



#### Genetic Terms:

**Phenotype:** The characteristics of an animal that can be seen and/or measured.

**Gene:** A segment of DNA on the chromosome that codes for a specific trait and determines how that trait will develop.

**Allele:** A version of a gene. Alleles occur in pairs, one being inherited from the dam and one from the sire.

**Dominant Allele:** A dominant allele will always express itself and will suppress the expression of a recessive allele.

**Recessive Allele:** A recessive allele can only be expressed if a dominant allele is not present.

**Heterozygous:** The two alleles in a gene pair are not alike.

**Homozygous:** The two alleles in a gene pair are alike.

#### Dexter Color Genes

- Melanocortin Receptor Gene
  - MC1R. Also called the Extension Gene.
  - Located at the E locus of Chromosome 18.
  - Controls the inheritance of red and black.
  - Has 3 alleles:
    - Dominant black (abbreviated ED)
    - Recessive red (abbreviated e)
    - Recessive wild red (abbreviated E+)
- Tyrosinase Related Protein 1 Gene
  - TYRP1. Also called the Brown Locus.
  - Located on Chromosome 8
  - Controls the inheritance of dun
  - Has 2 alleles:
    - Normal dominant TYRP1 gene (B)
    - Mutated recessive TYRP1 gene (b)

#### How the TYRP1 Gene Works:

The mutated allele dilutes black pigment (eumelanin) in its homozygous state (bb). If a Dexter inherits two mutated alleles (bb), AND at least one black allele (ED), it will be dun.

The (bb) genetics has no effect upon red coloration.

#### Offspring Color Probabilities

Parent #1	Parent #2	Probabilities		
		Black	Red	Dun
any red animal	any red animal	0%	100%	0%
homozygous black	any animal	100%	0%	0%
black carries red	black carries dun			
black carries red	dun			
dun	red	75%	25%	0%
black carries red	black carries red			
black carries red	black carries red & dun			
black carries red	dun carries red	75%	0%	25%
black carries dun	black carries dun			
black carries dun	black carries red & dun			
black carries red & dun	black carries red & dun	56.25%	25%	18.75%
black carries red	red	50%	50%	0%
black carries red	red carries dun			
black carries red	red homozygous dun			
black carries red & dun	red	37.5%	50%	12.5%
black carries red & dun	red carries dun			
black carries red & dun	red homozygous dun			
dun carries red	red carries dun	25%	50%	25%
black carries red & dun	dun	50%	0%	50%
dun	red carries dun			
black carries red & dun	dun carries red	37.5%	25%	37.5%
dun	dun	0%	0%	100%
dun carries red	dun			
dun	red homozygous dun			
dun carries red	dun carries red	0%	25%	75%
dun	red carries dun	50%	0%	50%
dun carries red	red homozygous dun	0%	50%	50%

#### The Genetics Behind The Color

Gene & Alleles		Phenotype	Description
MC1R	TYRP1		
ED ED	B B	Black	Homozygous black
ED ED	B b	Black	Black carries dun
ED E+	B B	Black	Black carries red
ED e	B B	Black	Black carries red
ED E+	B b	Black	Black carries red and dun
ED e	B b	Black	Black carries red and dun
ED ED	b b	Dun	Dun
ED E+	b b	Dun	Dun carries red
ED e	b b	Dun	Dun carries red
E+ E+	B B	Red	Red carries no dun
E+ e	B B	Red	Red carries no dun
e e	B B	Red	Red carries no dun
E+ E+	B b	Red	Red carries dun
E+ e	B b	Red	Red carries dun
e e	B b	Red	Red carries dun
E+ E+	b b	Red	Red homozygous dun
E+ e	b b	Red	Red homozygous dun
e e	b b	Red	Red homozygous dun

<https://www.vgl.ucdavis.edu/services/coatcolorcattle.php>

<http://homepage.usask.ca/~schmutz/colors.html>

<http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-9574/ANSI-3173web.pdf>

<https://www.ncbi.nlm.nih.gov/pubmed/12755816>

<https://onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2052.2003.00985.x>

Updated: 5/4/2018 Kim Newswanger