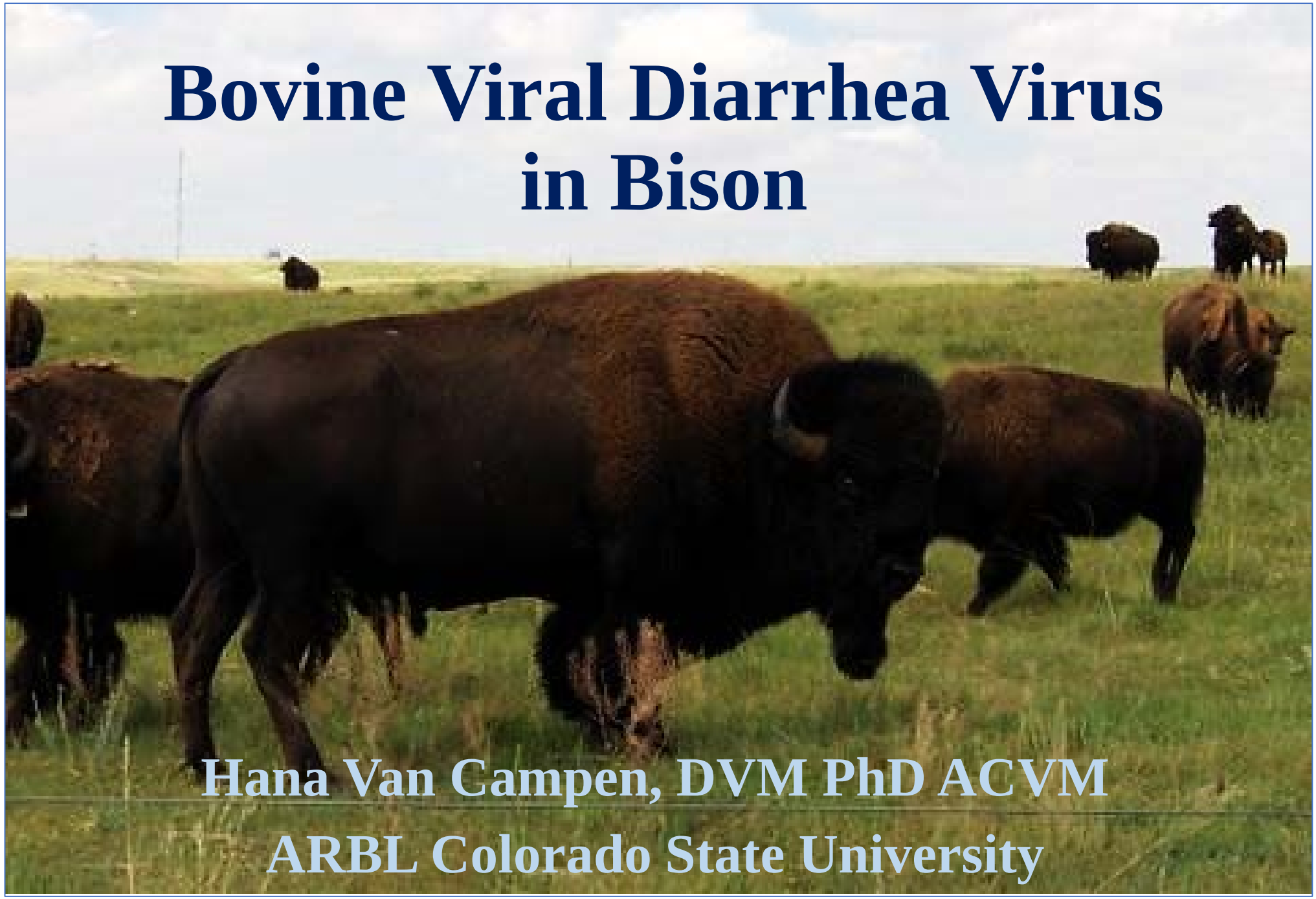
Bovine Viral Diarrhea Virus in Bison



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