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## Herd health considerations for maximizing reproductive outcomes

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## Ultimate Goal

- Reproductive efficiency
  - Wean as many healthy and productive calves as possible



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### Factors affecting optimal reproduction:

- Conception Rates
- Pregnancy Rates
- Early Embryonic Death (EED)
- Mid-Late Term Abortions
- Dystocias
- Weak/Poor Neonatal Health
- Pre-wean Morbidity and Mortality

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### Abortions

- Common occurrence in beef herds (~2%)
  - Can cause devastating losses
    - Most are isolated incidents but abortion storms are possible
- Many different causes
  - Infectious vs non-infectious
- Typically frustrating for all involved (producers, veterinarians, etc)

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### Beef cattle abortions at ISU VDL (613 Cases: 2011-Current)

Diagnosis	Number (n)	% of Total
Idiopathic/Unknown	443	72.3%
Bacterial	107	17.5%
Fungal	24	3.9%
Viral	24	3.9%
Protozoal	10	1.6%
Toxin	5	0.8%

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### Abortion agents based on category at ISU VDL (170 Cases: 2011-Current)

Agent Category	Number (n)	% of Total Category
<b>Bacterial</b>		
Unidentified	33	30.8%
Bacillus sp.	25	23.4%
Trueperella pyogenes	11	10.3%
Listeria monocytogenes	8	7.5%
Ureaplasma sp.	6	5.6%
Campylobacter sp.	6	5.6%
E. coli	4	3.7%
Leptospira sp.	4	3.7%
Salmonella sp.	2	1.9%
Staphylococcus sp.	3	2.8%
Siberistonia trahatosi	1	0.9%
Mycoplasma sp.	1	0.9%
Pasteurella multocida	1	0.9%
<b>Viral</b>		
Infectious bovine rhinotracheitis (IBR)	18	75.0%
Bovine viral diarrhea (BVD)	6	25.0%
<b>Fungal</b>		
Unidentified	21	87.5%
Aspergillus sp.	3	12.5%
<b>Protozoal</b>		
Unidentified	3	30.0%
Neospora sp.	7	70.0%
<b>Toxin</b>		
Nitrates	5	100.0%

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In Comparison/Review  
*Kirkbride. "Etiologic agents detected in a 10-year study of bovine abortions and stillbirths". JVDI. 1992*

- 51% no diagnosis
- 17% ...
- 1% ...
- 1% ...
- 5% tunggal
- 2% other

No Diagnosis

**Has Anything Really Changed???**

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**NAHMS Data 1997 vs 2007**

	1997	2007
<b>IBR</b>		
Replacement Heifers	16.8	19.4
Heifers	9.3	11.9
Cows	18	24.6
<b>BVD</b>		
Replacement Heifers	16.3	25.1
Heifers	9.2	13.7
Cows	17.4	28.1
<b>Brucella</b>		
Replacement Heifers	24.7	14.8
<b>Leptospira</b>		
Replacement Heifers	18	19.9
Heifers	13.3	15.1
Cows	28.5	31.7
<b>Campy (Vibrio)</b>		
Replacement Heifers	11	12.6
Heifers	8.9	10
Cows	20.1	19
<b>Trich</b>		
Replacement Heifers	0.2	0.7
Heifers	0.2	0.9
Cows	1.1	1

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**Diagnostics**

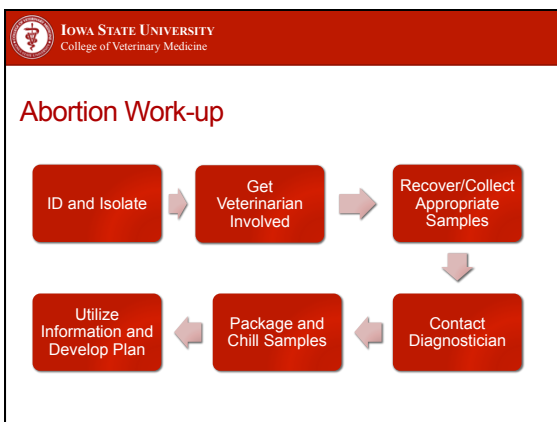
- Diagnostic tools have improved dramatically over time
  - PCR and other molecular diagnostic tools
- Specific diagnostic laboratory kits and a battery of tests available
- Diagnostic tests are as only good as the samples and history that come with the work-up

