Heart Score Comparisons between Finished Beef and Beef on Dairy Animals

I. M. Kukor [α], R. M. Enns [α], T. Holt [β], M.A. Cleveland [γ], G. Sardella [γ], B.P. Holland [δ], A.B. Word [δ], G.B. Ellis [δ], M. Theurer [ε] and S. E. Speidel [α]

[α]Department of Animal Sciences, Colorado State University, Fort Collins, CO, 80523-1171
[β] Department of Clinical Sciences, Colorado State University, Fort Collins, CO, 80523-1171
[γ] ABS Global, DeForest, WI.
[δ] Cactus Research, Amarillo, TX.
[ε] Veterinary Research and Consulting Services LLC, Cimarron, KS.

Colorado State University

Previous Research on Heart Scores

- In beef cattle at moderate altitude, score 3 hearts tend to be cattle with higher carcass weights, presumably these would include cattle considered to be genetically superior in carcass and performance traits (Kukor et al. 2022).

- Dairy cattle often die due to heart failure earlier in the feeding period compared to beef, but beef cattle were overall found to have higher risk of heart failure in comparison to dairy and beef on dairy cattle (Johnson et al. 2023).

- Heart scores were positively correlated with the percentage of Angus ancestry observed by genomic breed analysis in a previous study. (Buchanan et al. 2023)

Feedlot Heart Disease

- Condition affecting the cardiovascular system feedlot cattle at low to moderate altitudes (1,500m below).

- No direct cause at the feedlot.

