

Bovine Leukocyte Adhesion Deficiency

By Amy Brent

What is Bovine Leukocyte Adhesion Deficiency (BLAD)?

BLAD is an autosomal recessive hereditary disease affecting young Holstein calves. It was first identified in the early 1980s in Holstein-Friesian cattle. There have been no reports of this disease in other breeds. Heterozygous carriers are clinically normal but heterozygous cows and bulls have a 25% chance of producing homozygous calves that are affected by the disease.

Clinical Signs:

Calves with BLAD are poor-doers. They may be normal at birth with clinical signs appearing within 1-2 weeks of life. They experience recurrent bacterial infections, pneumonia, enteritis, diarrhea, ulcerative and granulomatous stomatitis, delayed wound healing and usually die within 2-4 months of age. Hematologically, these animals have a mature neutrophilia (often >100,000) without a left shift, lymphocytosis and monocytosis. They also are hypoalbuminemic, hyperglobulinemic, have a low creatinine, urea nitrogen and glucose. Some animals may live past 2 years old but they have stunted growth and suffer from recurrent infections of the skin, gastrointestinal and respiratory tracts. The gastrointestinal and respiratory tracts seem to be the most severely affected with severe necrosis of both found on necropsy. Some studies have been done to try and prove that heterozygote cows may have decreased mastitis resistance. However, results show that carriers have no immune dysfunction. It has also been proven that the mean birth weight of calves heterozygous for BLAD is no different than the mean birth weight of homozygous normal calves, therefore suggesting that carriers have no disadvantage to normal calves.

Pathogenesis:

The CD18 gene has been identified as the site of mutation causing BLAD. Animals with BLAD have two point mutations of the alleles encoding CD18. One mutation is called D128G; here there is an aspartic acid to glycine substitution at amino acid 128. The second mutation is silent. These mutations cause a reduced expression of the beta-2 integrin adhesion molecules on the surface of white blood cells. Without these adhesion proteins the white blood cells are unable to travel to sites of infection and help fight them off.

Frequency of BLAD:

BLAD is a common disease but is decreasing in frequency. All homozygous animals can be traced back to a single male ancestor that is present in the dam and sire pedigree, Osborndale Ivanhoe, who is known to have the largest impact on the Holstein gene pool due to his genetic impact on milk production. Penstate Ivanhoe Star and Carlin-M Ivanhoe Bell, offspring of Osborndale Ivanhoe, are other sires that have been diagnosed as carriers that are responsible for the spread of BLAD. Some of these bulls may be related to 10% of the registered female

Holsteins in the U.S. Reports vary, but possibly up to 24% of registered artificial insemination bulls are carriers, however, the diagnostic test developed to genotype cattle is helping to eradicate BLAD in future registered A.I bulls.

Diagnostic Testing:

The test done to determine the status of animals is a DNA test using PCR. By using PCR the mutation in the DNA of the animal can be detected. Many specimens can be used to for the test including blood, skin or hair. There are no age requirements for the test. The Holstein Association of America uses Immgen and Genetic Visions but is starting to use a testing laboratory in Canada called Genetic Analytics.

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