

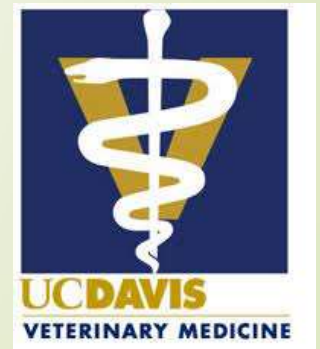
# REFERENCE RANGES FOR NEONATAL MILESTONES AND PARAMETERS IN HEALTHY GIRAFFE (*Giraffa camelopardalis*) CALVES

*Kimberly A Thompson, DVM, MPVM, Dipl ACVPM, Dipl ACZM*  
*Munashe Chigerwe, BVSc, MPH, PhD, Dipl ACVIM*



**MICHIGAN STATE**  
UNIVERSITY

College of Veterinary Medicine



# Why focus on giraffe calves?

- ▶ Charismatic species
- ▶ Unique challenges
- ▶ Long gestation
- ▶ Lack of knowledge
  - ▶ No established norms
  - ▶ No validated tests for passive transfer
- ▶ Common
  - ▶ Failure of passive transfer of immunity
  - ▶ Maternal neglect



# Passive transfer of immunity...what is it and why is it so important?!?

**\*NO SUBSTITUTE FOR COLOSTRUM\***

## ► What's is Colostrum?

► 1<sup>st</sup> “milk” produced

► **Immunoglobulins (IgG, IgA, IgM)**

► Systemic and local immunity

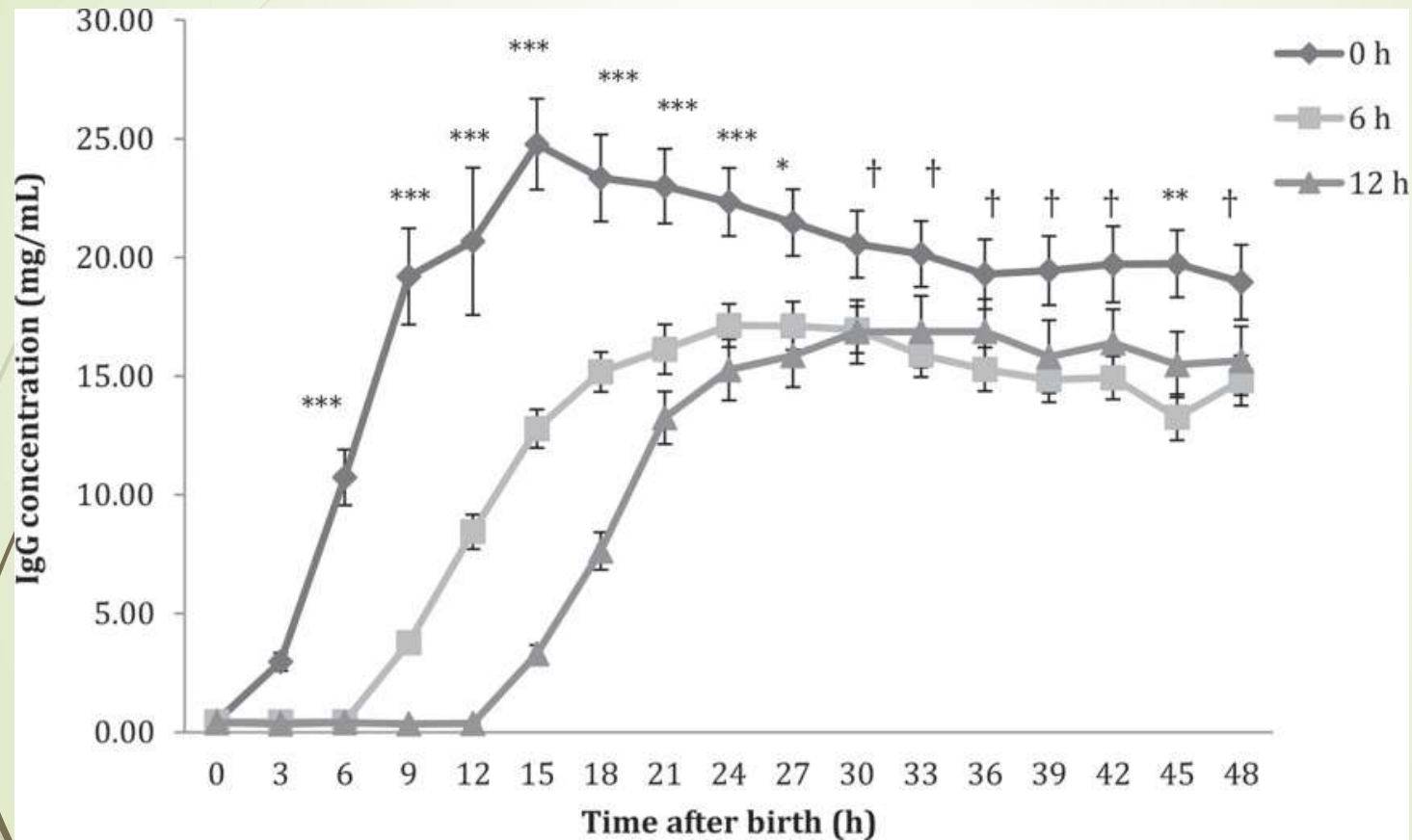
► Nutrients: fat, protein, lactose, solids

► AND....micronutrients, growth factors, hormones, immune cells, complement, antimicrobial proteins, enzymes, etc...

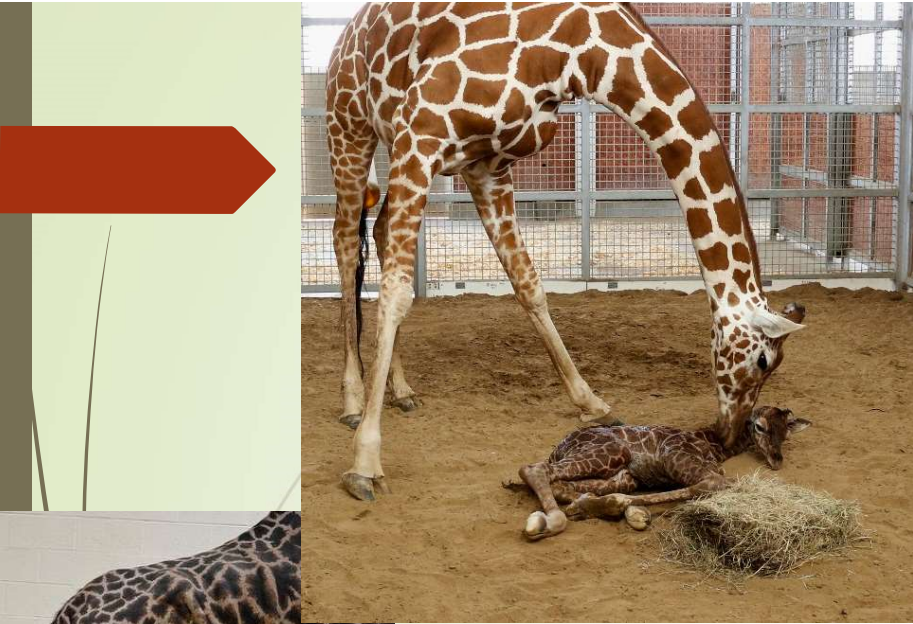


# Timing of Colostrum ingestion important

## *What we know from Dairy Cattle Studies*



Fisher et al 2018



## Goals of study

- Identify what is normal and abnormal
- Morbidity and mortality information
- Provide information to managers
- Improve intervention strategies by:
  - Identifying calves that do not meet milestones
  - Identifying calves at increased risk for failure of passive transfer of immunity earlier
  - Encourage EARLIER intervention to improve outcomes