- Some research done on cattle breeds, but unknown origins of the disease.
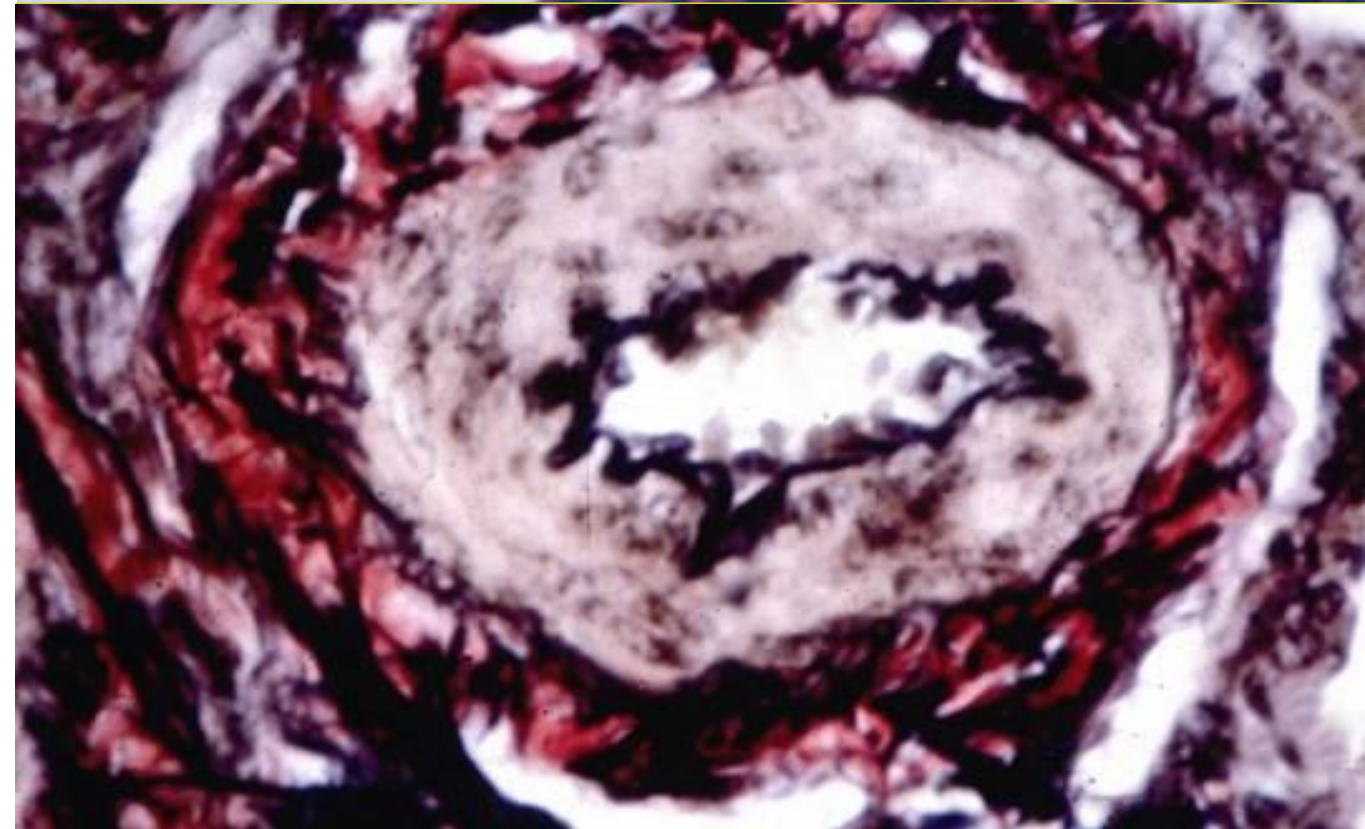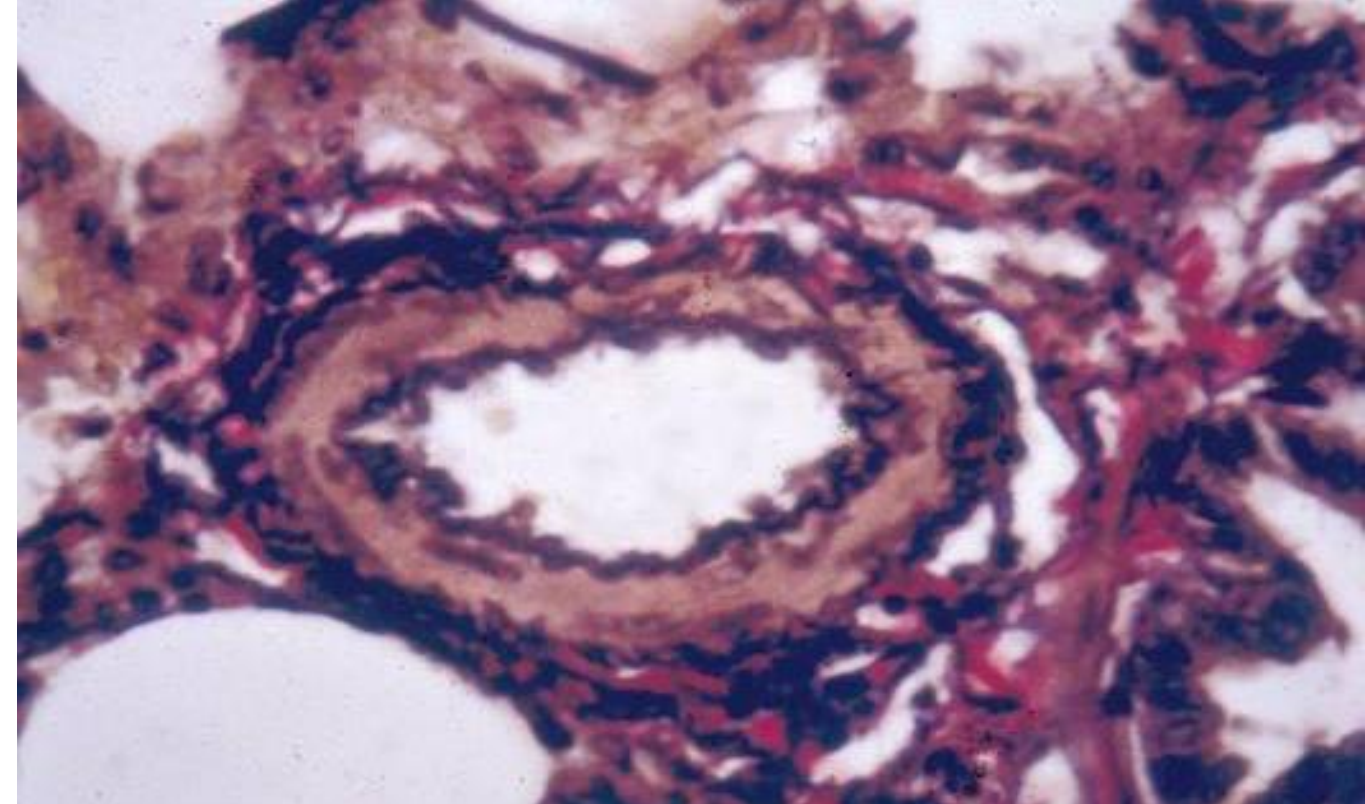
Progression of Pulmonary Hypertension