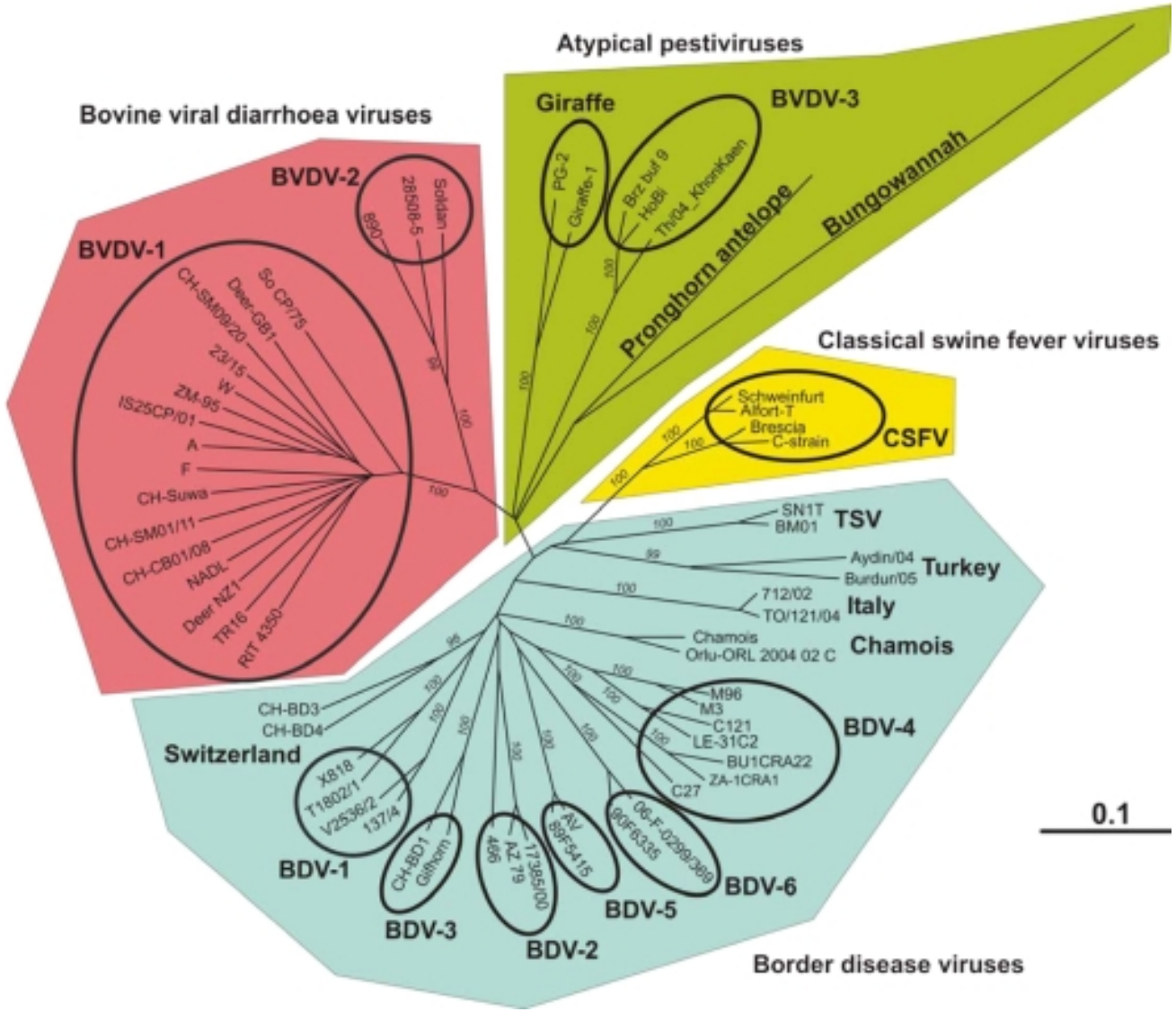
What is the evidence for BVDV in bison?