# STUDY DESIGN

- Presented data is part of PhD study on giraffe calf health and passive transfer of immunity
- Survey:
  - Giraffe calves born 2016-2021
  - Banked serum
  - All giraffe holding institutions
  - Neonatal milestones
  - Dam and husbandry parameters



## GIRAFFE CALF PASSIVE TRANSFER OF IMMUNITY STUDY FORM

Please submit a separate form for each giraffe calf.  
If calf received plasma transfusion please use Appendix II form.

Institution	
Name of contact person	
Email	
Phone number	

### Giraffe calf and dam information:

Calf name	
Calf local ID number	
Date of birth	
Time of birth (if unknown AM or PM)	
Sex (M or F)	
Subspecies (Masai or Generic)	
Weight (kgs)	
Age (hours) weight taken	
Age (hours) first able to stand	
Age (hours) first nursing observed	
Did calf ONLY nurse maternal colostrum?	
Were any colostrum replacers administered?	Brand, Amount/Dose, bottle or tube fed, age administered?
Was any plasma or serum administered?	Type, amount/dose, route, age administered?
Did calf have any health issues in 1 <sup>st</sup> month of life? (diarrhea, omphalitis, etc) Explain	
Is calf deceased? (If yes attach necropsy)	
Age of dam at parturition	
Number of calves dam has given birth to (including this calf)	
Body condition score of dam at parturition (1-9 scale)	
Was dam kept separate or with herd during parturition?	
Does dam have any health issues? Explain	
Was calf born indoors or outdoors?	
Herd size (M.F.Unk)	

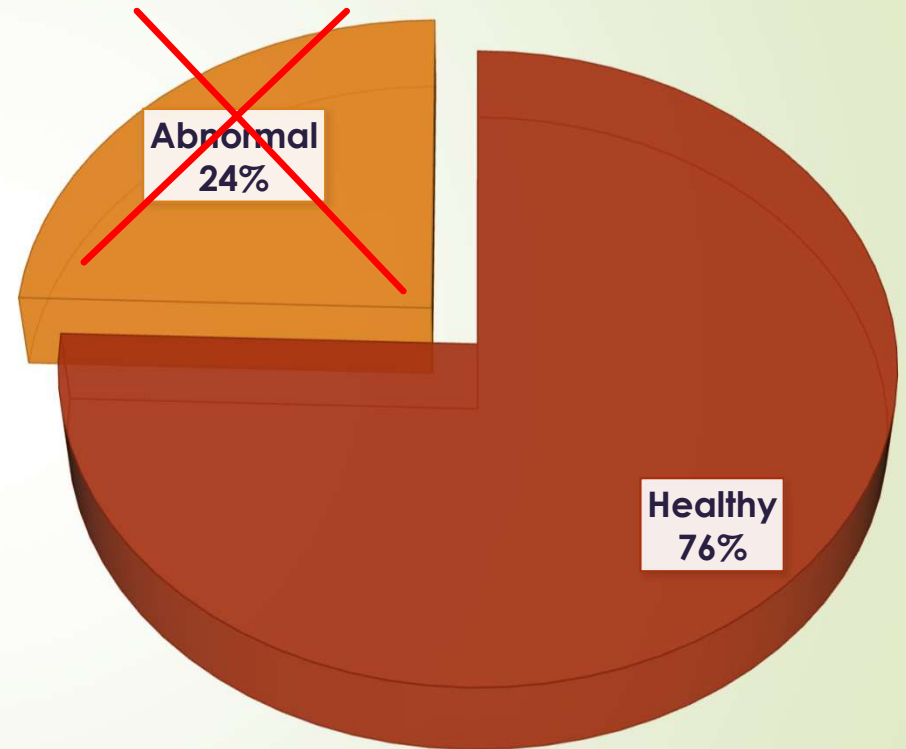
For any questions or concerns please contact:

Dr. Kim Thompson: [kthompson@binderparkzoo.org](mailto:kthompson@binderparkzoo.org), (707) 217-3268 or (269) 979-1351

## RESULTS

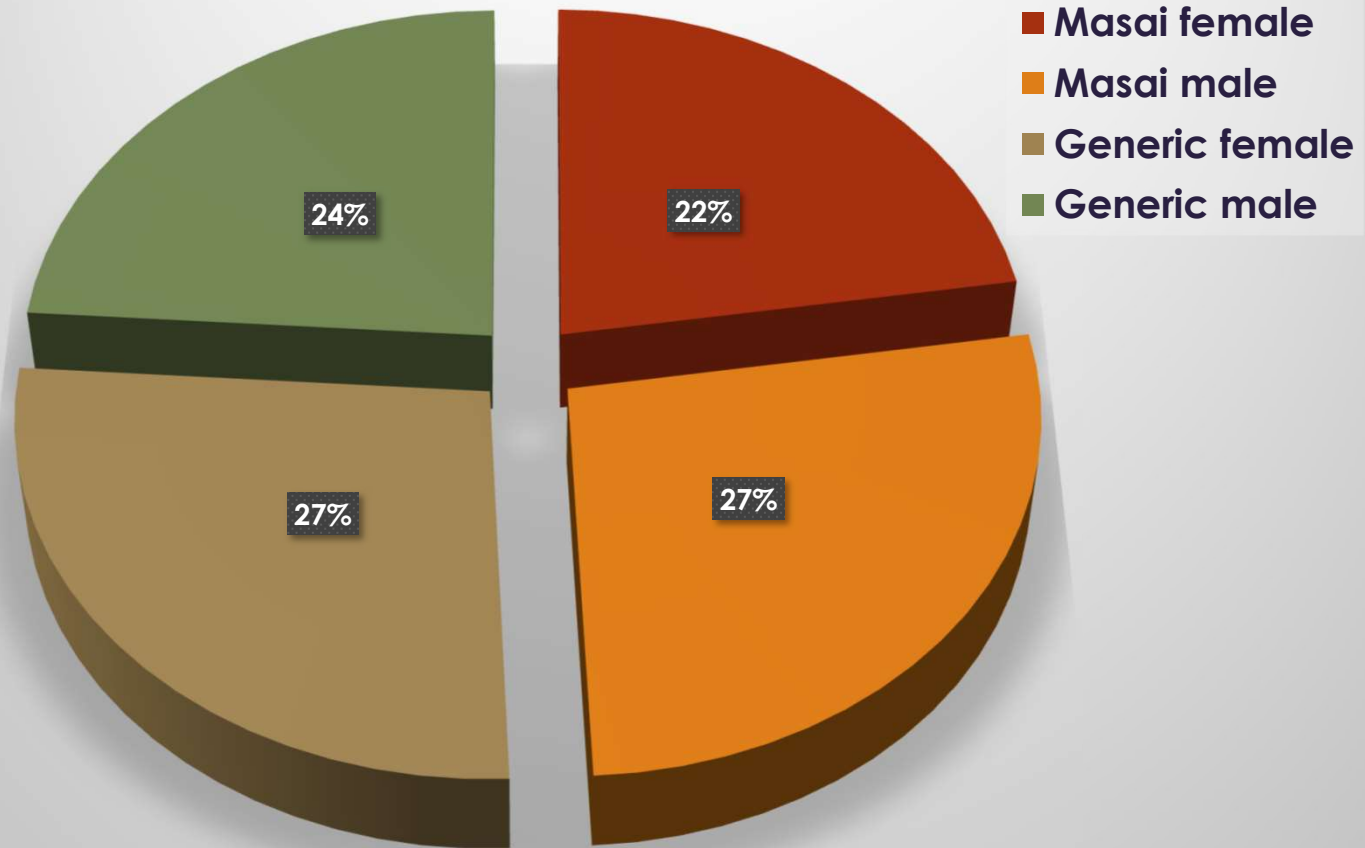
- ▶ Study Total: 93 calves
  - ▶ Healthy- 71 calves
  - ▶ Abnormal- 22 calves
- ▶ **Excluded from this part of the study if:**
  - ▶ Any medical intervention
  - ▶ Reported health issue by veterinarian in 1<sup>st</sup> 30 days of life

