatment schedule with your VETERINARIAN
- Sick animals need a sick pen
 - Enough space for treating 5 days
- Consider re-vaccination
 - Attack rate > 5% per day
 - Response to 1st time antibiotic therapy < 80%

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Resistance patterns for *Hemophilus somnus* isolates from large animal panels for the year 2001, NDSU VDL, March 2002.

Antibiotic	n	Percent Sensitive	Percent Intermediate	Percent Resistant
Amikacin	39	97	3	-
Ampicillin	39	92	-	8
Ceftiofur	39	95	5	-
Enrofloxacin	39	100	-	-
Erythromycin	39	87	13	-
Florfenicol	39	100	-	-
Gentamicin	39	97	3	-
Penicillin	39	79	-	21
Spectinomycin	39	49	41	10
Tetracycline	39	-	100	-
Tiamulin	39	100	-	-
Tilmicosin	39	97	3	-
Tribissen	39	85	-	15

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Resistance patterns for *Pasturella multocida* isolates from large animal panels for the year 2001, NDSU VDL, March 2002.

Antibiotic	n	Percent Sensitive	Percent Intermediate	Percent Resistant
Amikacin	112	79	16	3
Ampicillin	114	96	-	3
Ceftiofur	115	97	2	2
Enrofloxacin	113	95	4	2
Erythromycin	115	2	89	10
Florfenicol	112	89	7	4
Gentamicin	113	88	9	3
Penicillin	115	-	-	98
Spectinomycin	113	9	59	32
Tetracycline	115	71	9	19
Tiamulin	112	28	-	72
Tilmicosin	112	89	6	4
Tribissen	112	50	-	49

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Resistance patterns for *Mannheimia hemolytica* isolates from large animal panels for the year 2001, NDSU VDL, March 2002.

Antibiotic	n	Percent Sensitive	Percent Intermediate	Percent Resistant
Amikacin	103	96	1	2
Ampicillin	103	84	-	16
Ceftiofur	104	99	1	-
Enrofloxacin	104	91	5	4
Erythromycin	104	5	87	9
Florfenicol	102	50	43	7
Gentamicin	104	97	2	1
Penicillin	104	8	-	91
Spectinomycin	104	11	63	26
Tetracycline	104	65	6	27
Tiamulin	102	40	-	60
Tilmicosin	102	89	4	7
Tribissen	102	90	-	10

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Resistance patterns for *Escherichia coli* isolates from large animal panels for the year 2001, NDSU VDL, March 2002.

Antibiotic	n	Percent Sensitive	Percent Intermediate	Percent Resistant
Amikacin	489	99	-	1
Ampicillin	503	36	-	63
Ceftiofur	534	76	6	16
Erythromycin	534	-	-	100
Florfenicol	489	-	1	99
Gentamicin	520	76	3	20
Penicillin	534	-	-	100
Spectinomycin	520	31	23	45
Tetracycline	534	12	1	86
Tiamulin	489	-	-	100
Tilmicosin	489	-	3	97
Tribissen	489	56	-	43

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Treatment Protocols

Diagnosis	Treatment	Dosage	Route	Withdrawal
Respiratory Systems: Respirators, Acute				
Acute Treatment	Micortin (80)	1.5oz/cwt	I/O	28 days
Second Treatment (in cases of recurrence)	Micortin (80)	1.5oz/cwt	I/O	42 days
Chief Treatment (in cases of recurrence)	Penicillin 2000 Fungus Procid 27.5 (80)	As directed on label See label on label See label on label	I/O I/M I/M	42days
Heavy Cattle > 900 lbs.	Penicillin (80)	See label on label for 7 days	I/M	1 day

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Arrival Protocol Example

- Arrival
 - Metaphylaxis Micotil
 - 4-way MLV vaccine
 - Booster in seven days
 - Parasiticide Internal/External
- 28 days later
 - Castrate
 - Implant
 - Clostridials

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Illness Protocol Example

- Illness
 - Day One Tetradure & Banamine
 - Day Three Tetradure & Banamine
 - Day Five Baytril???
 - Day Seven Realizer pen
- Heavy Cattle
 - Naxcel

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Mannheimia hemolytica in Market Stressed Cattle After Natural Infection

Current Microbiology 1988

- Risk of Stress and Commingling
 - *Mannheimia hemolytica* produces substances in stressed cattle allowing the organism to be more pathogenic
 - Neuraminidase produced in market stressed cattle after a natural *Mannheimia hemolytica* infection
 - Neuraminidases play a role in adhesion of organisms to host epithelial cells.

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What does a sick animal cost?

- Feedlot
 - Sick animal \$90/animal
 - Medical costs \$30
 - Decreased efficiency \$60

*Texas A&M Ranch to Rail Program

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Health Performance of Feeder Calves – Ontario, 1999 & 2000

n=12,313 JAVMA Sept 2003

Factor	Conventional	Vaccinated	Conditioned
• Mean Wt (lb)	550	550	640
• \$/lb	1.49	1.57	1.43
• \$/calf	820	864	915
• \$ for processing	10.46	6.84	6.84
• Extra days on feed*	7.31	1.92	0.60
• Feed&Yard/day	2.15	2.15	2.15
• Days on feed	240.31	234.92	188.60
• Total Feed&Yard	516.67	505.08	405.49
• Morbidity*	15	16	6
• BRD Rx Cost	9.96	10.52	9.74
• Total Expense	1357.09	1386.44	1337.07
• Difference	Base	-29.35	20.02

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Morbidity Rates by Source

Agri-Practice, 1992

- Auction 36%
- Ranch 14%
- Pre-conditioned 2.8%

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Effect of Month of Year on rate of BRD in Calves

Ribble, et al CJVR, 1995

- 58,885 calves
- September thru December 1985-1988
- Calves entering feedlot during November
 - 2-8 times higher than September or December

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Mycoplasma bovis

- Clinical Signs
 - Pneumonia
 - Mastitis
 - Polyarthritis
- Difficult to Treat
 - Extracellular
 - No cell wall
 - Adhere to cells
 - Toxins
 - Hemolysins, proteases, nucleases and neurotoxins ?
- Treatment
 - Few Antibiotics work
 - Those that may
 - Enrofloxacin
 - Florfenicol
 - Spectinomycin
 - Tetracycline
- Clean-up
 - Survive many days when protected from sunlight

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Wise Words for the Future?

- “As in a court of law, the worst written records will always supercede the best recollection.”

-Dr. Charlie

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