Ehlers-Danlos Syndrome in a Beef Calf

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Herd History

- Southern North Carolina mixed beef herd with Angus and Angus cross predominantly.
- Herd has 135 cows with calves and 6 Angus bulls.
- Calving season 2011 had 1 calf with suspected fragile skin disease.
- Calving season 2012 had 3 calves with suspected problem and the third was submitted for necropsy.
Herd History (cont.)

- Calving season 2012 was 90% complete by the time of necropsy of the submitted calf.
- No other disease problems or dystocia reported from the herd.
- Herd bulls were not changed from breeding season 2011 to breeding season 2012.
Individual Calf History

- The first 2 calves, not presented, died at 2-3 days of age and were born with or developed lax joints.
- These 2 calves also had numerous lacerations over the metacarpal areas.
- The third calf, presented for necropsy, was 3 weeks-of-age at presentation.
Individual Calf History (cont.)

- The necropsied calf was thin, BCS 2/9.
- Degloving injuries were located over the metacarpal regions. Lesions looked like “barbed wire injuries”.
- The skin was subjectively half normal thickness.
- Skin was not resilient and tore easily by hand.
Gross Appearance
(this is not a calf)
Biochemistry of Ehlers-Danlos Syndrome VIIc

- The genetic defect in calves is the same as the genetic defect in humans.
- Only 6 humans described with this syndrome.
The fibripositor secretory pathway.

Collagen assembled as the Procollagen enters Golgi

Procollagen produced in rER

Elizabeth G. Canty, and Karl E. Kadler J Cell Sci
2005;118:1341-1353

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Biochemistry of Ehlers-Danlos Syndrome VIIc (cont.)

Recommended Name:
Disintegrin and (zinc) metalloproteinase with thrombospondin motifs 2

Also:
Procollagen 1-N-peptidase pNPI

Action:
pNPI cleaves N-terminus of procollagens 1 and 2
The genetic defect in calves is the same as the genetic defect in humans.

There is a C\rightarrow T transition in the gene that causes a 17bp deletion in protein pNPI.

Normal pNPI causes excision of the N-terminal peptide of procollagen Types I and II.
Biochemistry of Ehlers-Danlos Syndrome (cont.)

- When the C→T transition occurs (as in the calf),
- This results in a 17bp deletion of pNPI.
- pNPI defect prevents cleavage of procollagen 1 and procollagen 2.
- Thus, the procollagen fibrils are never activated to produce collagen Types 1 and 2.
Biochemistry of Ehlers-Danlos Syndrome (cont.)

- When the procollagens-1 and -2 fail to convert and intertwine to form Collagen Type 1 and Collagen Type 2, the resulting loss causes joint laxity and loss of skin tensile strength.
Clinical Findings

- In human and veterinary patients with Ehlers-Danlos syndrome, the skin, lacking tensile strength will stretch and sag.
- Skin in these patients also tears or lacerates easily due to the lack of Collagen-1 which is the insoluble collagen of skin.
- The skin is also grossly thinner than normal.
Histopathology (Normal calf)

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Dermatosparaxis – calf, low magnification with thin dermis and submucosal hematoma

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Dermatosparaxis – calf, low magnification with homogeneous dermal connective tissue and compacted adnexae
Dermatosparaxis – calf, higher magnification with homogeneous dermal connective tissue and compacted adnexae
Types of Ehlers-Danlos Syndrome Based on Clinical Signs

- Classical Type
- Hypermobility Type (Joints)
- Kyphoscoliosis Type (Defective Bone Collagen)
- Arthrochalasia Type (Hip Luxations/Osteopenia)
- Tenascin-X Deficient Type (Wound Healing Defects)
- Dermatosparaxis Type
Types of Ehlers-Danlos Syndrome Based on Genetic Cause

- Genetic cause usually autosomal recessive or occasionally autosomal dominant – fairly simple
  - Classical Type
  - Hypermobility Type (Joints)
  - Kyphoscoliosis Type (Defective Bone Collagen)
  - Arthrochalasia Type (Hip Luxations/Osteopenia)
  - Tenascin-X Deficient Type (Wound Healing Defects)
  - Dermatosparaxis Type – Autosomal Recessive

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