VIKINGGENETICS

Genetic information guide

Holstein

Name	Long name	Symptoms	Carrier	Free	Carrier frequency in Nordic population*	Not accepted in the VG breeding programme
BL	Bovine Leukocyte Adhesion Deficiency	BLAD is a fatal progressive immune defect, which gives reduced resistance to infections followed by growth inhibition. The calves are disposed to infection from birth, but their lifetime varies.	BLC	BLF	<1%	x
BY	Bovine Brachyspina Syndrome	The foetuses are often aborted but some calves are born around time of delivery. These calves are either stillborn or unviable. Full born calves have a very low birth weight (approx. 10kg) the spine and body are abbreviated.	BYC	BYF	1%	x
CD	Hereditary cholesterol efficiency	CDH is a defect in cholesterol metabolism. CDH causes poor uptake of fat in the feed, which has a negative influence on growth and health. As calves get a lot of their energy from fat in milk the first weeks of their lives, the defect results in inhibitory growth of the calves as they cannot utilize the fat from the milk optimally. The calves (**Homozygotes**) affected by the defect show signs of serious cholesterol deficiency and usually die within a few days or a couple of months after birth. Typically, chronic diarrhoea and loss of weight. **Heterozygotes** will normally survive but have reduced cholesterol uptake	CDC	CDF	<1%	x
CV	(Coplex Vertebral Malformation) marked “CV”	The foetuses are often aborted, but some calves are born around time of delivery. Most frequently, the calves are stillborn as they breath with difficulty because of deformed ribs. The calves have more or less noticeable shortage of the neck	CVC	CVF	<1%	x
Mulefoot	Syndactylism	An inherited defect where the bones of toes 3 and 4 merge into one bone. The animals have a hoof-like formation instead of a proper hoof and the deformation can occur on one or several legs. The defect has been known for more than 100 years.	MFC	MFF		x
HH1	Holstein Haplotype 1	The defect cause early foetal death (spontaneous abortion) but can also happen through the whole pregnancy.	HH1C	HH1F	2%	
HH2	Holstein Haplotype 2	Primarily spontaneous abortion within the first 100 days of the pregnancy.	HH2C	HH2F	<1%	
HH3	Holstein Haplotype 3	Primarily spontaneous abortion within the first 60 days of the pregnancy.	HH3C	HH3F	4%	
HH4	Holstein Haplotype 4	HH4 cause early spontaneous abortion. Heifers experience the biggest effect. For cows who carry the gene the effect is less.	HH4C	HH4F	2%	
HH5	Holstein Haplotype 5	HH5 is causing spontaneous abortion when foetus is homozygote	HH5C	HH5F	-	
HH6	Holstein Haplotype 6	The effect of HH6 is spontaneous abortion in homozygotes foetuses	HH6C	HH6F	<1%	
HH7	Holstein Haplotype 7	The effect of HH7 is spontaneous abortion on homozygotes	HH7C	HH7F	<1%	