Pulmonary oxygen decreases, alveolar hypoxia

⬇

Constriction of pulmonary artery
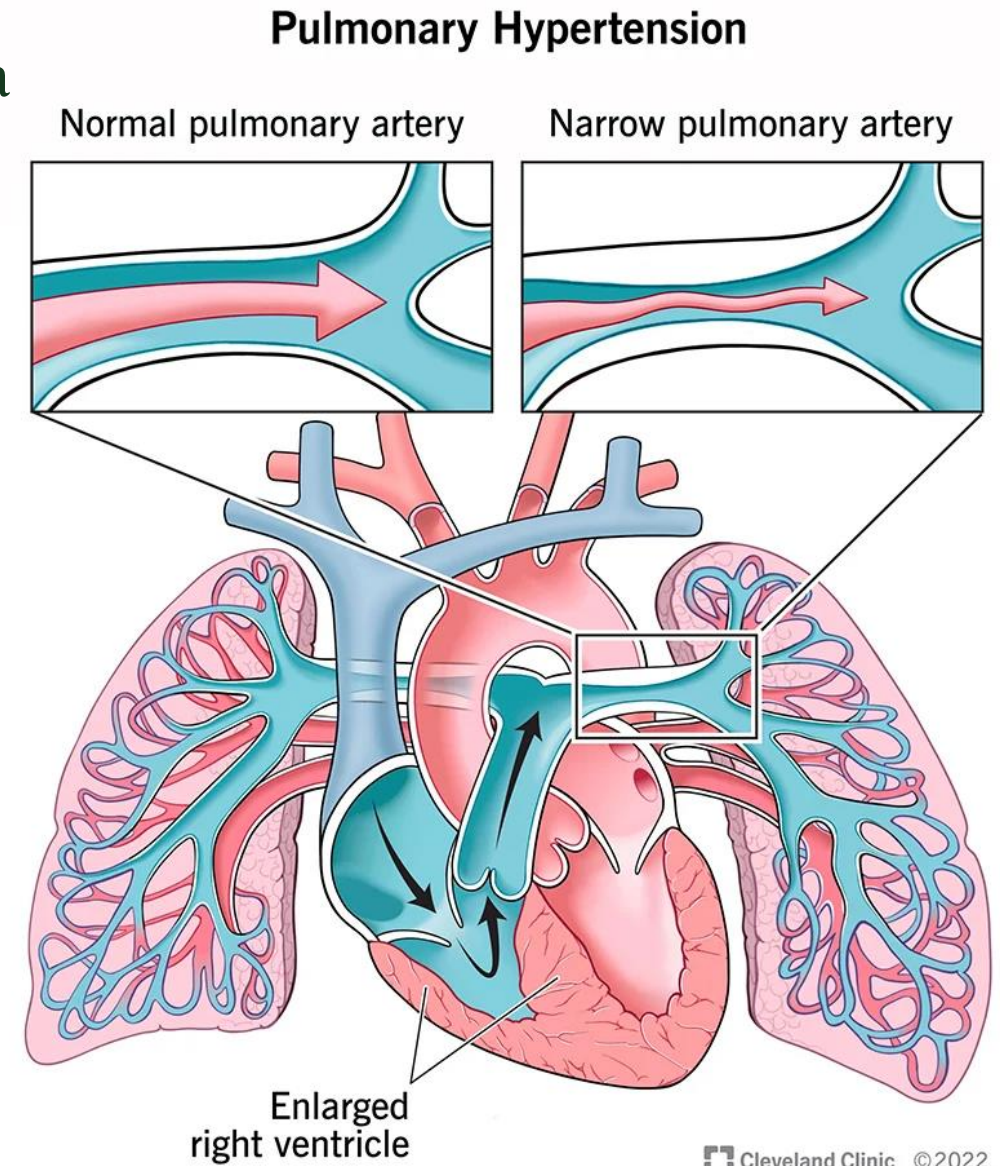
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Smooth