courtesy of J. Cavendar

BVDV antibody positive free-ranging bison

- 12/16 (75%), National Elk Refuge, Jackson WY, Williams ES et al., 1993
- 31/101 (31%), N. Yellowstone, Taylor SK et al., 1997
- 2/50 (4%), Badlands, SD, WSVL

the Pestiviruses



from Peterhans et al., 2010

Antibody titers in Bison, Jackson WY

Number of bison	BVDV type 1	BVDV type 2	Border disease virus
3	<1:4	<1:4	<1:4
2	>1:8192	<1:4	<1:4
6	1:1024	1:256	1:1024
4	1:4096	1:1024	1:2048
Total = 15			

Antibody titers in Bison, Badlands SD

Animal ID	BVDV type 1	BVDV type 2	Border disease virus
30	1:8	1:256	1:64
39b	1:16	1:512	1:64

BVDV isolated from Bison

- **1 month old calf, commercial herd, severe lameness due to coronitis, diarrhea, 30% calf losses, history of mucosal disease-like disease in other bison**
- **7 year old bull, free-ranging herd Elk Island Nat'l Park Alberta, pleuritis, history of wasting and diarrhea in other bison**

The isolation of bovine viral diarrhea viruses from bison. 2005. D Deregt, SV Tessaro, MK Baxi, J Berezowski, JA Ellis, JTY Wu, SA Gilbert. Vet Rec 157(5): 448-450.

