UCDAVIS VETERINARY MEDICINE
Veterinary Genetics Laboratory

CATTLE GENETIC MARKER TEST REPORT

Provided Information:	***Case:*** **NC108374**
Name: **BUTTERCUP HEIFER**	***Date Received:*** 21-Oct-2026
Registration:	***Report Issue Date:*** 23-Oct-2026
	Report ID: 8145-2484-1958-3142
	Verify report at vgl.ucdavis.edu/verify

DOB: **10/11/2026** *Sex:* **Female** *Breed:* **Scottish Highland**

RESULTS AND INTERPRETATION

Permanent Record.

GENETIC MARKERS

LOCUS	TYPE	LOCUS	TYPE	LOCUS	TYPE
BM1818	262	*BM1824*	180/188	*BM2113*	125/141
BRR	244/258	*CYP21*	190	*ETH003*	117
ETH10	221	*ETH225*	144/148	*INRA23*	198/208
RM006	116/118	*RM067*	90/102	*SPS115*	248
TGLA122	141/143	*TGLA126*	115	*TGLA227*	81/89

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CATTLE GENETIC MARKER TEST REPORT

Client/Owner/Agent Information:	*Case:* **NC108374**
MIKE ISAAC 17020 HEBRON RD HARVARD, IL 60033-9363	***Date Received:*** 21-Oct-2026 ***Report Issue Date:*** 23-Oct-2026 ***Report ID:*** 8145-2484-1958-3142 Verify report at vgl.ucdavis.edu/verify

Name: **BUTTERCUP HEIFER**

Additional Information

If testing for a disease or a disorder was performed and results indicate the animal is affected or at risk, we recommend contacting your veterinarian for further clinical evaluation and for additional information on disease and management.

The Veterinary Genetics Laboratory is an institutional member of ISAG. DNA types are reported according to standardized nomenclature for those markers tested in the ISAG core panel.

For more detailed information on Genetic Marker test results, please visit our website at:
vgl.ucdavis.edu/services/parentage

For terms and conditions of testing, please see vgl.ucdavis.edu/about/terms-and-conditions

Results are determined using PCR-based methods. The results relate only to the sample tested as identified by the submitter (for example, identity and/or breed).

Report authorized by Dr. Rebecca Bellone, VGL Director

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 TESTING LABORATORY

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Genetic Markers Report

What is a Genetic Markers Report?

A Genetic Markers Report consists of a set of species-specific DNA-based identification markers for an animal, similar to a DNA fingerprint. Each animal will, therefore, have a unique combination of these ID markers and this DNA profile can be used for identification and parentage verification purposes.

*Please note that the Genetic Markers Report **does not** provide you with information about your animal's coat color, disease, lineage, or breed.*

What do the results mean?

The markers used in the Genetic Markers Report are called microsatellite markers (or short tandem repeats, STRs). The report contains a list of genotypes for several species-specific markers that were selected either by the International Society for Animal Genetics (ISAG), or by research done at the VGL and/or by others, because there is great variation between individuals in the DNA sequence at each of these markers. Therefore these markers are highly informative for the purpose of animal identification and parentage.

The LOCUS is the name of the marker tested and the TYPE is what your animal has for that marker (i.e. its genotype). Each animal has two copies of every marker (called alleles): one they received from their dam and one they received from their sire. The two alleles for a given marker determines the genotype. The genotypes are listed under TYPE. When the animal has two copies of the same allele (homozygous) at a given marker, that is indicated by a single number or letter, depending on the species. When two different alleles are present (heterozygous), you will see 2 different numbers or letters under TYPE.

How can this be used for parentage verification?

Parentage testing is based on the principle of exclusion. Every animal receives one copy of each genetic marker (or allele) from their sire and one copy from their dam. Based on this, our analysts compare the Genetic Markers Report of the offspring to those of the possible sire(s) and dam(s). Candidate sires and dams may either qualify (no mismatches detected) or be excluded (mismatches detected) as parents based on whether they share microsatellite marker alleles with the offspring or not. If a listed parent or parents are excluded, additional analysis is performed, including retesting of samples and the possible use of additional DNA markers to confirm an exclusion.

For more detailed information about parentage verification visit https://vgl.ucdavis.edu/parentage

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UCDAVIS VETERINARY MEDICINE
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CATTLE COAT COLOR TEST REPORT

Provided Information:	***Case:*** **NC108374**
Name: **BUTTERCUP HEIFER**	***Date Received:*** 21-Oct-2026
Registration:	***Report Issue Date:*** 26-Oct-2026
	Report ID: 9631-9531-1591-3075
	Verify report at vgl.ucdavis.edu/verify

DOB: **10/11/2026** *Sex:* **Female** *Breed:* **Scottish Highland**

RESULT		INTERPRETATION
DILUTION (PMEL17)	**Dh/N**	One copy of the PMEL17-delTTC dilution variant. Coat color is gray or pale-red.
MC1R (EXTENSION)	**e/e**	Recessive red. When bred to another 'e/e' will produce only red offspring.