muscles grow in pulmonary artery
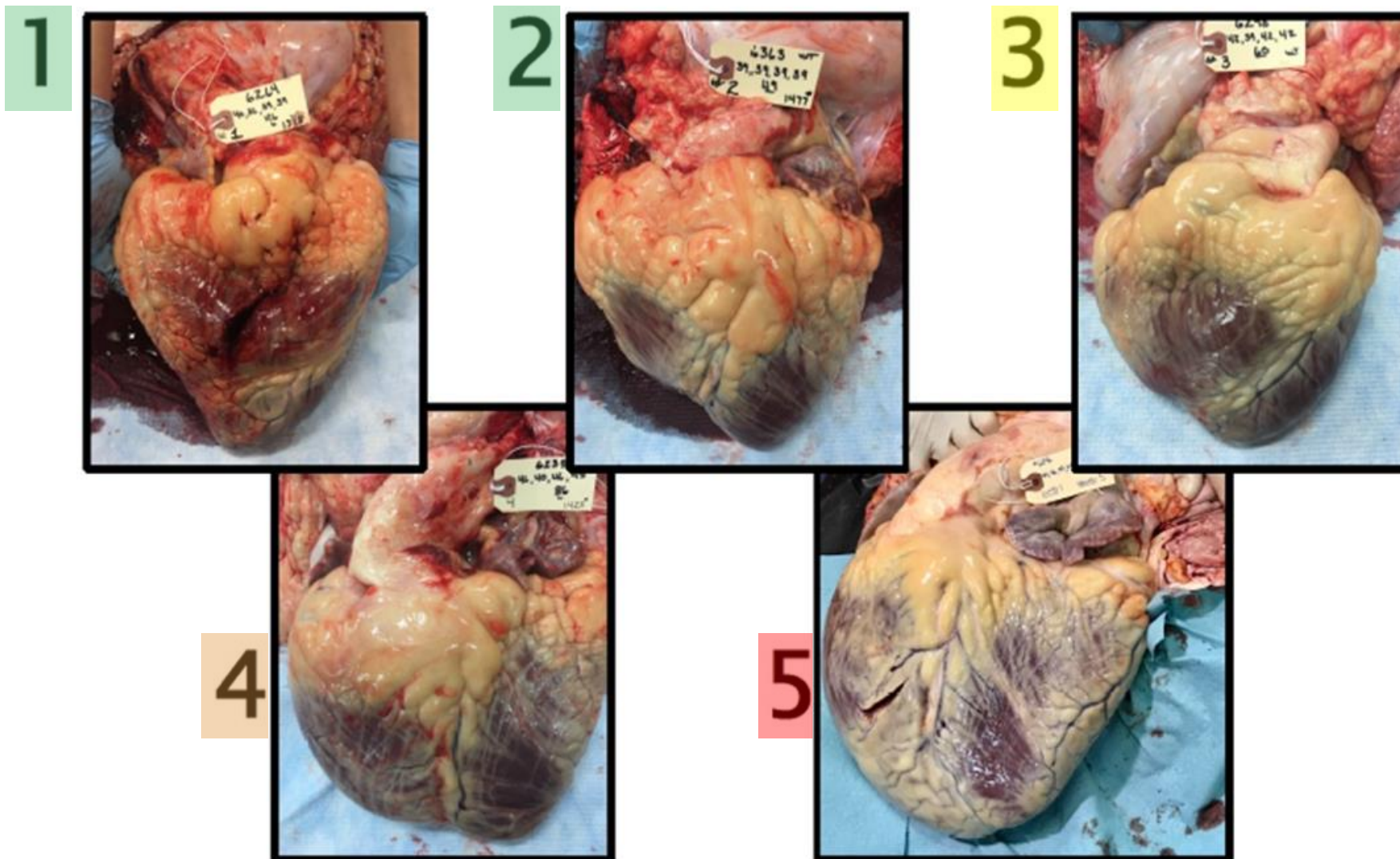
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Narrowing of blood vessels