## CALF HEALTH STATUS



**RESULTS:**  
**Total of 71**  
**healthy calves**

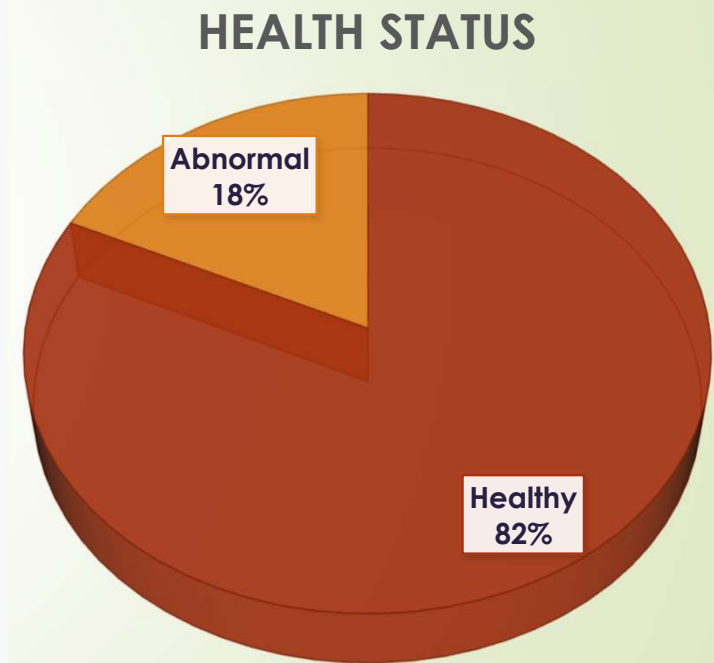
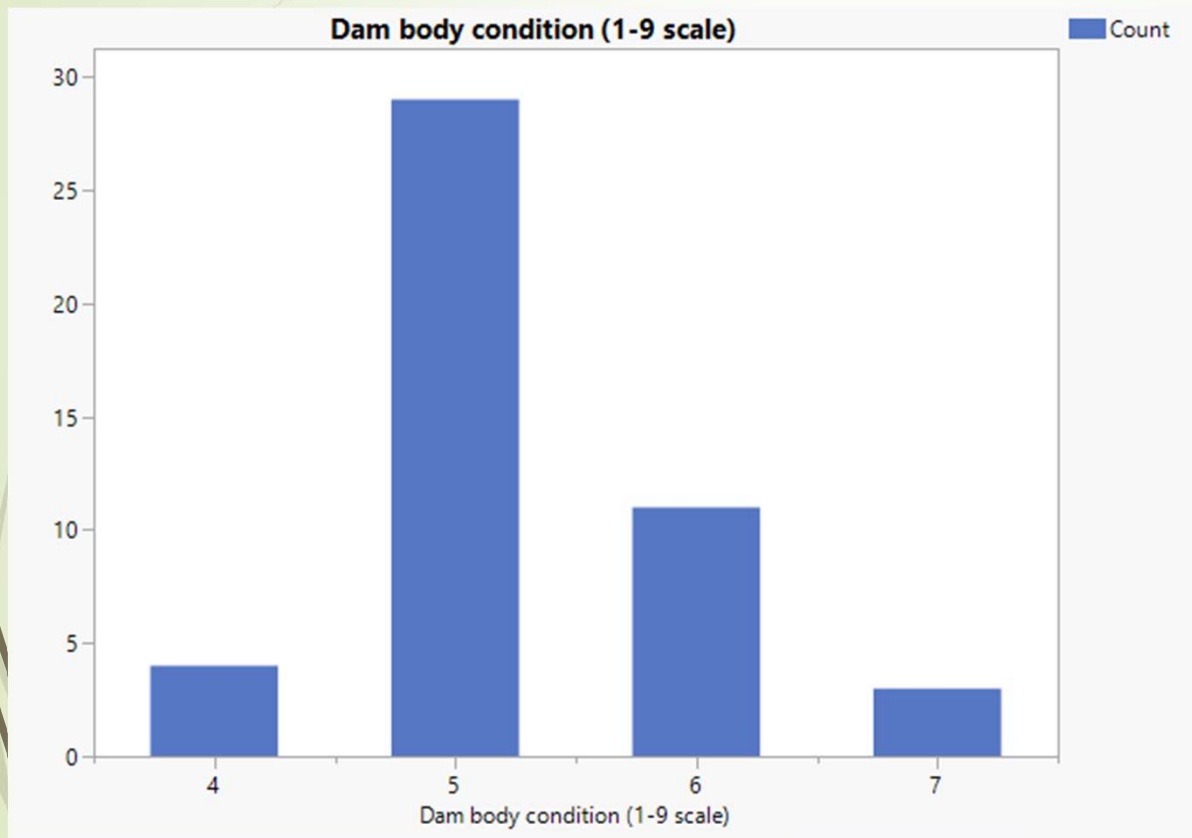
## Subspecies and Sex Distribution