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Pathogen	Gestational Period	Common Diagnostic Procedure
<b>Viral</b>		
IBR	Mid to Late	FAIHC/VI
BVD	Mid	FAIHC/VI/PCR
Bluetongue Virus	Late	PCR/VI
<b>Bacterial</b>		
Brucella abortus	Mid to Late	Bacterial culture
Leptospira spp.	Late	Culture/IHC/PCR
Campylobacter fetus spp.	Any	Culture/MAT/FAIHC
Ureaplasma	Late	Culture/PCR
Sporadic/Opportunistic bacteria <sup>1</sup>	Any	Bacterial culture
Listeria	Late	Bacterial culture/IHC
Chlamydia spp.	Late	PCR/IHC/FA
<b>Protozoal</b>		
Trichostrongylus	Early	Culture/IHC/Silver Stain/H+E
Neospora spp.	Mid to Late	IHC/PCR
Sarcocystis spp.	Mid to Late	IHC
<b>Mycotic/Fungal</b>		
Aspergillus fumigatus	Any	Fungal culture/H+E
Mucor/ Candida/ Rhizopus spp. <sup>2</sup>	Any	Fungal culture/H+E
<b>Unknown Agent</b>		
Epizootic/Enzootic Bovine Abortion	Late	IHC/Silver Stain

<sup>1</sup> Arcanobacterium pyogenes, Bacillus spp., E. coli, Mannheimia hemolytica, Streptococcus spp., Pasteurella multocida, Salmonella spp., etc.  
<sup>2</sup> Many genus and species associated with bovine abortions

Abbreviations: FA, Fluorescent Antibody; IHC, Immunohistochemistry; VI, Virus Isolation; PCR, Polymerase Chain Reaction; H+E, Hematoxylin and Eosin; MAT, Micro Agglutination Test



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**Preferred Tissue/Specimens for Workup**

Formalin-fixed	Fresh
Placenta	Placenta
Skeletal muscle (tongue/diaphragm)	Thymus
Ear notch	Lung
Thymus	Heart
Lung	Liver
Heart	Kidney
Liver	Spleen
Kidney	Lymph node
Spleen	Brain (1/2)
Lymph node	Stomach contents
Adrenal gland	Thoracic fluid
Brain (1/2)	

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### Serum Samples

- Inability to get adequate samples
  - Serum is only option
    - Poor diagnostic tool
      - Infection and immune response already happened
- **Serologic profiling**
  - Chronic issues with abortion

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### Abortion Management

- Utilize Information
  - Conclusive or Not
- Devise Plan
  - Current vs Future
- Revisit Vaccination Protocol
- Control Biosecurity and Exposure

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### Identify Herd Type and Risk

- **Closed** (limited movement)
  - Lowest risk
  - Venereal transmission
- **Modified Open** (movement + addition)
  - Moderate Risk: primarily viral component
  - Yearling heifers main concern
- **Open** (continuous risk)
  - Greatest challenge
  - All agents

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### Successful Circle of Optimizing Reproductive Health

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    graph TD
      Plan --> Implement
      Implement --> Evaluate
      Evaluate --> Improve
      Improve --> Plan
    
```

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### Things to Remember

- **Not all abortions are infectious**
- **Not all infectious abortions are contagious**
- **Low diagnostic rates should not inhibit investigation**
- **Many of abortion causes can be mitigated with proper changes**

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### Future Focuses

- Proactive Behaviors
  - Adequate Samples
  - Implementing management changes
- Better diagnostic tools
  - Serologic Profiling
  - Metagenomics Implementation
- Research

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**Thank you!**