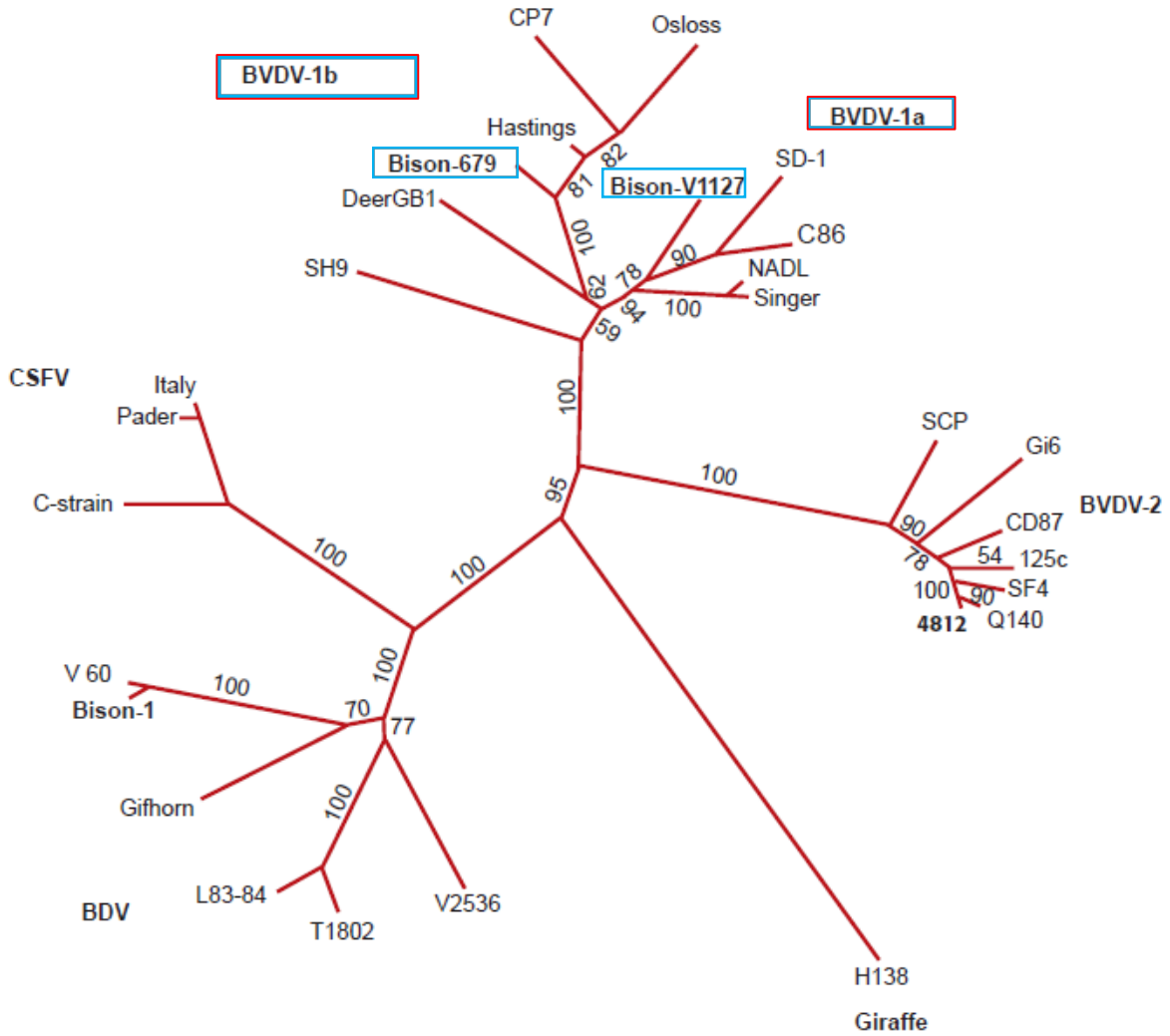


FIG 2: Phylogenetic tree showing the genetic relationships of the bison isolates V1127 and 679 with other pestiviruses. The lengths of the branches indicate the phylogenetic distance between different viruses. Bootstrap values are given for 100 datasets and are shown for each branch. Subgroups are shown only for bovine viral diarrhoea virus (BVDV) type 1. BDV Border disease virus, CSFV Classical swine fever virus