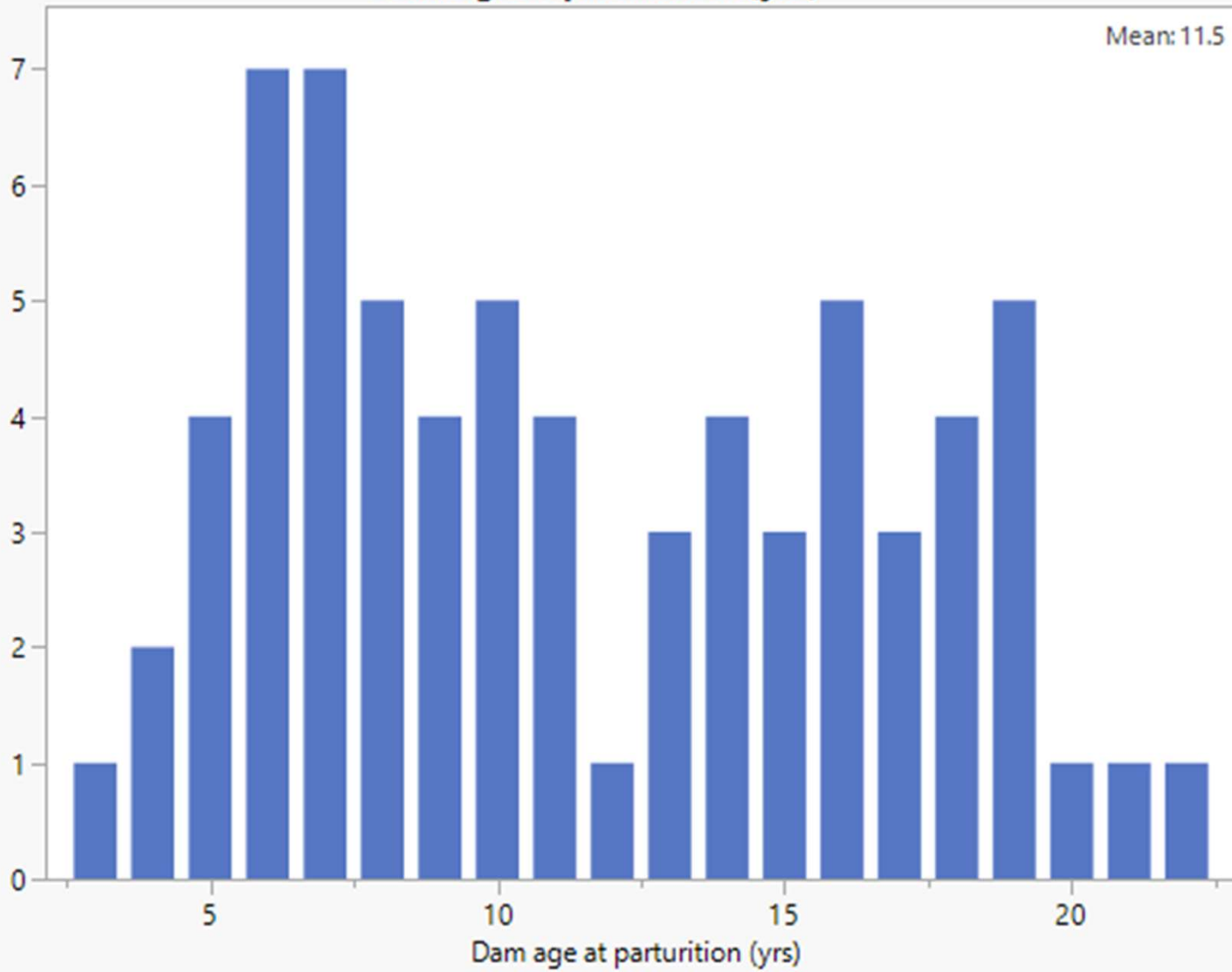
## Results: Dam parameters

- Dam body condition: n=47, Median 5/9, range 4-7/9



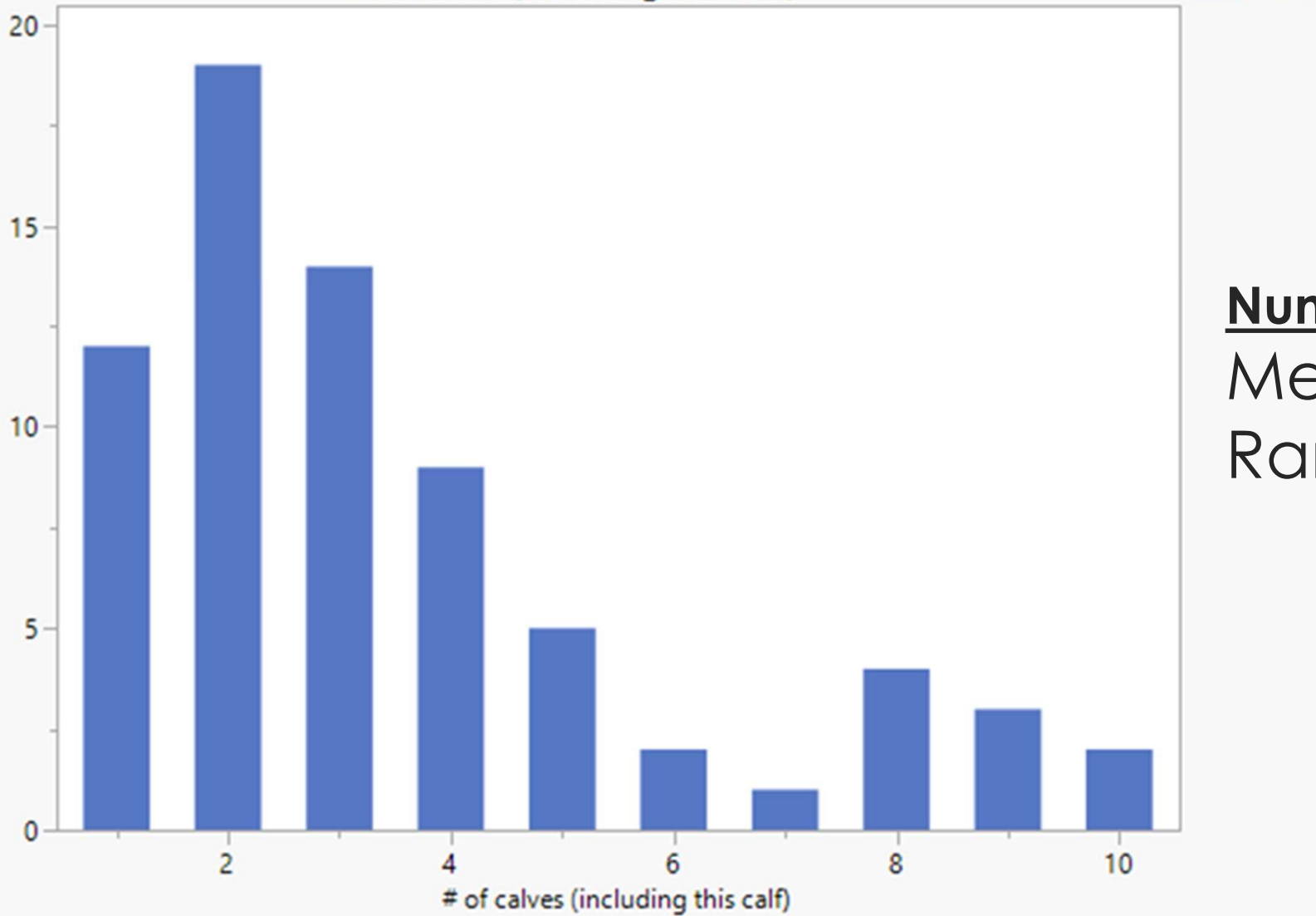
Dam age at parturition (yrs)