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CATTLE COAT COLOR TEST REPORT

Client/Owner/Agent Information:	*Case:* **NC108374**
MIKE ISAAC 17020 HEBRON RD HARVARD, IL 60033-9363	***Date Received:*** 21-Oct-2026 ***Report Issue Date:*** 26-Oct-2026 ***Report ID:*** 9631-9531-1591-3075 Verify report at vgl.ucdavis.edu/verify
Name: **BUTTERCUP HEIFER**	

Additional Information

If testing for a disease or a disorder was performed and results indicate the animal is affected or at risk, we recommend contacting your veterinarian for further clinical evaluation and for additional information on disease and management.

For more detailed information on Cattle Coat Color test results, please visit our website at:
vgl.ucdavis.edu/test/mc1r-cattle
vgl.ucdavis.edu/test/cattle-dilution

For terms and conditions of testing, please see vgl.ucdavis.edu/about/terms-and-conditions

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Report authorized by Dr. Rebecca Bellone, VGL Director

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Highland Coat Color

The coat color phenotype in cattle depends on multiple genes. The Veterinary Genetics Laboratory offers testing for Extension (*MC1R* gene) and Dilution (*PMEL17* gene).

The table below shows the expected phenotype based on the various possible genotype combinations of these two genes. While these two loci together explain some coat color phenotypes in Highland cattle, it is important to note that other, yet unknown, genes may influence the resulting coat color observed and the animal may have a different phenotype than what is predicted by the Extension and Dilution genotypes alone.

Extension (*MC1R*)	Dilution (*PMEL17*)	Coat Color Phenotype Predictions
E+/E+	N/N	Red
E+/e	N/N	Red
e/e	N/N	Red
E+/E+	Dh/N	Yellow
E+/e	Dh/N	Yellow
e/e	Dh/N	Yellow
E+/E+	Dh/Dh	White/cream
E+/e	Dh/Dh	White/cream
e/e	Dh/Dh	White/cream
ED/ED	N/N	Black
ED/E+	N/N	Black
ED/e	N/N	Black
ED/ED	Dh/N	Dun
ED/E+	Dh/N	Dun
ED/e	Dh/N	Dun
ED/ED	Dh/Dh	Silver Dun (CAN) or Silver (USA)*
ED/E+	Dh/Dh	Silver Dun (CAN) or Silver (USA)*
ED/e	Dh/Dh	Silver Dun (CAN) or Silver (USA)*

Table 1: Coat color phenotypes based on Extension and Dilution genotypes. *Adapted from Schmutz SM, Dreger DL. (2013) doi: 10.1111/j.1365-2052.2012.02361.x.*

** The Canadian Highland Cattle Society uses the term "Silver Dun" whereas the American Highland Cattle Association refers to this phenotype as "Silver*

For more detailed information about these coat color genes, please visit our website at https://vgl.ucdavis.edu/test/mc1r-cattle and https://vgl.ucdavis.edu/test/cattle-dilution

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DEXTER GENETIC TEST REPORT

Provided Information:	***Case:*** **NC108374**
Name: **BUTTERCUP HEIFER**	***Date Received:*** 21-Oct-2026
Registration:	***Report Issue Date:*** 26-Oct-2026
	Report ID: 2392-3753-0759-7006
	Verify report at vgl.ucdavis.edu/verify

DOB: **10/11/2026** *Sex:* **Female** *Breed:* **Scottish Highland**

RESULT	INTERPRETATION
MC1R (EXTENSION)	Animal has two copies of recessive red and is red in color.
e/e	
Dun (TYRP1)	
Not Requested	
Dexter Dilution (SLC45A2)	
Not Requested	
Pulmonary Hypoplasia with Anasarca (PHA)	
Not Requested	
Polled vs. Horned	HORNED. No copies of either Polled molecular marker are present.
H/H	
Bulldog Dwarfism (BD1)	Normal, does not have the Dexter BD1 Bulldog mutation.
N/N	
Bulldog Dwarfism (BD2)	
Not Requested	

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DEXTER GENETIC TEST REPORT

Client/Owner/Agent Information:	*Case:* **NC108374**
MIKE ISAAC 17020 HEBRON RD HARVARD, IL 60033-9363	***Date Received:*** 21-Oct-2026 ***Report Issue Date:*** 26-Oct-2026 ***Report ID:*** 2392-3753-0759-7006 Verify report at vgl.ucdavis.edu/verify

Name: **BUTTERCUP HEIFER**

Additional Information

If testing for a disease or a disorder was performed and results indicate the animal is affected or at risk, we recommend contacting your veterinarian for further clinical evaluation and for additional information on disease and management.

For more detailed information on Dexter Genetic test results, please visit our website at:
vgl.ucdavis.edu/services/cattle/dexter-tests

For terms and conditions of testing, please see vgl.ucdavis.edu/about/terms-and-conditions

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Report authorized by Dr. Rebecca Bellone, VGL Director

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