Deregt D et a., 2005

Transmission of BVDV

1. **Acute infection, horizontal transmission, post-natal, transient infection**
2. **Fetal infection, vertical transmission from cow to fetus**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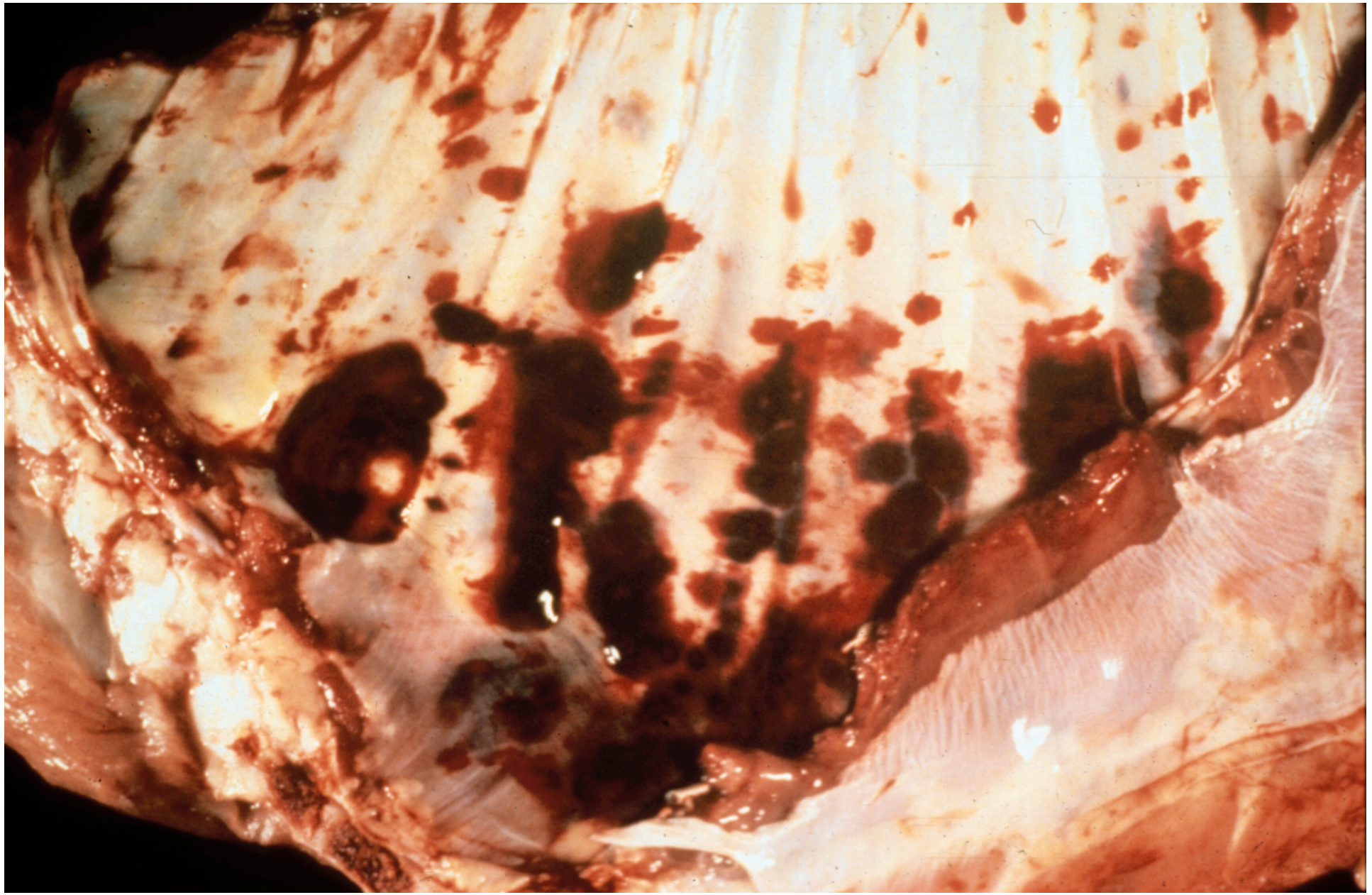
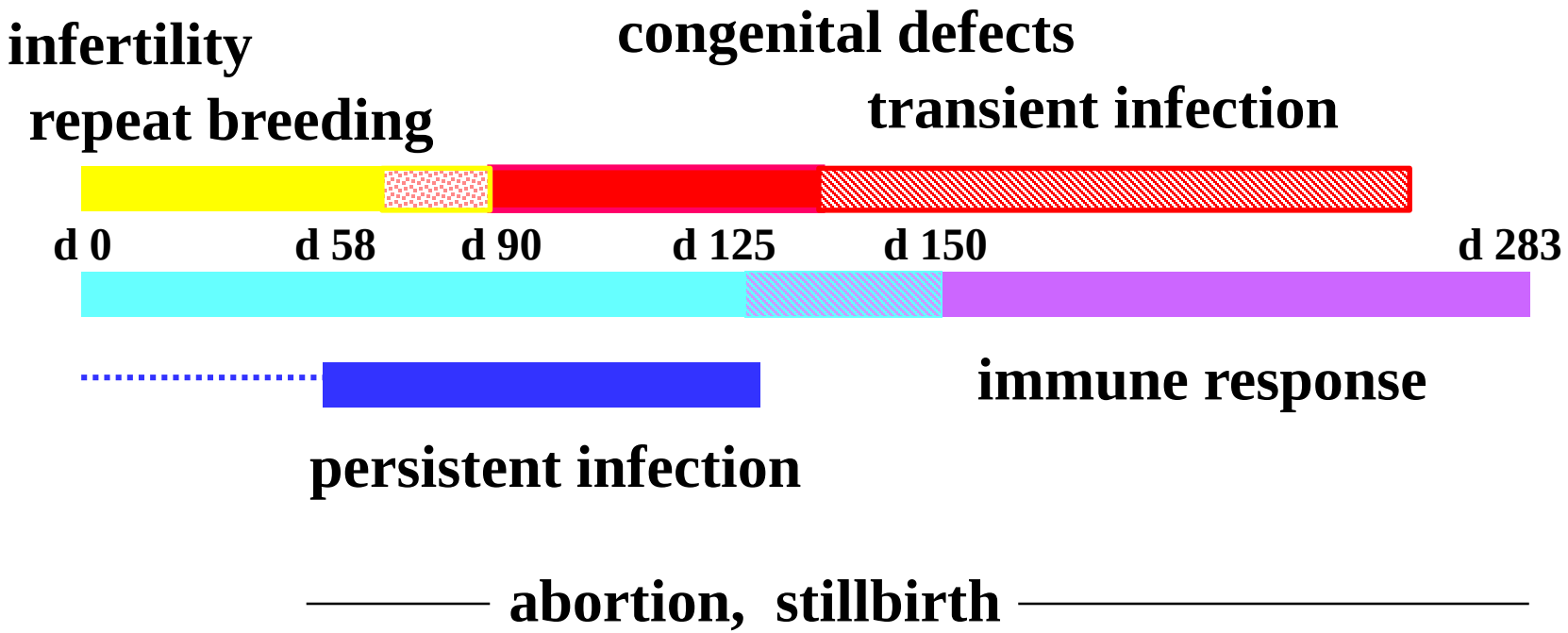