Count



Mean: 11.5  $\pm$  5.09 yr  
Range: 3-22 yr

# of calves (including this calf)



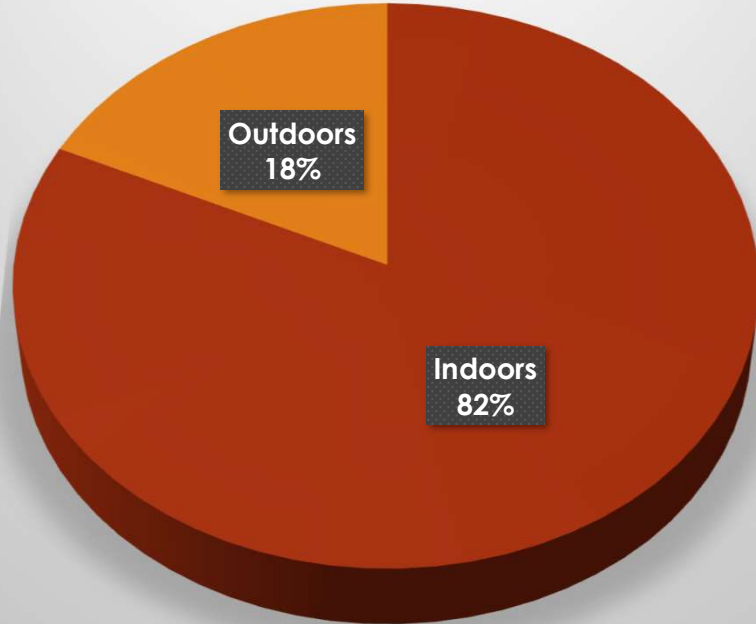
**Number of calves:**

Median: 3

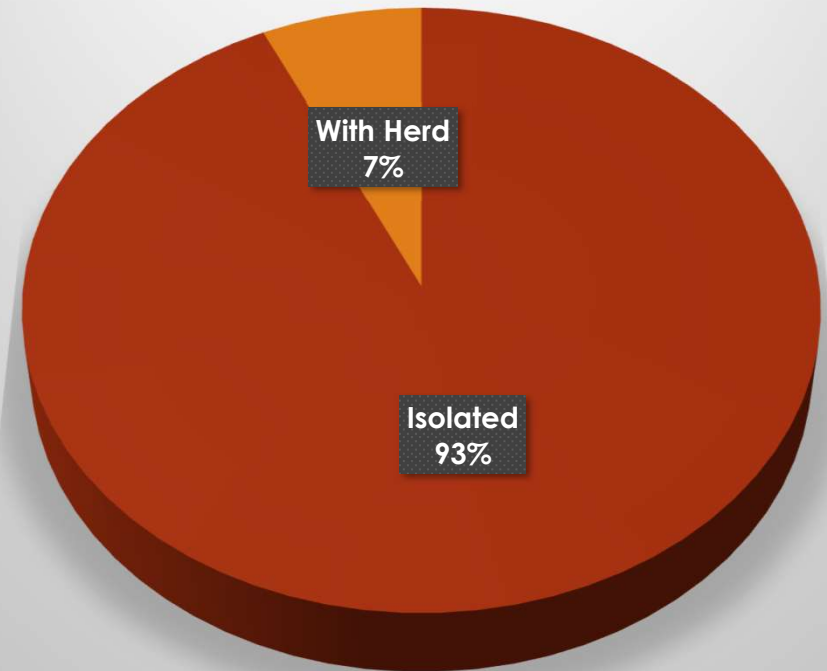
Range 1-10

# Results: Parturition parameters

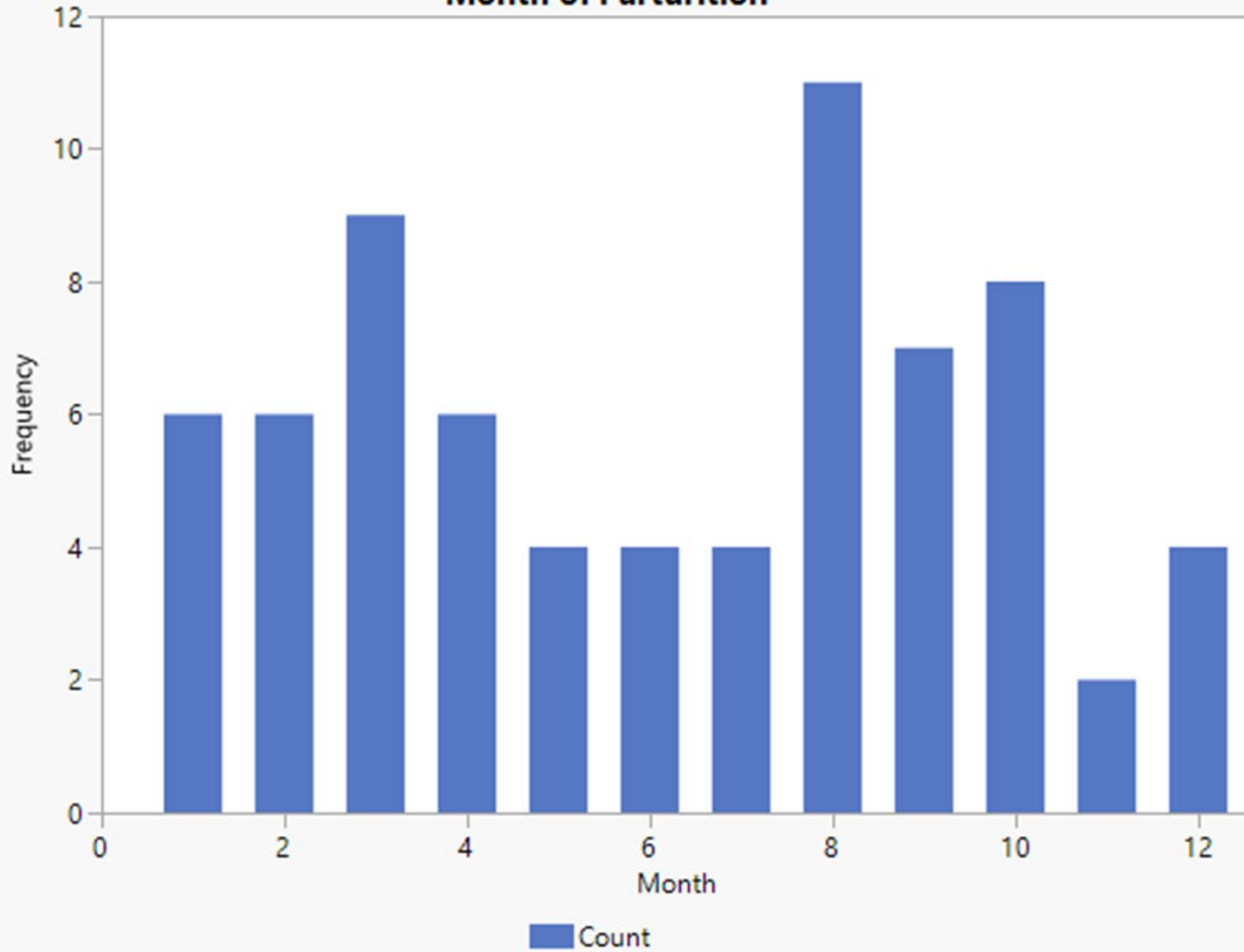