VIKINGGENETICS

Red breeds

Name	Long name	Symptoms	Carrier	Free	Carrier frequency in Nordic population*	Not accepted in the VG breeding programme
PI	PIRM (Ayrshire Haplotype 1)	AH1 primarily causes spontaneous abortion within the first 100 days of the pregnancy. If calves are born with a double dose of AH1 they will have body defects (e.g. heavy eyelids, structural change in the head or limp muscles) and inhibitory growth. There has also been reports of learning disabilities (difficulty in drinking, etc.). There is a high frequency of the defect in the North American Ayrshire populations.	PIC	PIF	3%	
AH2	Ayrshire Haplotype 2	Early foetus death.	AH2C	AH2F	2%	
BH1	Braunvieh Haplotype 1	Causes spontaneous abortion - usually before day 60 of the pregnancy, if the foetus has double dose of the defect.	BH1C	BH2C	-	
BH2	Braunvieh Haplotype 2	Many of the calves with the mutation in double dose (homozygotic) are stillborn or die shortly after birth. It is common for them that they have a low birth weight and are underdeveloped. The calves, which live longer, suffer from chronic lung disease resulting in little growth and high young animal mortality. Most of these calves die or are put down within the first month, however a few can survive. Surviving calves suffer from repeated airway diseases and inhibitory growth, and will most likely die or be put down.	BH2C	BH2F	<1%	
BTA12	Bos Taurus Autosome 12	The defect causes spontaneous abortion in early stage of pregnancy for homozygotic foetuses.	B12C	B12F	15%	
BTA23	Bos Taurus Autosome 23	A double dose (homozygote) causes abortion late in the pregnancy or a stillborn calf. The foetuses are not deformed.	B23C	B23F	2%	Carriers only used as sires of sons
FM	Shrimp gene	The shrimp gene is a genetic defect. It is an enzyme, which breaks down a fishy smell in the milk. Lack of this enzyme results in the milk getting a smell, which reminds of fish or shrimps. The shrimp gene is a recessive trait, which means that a cow must inherit the defect from both parents for the milk to get an after-taste/smell of fish. Cattle with the defect (or carriers of the defect) are viable and well and have no visible signs of the defect.	FMC	FMF	5%	
SM	Spinal muscular atrophy	Disease in the central nervous system comes from Brown Swiss. The nerve cells in the spinal cord, which control the muscle functions, die, after which the connection to the muscles decrease. It is detected especially with 1-12 weeks old calves but can also be seen at birth. The disorder appears when the calves show signs of weakness and have problems standing up. The disease is progressive and the sick animal will end up not being able to stand up at all. The calves often get pneumonia and the disease is fatal.	SMC	SMF	1%	x

SD	Spinal Dysmyelination (Medfødt lammelse)	This is a disease in the central nervous system, which causes the calves from birth to have spasms in the limb muscles and not being able to stand up. The disease is caused by a defect in some of the nerve paths of the spinal cord. The transaction of impulses through the spinal cord is therefore disturbed. The disease is inherited, and the symptom is the calf lying on its side with the head backwards and straight legs. When the calf is lying on the chest, it will look relatively normal. The disease is fatal.	SDC	SDF	<1%	x
WE	Bovine progressive degenerative myeloencephalopathi 'Weavers syndrome'	Progressive disease in the central nervous system. The first small signs of the disease appear when the animal is 5-8 months old, however clear symptoms first show when the animal is 1½-2 years old. Therefore, the condition is typically noticed on heifers. The animal finds difficulty in getting up, the back of the body sways and it has problems with placing the back legs correctly. In the final phase, the animal cannot get up and often dies of weight loss.	WEC	WEF	-	
A2	Arthrogryposis multiplex congenital (AMC)	Hereditary condition, which is characterized by the calf being severely stunted. The condition is fatal and often gives calving problems. This condition can be a result of several various defects.	A2C	A2F	4%	Carriers only used as sires of sons

Jersey

Name	Long name	Symptoms	Carrier	Free	Carrier frequency in Nordic population*	Not accepted in the VG breeding programme
JH1	Jersey Haplotype 1	Primarily spontaneous abortion before the first 60 days of the pregnancy. The North American population has a high occurrence while it is less in the Danish population.	JH1C	JH1F	9%	

Not breed specific

Name	Long name	Symptoms	Carrier	Free	Carrier frequency in Nordic population*	Not accepted in the VG breeding programme
	Kappa Casein	Two variants A and B combined into AA, AB, BB, AE, BE, EE. The BB variant is preferable into cheese productions, but only a few Dairies pay extra for the BB version				
	Beta Casein	The variant is A1 and A2. Combinations can be A1A1, A1A2 or A2A2. The A2A2 is seen as the preferable version for health perspective even though there is so far no scientific evidence.				
	Polled	POS = tested true polled (homozygous PP) POC = tested carrier of polled (heterozygous Pp) POF = tested free of polled	POC, POS	POF		

*Carrier frequency is estimated on animals born 2017 and 2018

The ones market with grey, the data is not available yet in VG breeding programmes