courtesy of EJ Dubovi

Acute Postnatal Infections

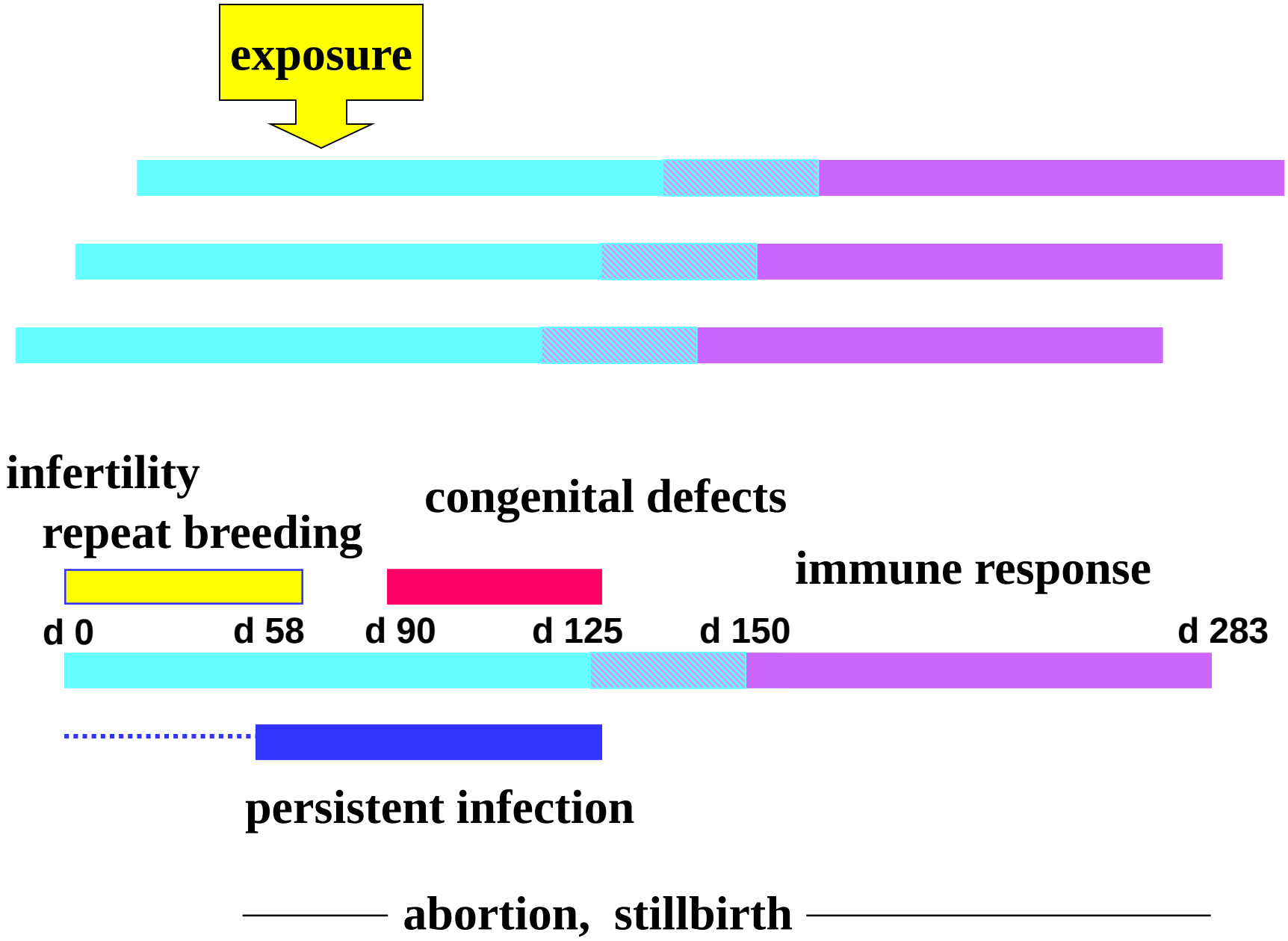
1. **Inapparent infections**
2. **Bovine viral diarrhea**
3. **Hemorrhagic syndrome**
4. **Peracute disease**
5. **Primary viral pneumonia**
6. **Immunosuppression-secondary infections**