## Location



## Social setting



**Month of Parturition**



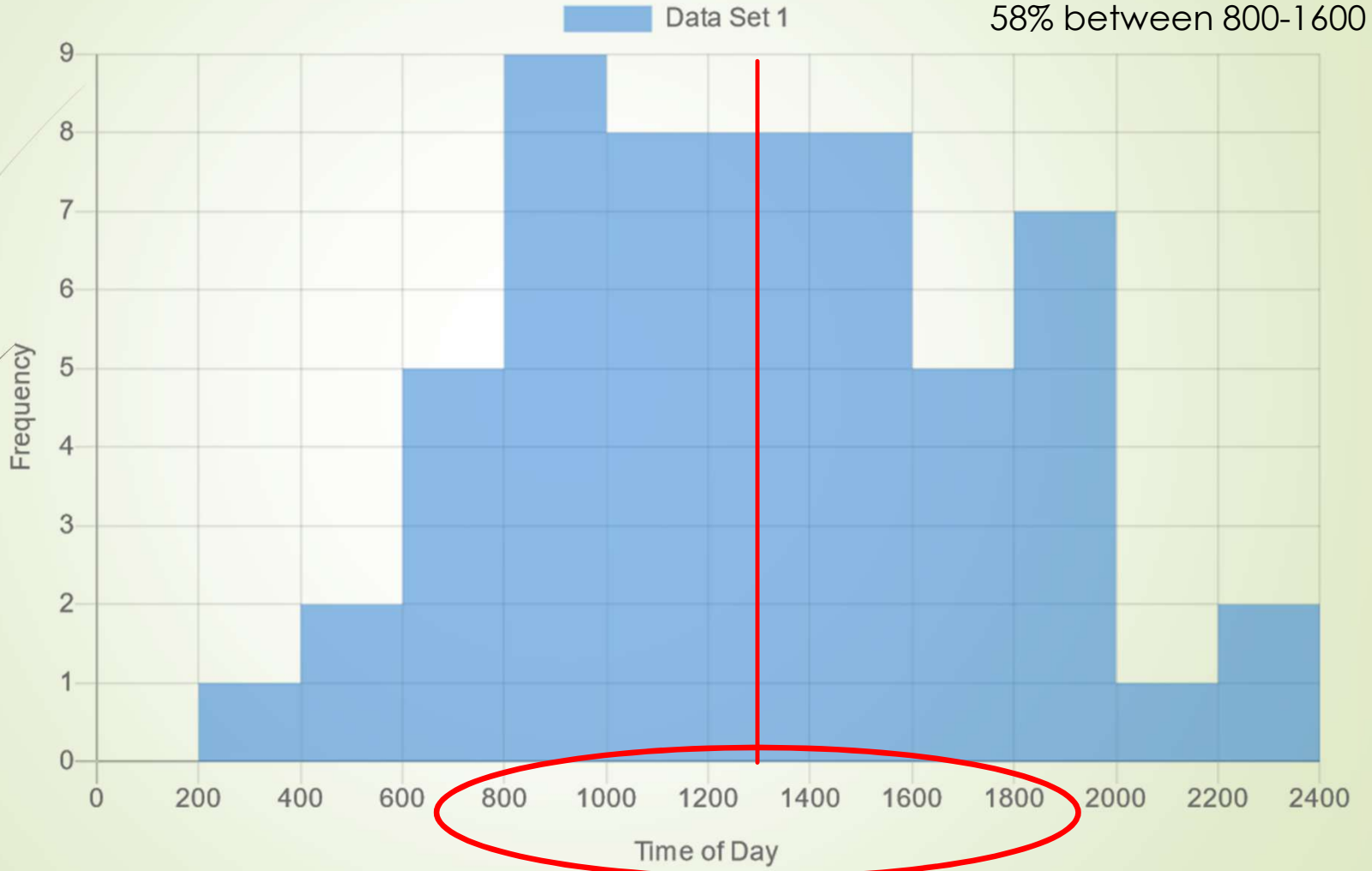
**Results: Timing  
of parturition**

### Parturition

n= 56

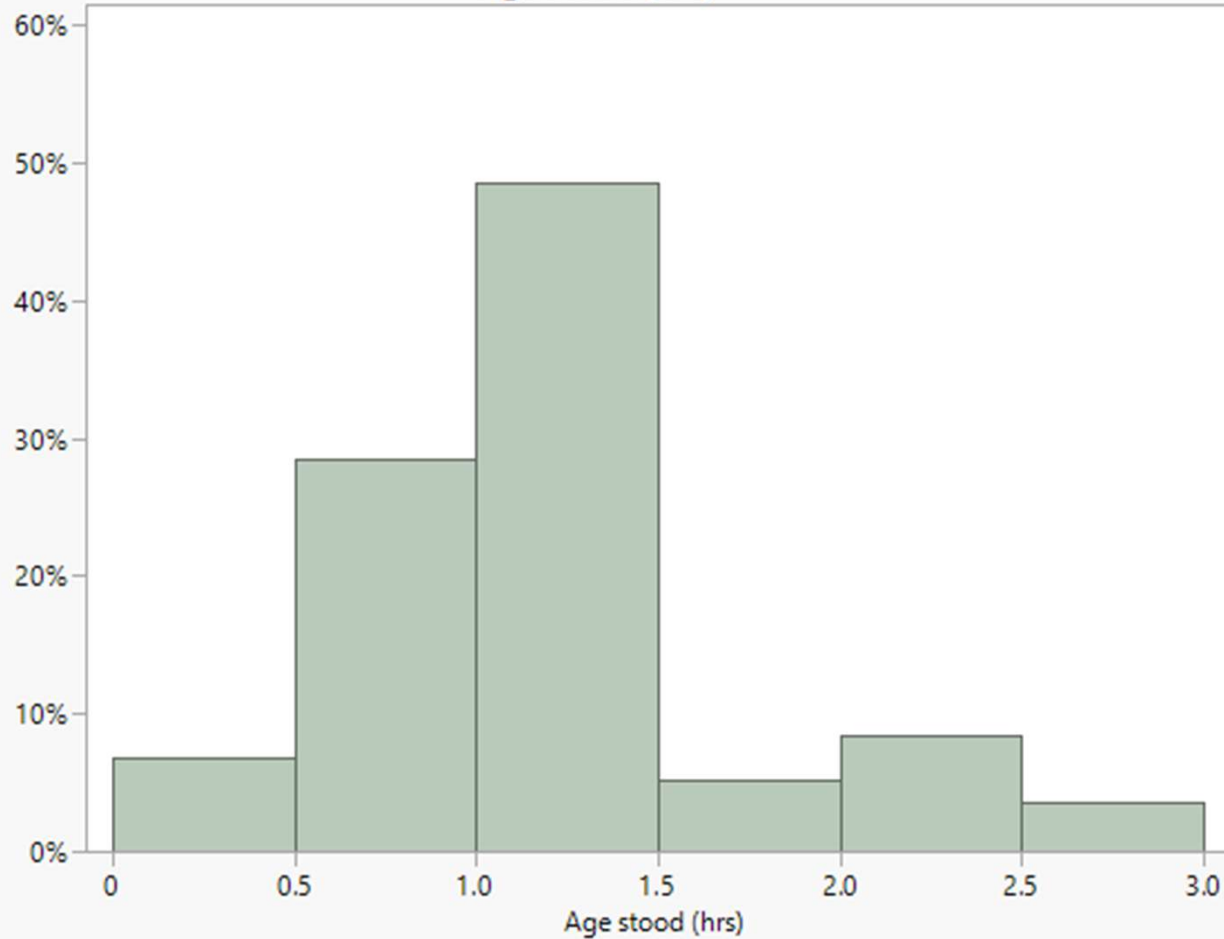
Mean:  $1300 \pm 445$

58% between 800-1600



## RESULTS: Time to standing

Age stood (hrs)