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Pulmonary arterial pressure increases

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Heart Failure and Death

Pulmonary Hypertension

Normal pulmonary artery | Narrow pulmonary artery

Enlarged right ventricle

Cleveland Clinic ©2022

Heart Score Grading System

Heart Failure in Beef Cattle

- Can occur at any type of beef operation, age, and altitude.
- According to the USDA, the Western Plains of the United States and Canada are the most at risk, can cost $**250,000** for just one operation.
  - In some cases, heart failure is more significant than bovine respiratory disease.
- Previously, the prevalence rate has been found to be close to 30%.
- Difficult to manage as multiple diseases such as congenital heart defects, hardware disease, and bovine respiratory can all cause heart failure or appear the same symptoms.

Heart Failure in Dairy Cattle

- Difficult to determine prevalence.
    - Previous CSU studies had 11% incidence rate for beef on dairy animal.
    - No known incidence rate among the dairy cattle raised in dairy management.
    - Right sided heart failure is either not a problem or other problems may receive more emphasis.
- Beef production through dairy animals are not managed the same.

Introduction of Beef x Dairy Production

- Advantageous breeding management tool for dairy producers to use beef semen on milking cows.

  – Holstein steers make up ~20% of the cattle enter the supply of fed cattle for slaughter.

  – Beef on Dairy progeny tend to be intermediate in carcass/performance qualities, often outdoing dairy x dairy progeny.

  – ~$100 per head more than Holstein steers

  – Affected by right sided heart failure?

Objective

Examine the prevalence of heart remodeling in beef and dairy cattle breeds and to investigate whether some breeds had a higher prevalence of heart remodeling.

Our Study

Beef Cattle:

- Raised at moderate elevation, panhandle of Texas
- Angus, Simmental, Other
- Days on feed 95-146 days
- 831 head

DairyX:

- Raised at moderate elevation, western Kansas.
- Holstein, Jersey, Angus, Simmental
- Days on Feed: 196-256 days
- 476 head

All cattle:

- All cattle raised in feedlot system.
- Harvest dates includes years 2020-2023.
- Both breeds had mix of heifers and steers.
- Data analyzed in RStudio.
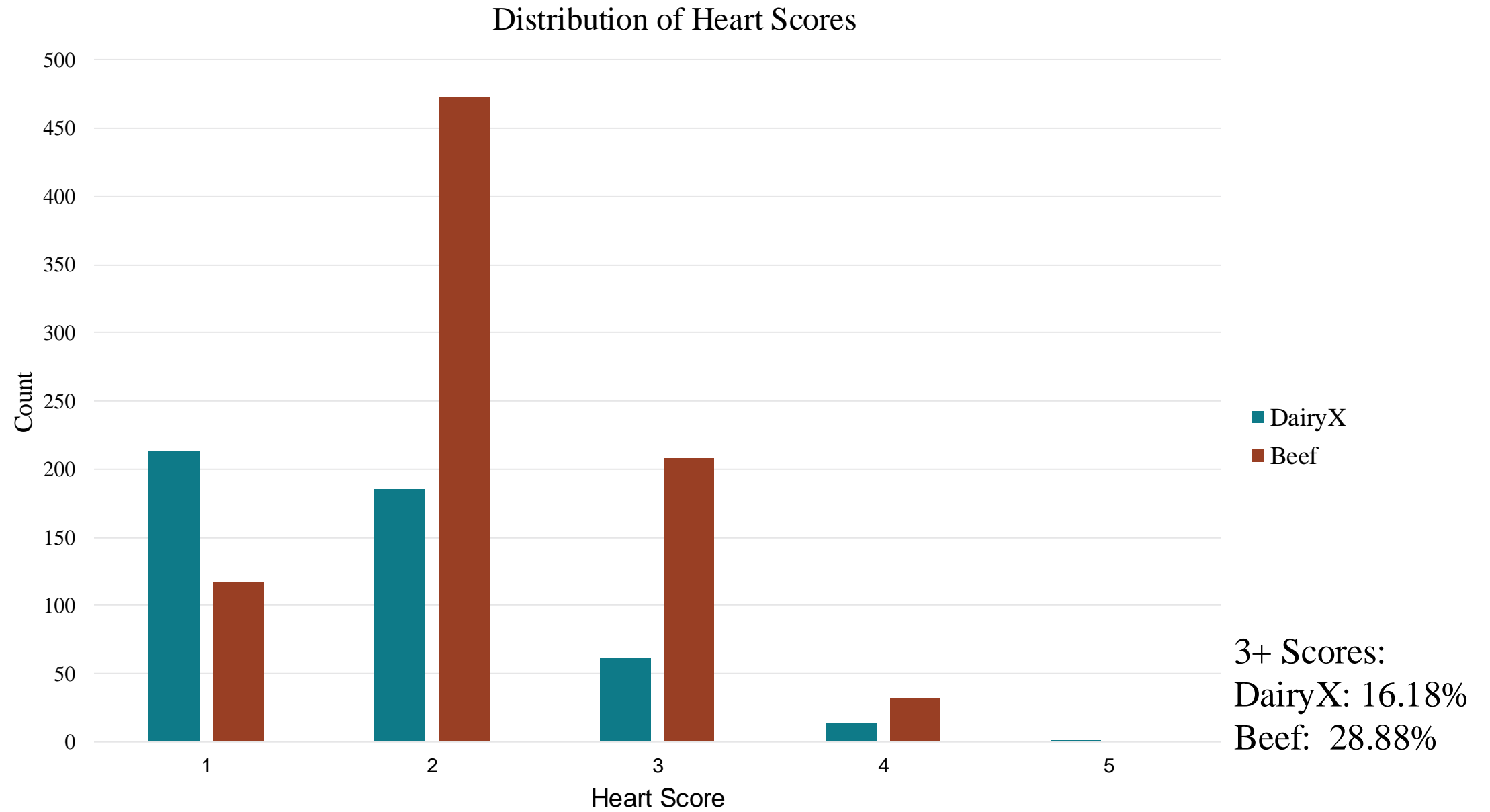- Total head: 1,307