Effects of BVDV on Fetal Development



Fetal Infections

1. **Infertility, repeat breeding**
2. **Abortions, stillbirths**
3. **Congenital defects**
4. **Weak calves**
5. **Persistently infected calves**
6. **Congenitally/transiently infected calves**


exposure
infertility
repeat breeding
congenital defects
immune response
d 0
d 58
d 90
d 125
d 150
d 283
persistent infection
abortion, stillbirth

Abortions & Stillbirths

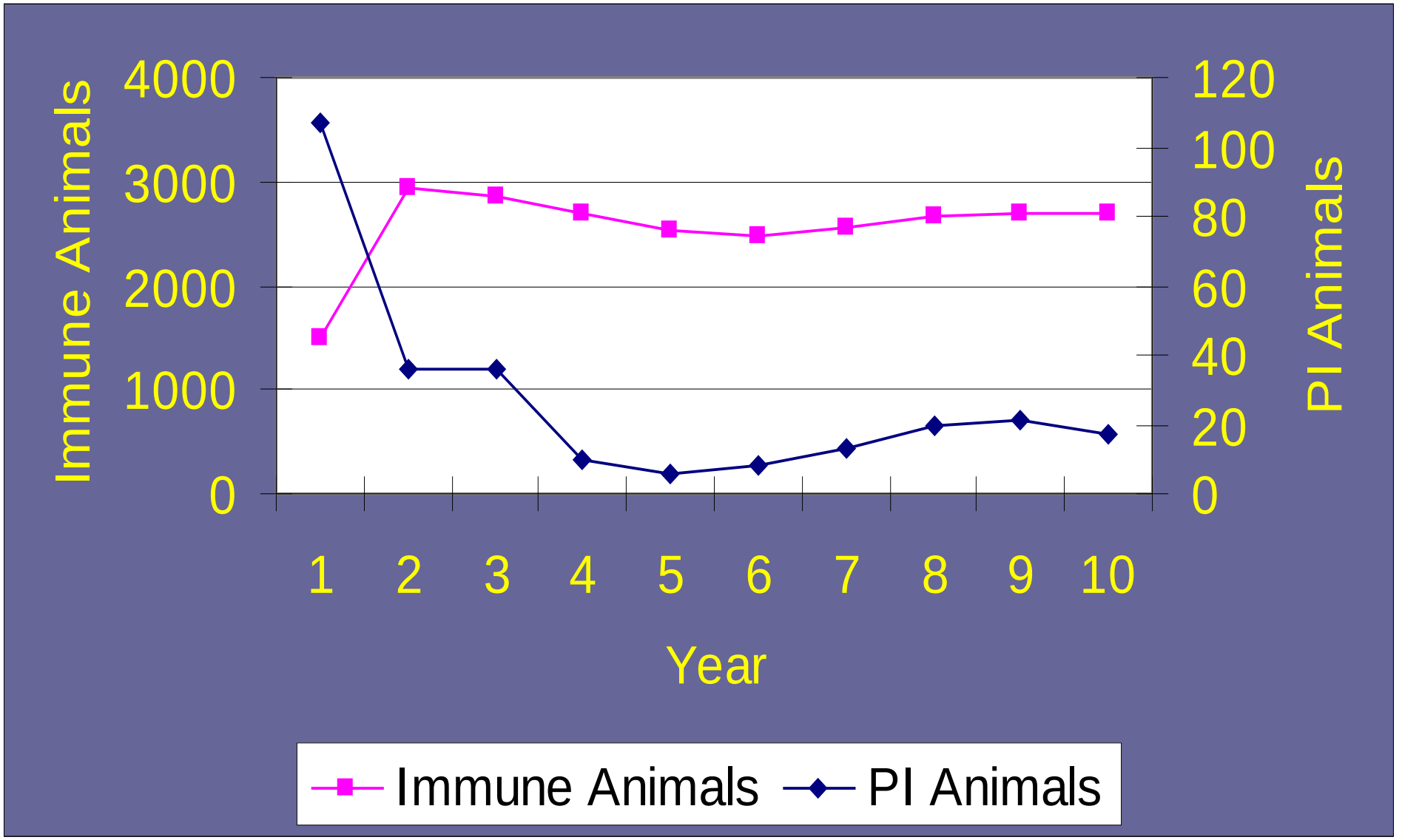
Neonatal Calf Deaths

Epidemic BVD

vs

Endemic BVD

PI Prevalence and BVDV Seroprevalence



Effect on Calf Mortality and Weaning Weight

Sources

PI calves/cattle

courtesy of D O’Toole

courtesy of ES Williams

Evidence for BVDV fetal infections in Bison

courtesy of J. Cavendar

- Pregnancy rate of 63% to 89%
- BVDV antibody positive cows
- History of bovine vaccine use
- Beef herd present on the ranch
- Bison and cattle test negative for BVDV PI by earnotch RTPCR
- Bulls were test negative for Trich
- April 2010: several abortions occurred in the bison herd
- 1 aborted fetus submitted for necropsy and associated tests

Mid-sagittal sections of long bones from aborted fetus showing retained secondary spongiosae, cortical thickening and markedly reduced medullary cavity size

Courtesy of Brett Webb

Radiograph of long bones from the same fetus showing multiple transverse radiodense bands within the metaphyses.

Courtesy of Brett Webb

Aborted bison fetus approx. 230 days of gestation

- Cortical thickening, reduced medullary cavity, multiple transverse radiodense bands
- Mandibular brachygnathia
- Moderate thymic atrophy and lymphocytolysis
- Lymphoplasmacytic epicarditis and pneumonia
- BVDV FA positive, lung

Two 1 week old bison calves from the heifer herd

- Marked thymic atrophy
- Moderate erosive abomasitis with multifocal mucosal hemorrhages
- Necrotizing enteritis with lymphoid depletion of Peyer’s patches
- BVDV FA and IHC positive staining

Factors favoring BVD infection in Bison herds

- proximity to cattle
- herding behavior
- population size
- seasonal/synchronous breeding
- length of gestation
- persistently infected carriers
- survivorship of PI animals

BVDV in Feedlot Bison

Bovine Respiratory Disease Complex

BRD Risks for Bison

- **Mixing bison from multiple origins**
- **Transport to feedlot**
- **Familiarity of bison to type and presentation of feed and water**
- **Processing and handling procedures**
- **Vaccinations and other treatments**
- **Exposure to BVDV PI cattle**

Acknowledgements

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Questions?

Colorado State University
Veterinary Diagnostic Laboratories

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Veterinary Diagnostic Laboratories

Infertility, Abortion and Fetal Bone Lesions in a Captive Bison Herd associated with Bovine Viral Diarrhea Virus

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