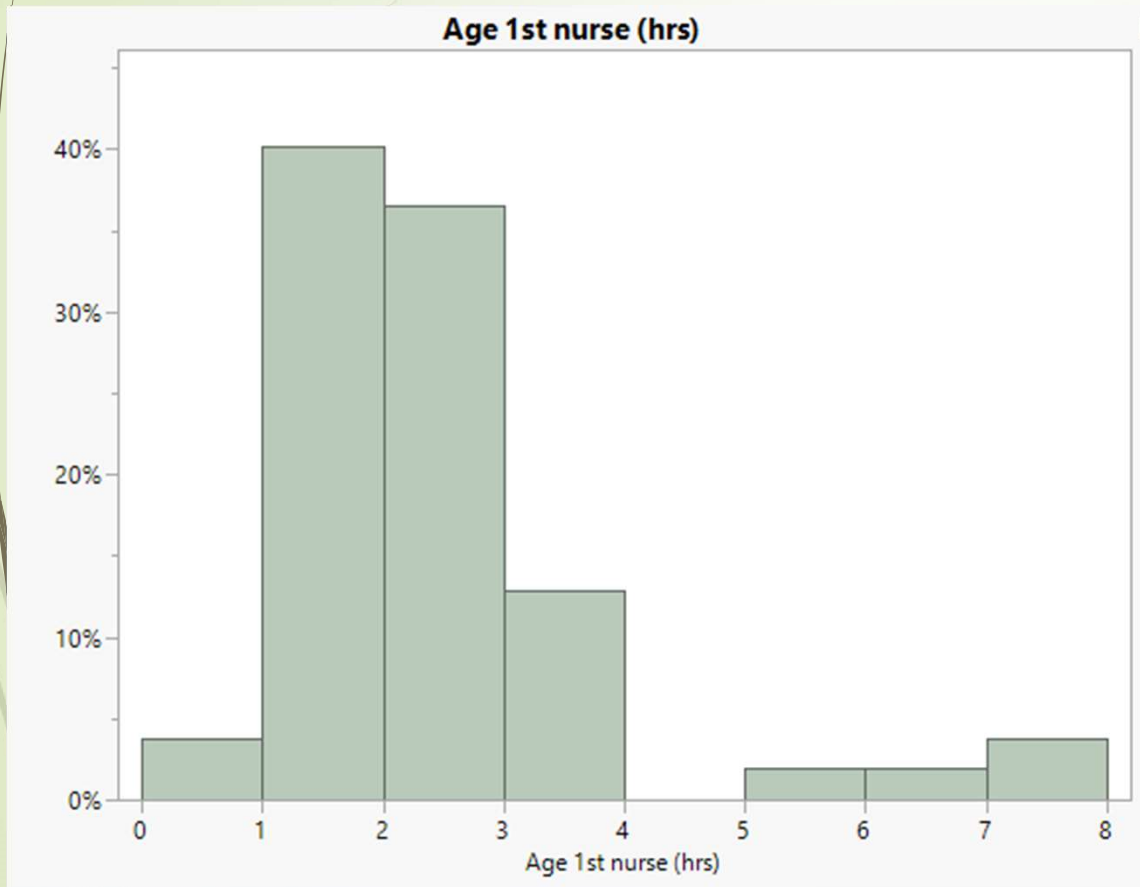


➤ N=60

➤ Mean:  $1.05 \pm 0.49$  hr

➤ Range: 0.38-2.5 hr

## RESULTS: Time to first observed nursing



➤ N=55

➤ Mean:  $2.18 \pm 1.40$  hr

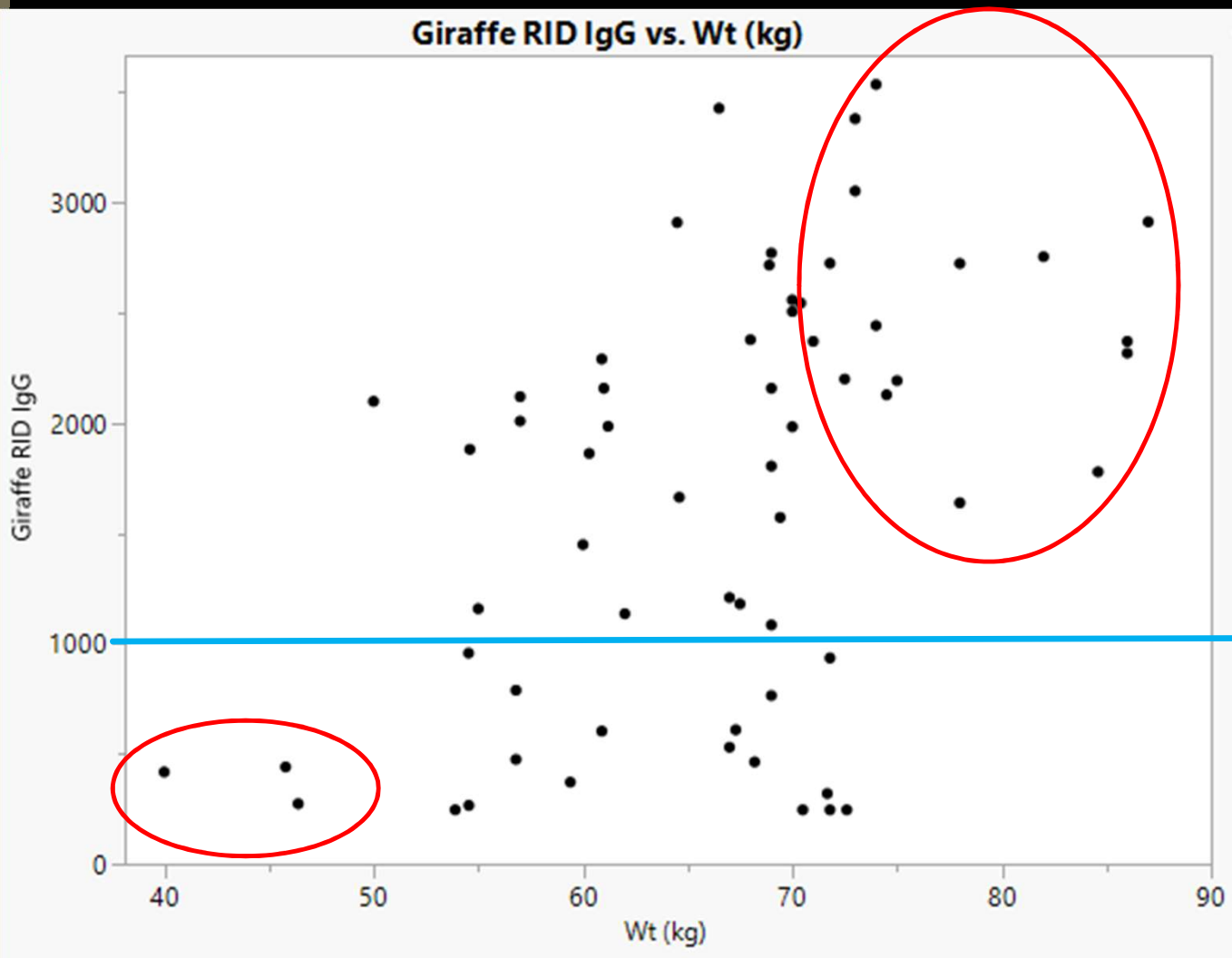
➤ Range: 0.52-7 hr



# Radial immunodiffusion Assay (RID)

- Measured using a novel *gold standard* test we developed:
  - Giraffe species specific RID
  - Allows *DIRECT* measurement of IgG
- Normal calf immunoglobulin:
  - Mean:  $1,702 \pm 9.51$  mg/dL





## RESULTS: Birth weight

- N=65
- Mean: 66.82 kg  $\pm$  9.86 kg
- Range: 40-87 kg
- No significant difference between
  - Sex
  - Subspecies

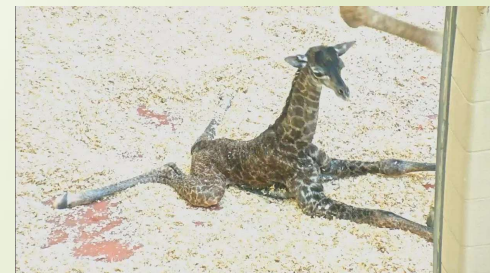
# Abnormal calves (22 animals)

- Total giraffe calf population
  - mortality rate= 5.3% (n=5/93)
- Abnormal giraffe calf
  - 23% mortality rate (n=5/22)
  - 86% required medical intervention (n=19/22)
  - 60% had FPI(n=13/22)
    - Mortality rate of 38% (n=5/13)
    - Resulted in: Sepsis, Respiratory disease/pneumonia, Diarrhea, Septic arthritis, Enterocolitis, Peritonitis



# Musculoskeletal abnormalities

- 41% of abnormal calves had a musculoskeletal abnormality (n=10/22)
  - Failure of passive immunity in 40% (n=4/10)
  - Mortality rate of 20% (n=2/10)
  - Causes:
    - Knuckling=1
    - Contracted (carpi)=2 (1 unable to stand)
    - Dropped (hocks, carpi)=4
      - resolved in all, 3/4 without medical intervention
      - 0% had FPI (IgG range: 1561-2807 mg/dL)
    - Trauma (splay, dislocation, other): n=3





# How can we use this info?

- ▶ Parturition parameters that result in healthy calves
  - ▶ Born year around, inside and outside, with herd and separated
  - ▶ Born all times of day (daytime more frequent) and times of year
  - ▶ Dams: good body condition with no health concerns



# How can we use this info?

- Help identify calves at increased risk for failure of passive immunity and **INTERVENE EARLIER**

***Initial data recommendations for intervention with calves that are:***

- ***Not standing by 2-2.5 hours***
- ***Not nursing by 7 hours***