Breakdown of Breeds

Breed Compositions Distributions of Heart Scores

Ranges of the Percentage of Breeds in Data

Angus: 0%-100%

Simmental: 0%-93%

Jersey: 0%-69.22%

Holstein: 0%-78.06%

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Results

Distribution of Heart Scores

3+ Scores:
DairyX: 16.18%
Beef: 28.88%
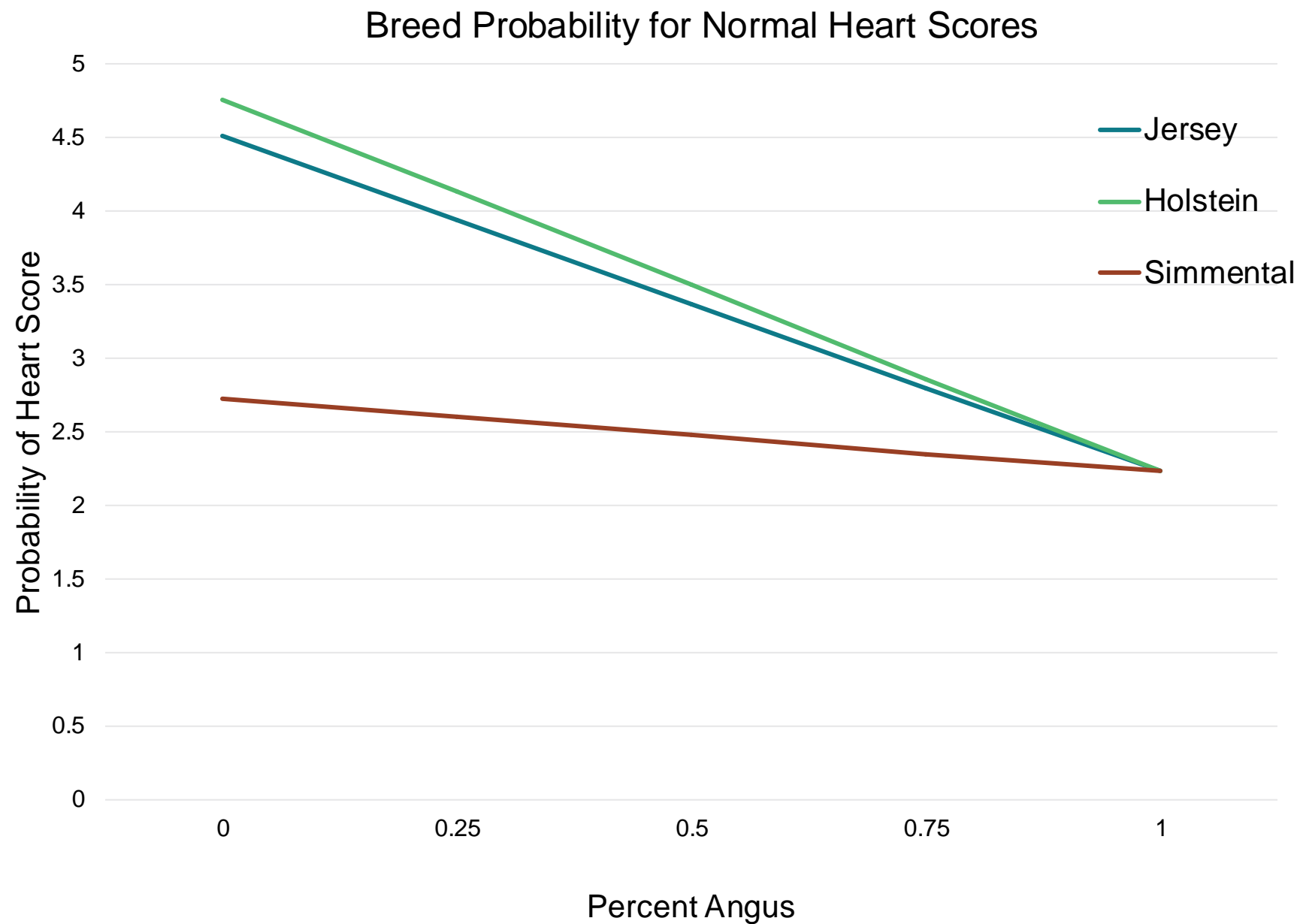
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Results Model

Heart Score ~ % Angus + % Simmental + % Jersey + % Holstein + Heart Scorer

Coefficient	Estimate	Standard Error	p-value
Intercept	2.83920	0.003	<2e-16
AAN	-0.005	0.003	0.05611 .
SIM	-0.008	0.003	0.016663 ***
JER	-0.014	0.004	0.00002***
HOL	-0.018	0.004	0.0000***

Breed Probability for Heart Scores: Angus Influenced

Conclusions

- An increased percentage of either Jersey or Holstein breed resulted in higher probability of lower heart scores.

- Incidence of beef breeds was found to be associated with some to little difference in the improvement of heart scores, alluding to potential breeding advantages for beef on dairy producers.

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Questions? Thank you!