- ***Calves less than 50 kg in weight with suspect nursing***

***GIVE COLOSTRUM REPLACER!!!!***

# What's next and in the works...?

## ➤ Future study:

- Retrospective study on causes of mortality in calves less than 1 year old → Expect a survey VERY soon!

## ➤ In the works:

- Reference ranges for neonatal giraffe bloodwork
  - CBC
  - Chemistry
  - In-house passive transfer tests
- Assessment of risk factors for failure of passive transfer of immunity in giraffe calves (abnormal vs normal calves)
- Giraffe calf plasma transfusion study to improve recommendations





## How you can help...

▶ Contact: [kthompson@binderparkzoo.org](mailto:kthompson@binderparkzoo.org), cell: 707-217-3268

▶ Samples we NEED still:

▶ **Colostrum:**

- ▶ 1 week before up to 1 week after calving (opportunistic, dystocia, etc?)
- ▶ Consecutive samples accepted
- ▶ Amount 5-30 mls frozen in Cryovials

▶ **Calves that receive bovine COLOSTRUM OR PLASMA transfusions**

▶ CONTACT ME FOR DETAILS IMMEDIATELY

▶ Samples we need:

- ▶ Serum: 1-4 mls frozen in cryovials from calf BEFORE and AFTER colostrum and/or plasma transfusion
  - ▶ Repeated samples from ANY time the calf is bled





# THANK YOU and QUESTIONS!

- MSU CMIB PhD program
- Funding:
  - Binder Park Zoo Research Fund
  - Robert and Eleanor Devries Professional Scholarship
- PARTICIPATING INSTITUTIONS:
  - Audoban Nature Institute, San Diego Zoo Safari Park, Disney's Animal Kingdom, Binder Park Zoo, Denver Zoo, The Living Desert, Caldwell Zoo, Safari West, Sacramento Zoo, The Maryland Zoo of Baltimore, Blank Park Zoo, Ft. Wayne Children's Zoo, Santa Barbara Zoo, Milwaukee County Zoo, Lion Country Safari, Roosevelt Park Zoo, Phoenix Zoo, Houston Zoo, Indianapolis Zoo, Toledo Zoo, Cheyenne Mountain Zoo, Virginia Zoo, Kansas City Zoo, Fossil Rim Wildlife Center, Woodland Park Zoo, Busch Gardens Tampa Bay, Franklin Park Zoo, Columbus Zoo and Aquarium, Cleveland Metroparks Zoo, Ft. Worth Zoo, The Wilds, Abilene Zoo, Brevard Zoo, Zoo New England, and Dan Houck.

