

# Equine Multiple Congenital Ocular Anomalies maps to a 305 kb interval on ECA6

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## Background

In 1999, Ramsey *et al.* described the eye disease Multiple Congenital Ocular Anomalies (MCOA) syndrome in the Rocky Mountain horse breed [1]. Various ocular abnormalities, predominantly localized to the frontal part of the eye, were encountered in approximately half of the 514 horses examined. The high frequency of disease is most probably due to a founder effect where extensive breeding from a limited founding stock has propagated the causative mutation(s) in this breed. The anomalies are congenital and non-progressive.

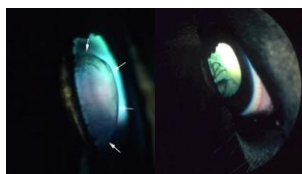
The disease has a co-dominant mode of inheritance with two distinct ocular phenotypes of different severities [2, 3]



MCOA syndrome is most prevalent in horses with the popular Silver coat color. This color is associated with a missense mutation in *PMEL17* [4].

### The Cyst phenotype

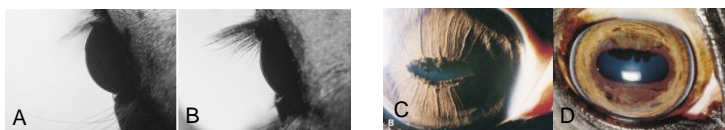
- **Heterozygous** for mutant allele
- Milder form of the ocular abnormalities
- Cysts originating from the temporal ciliary body, peripheral retina or iris
- Moderate retinal dysplasia and/or detachment which appears to be an extension of these ciliary cysts



Cysts of the ciliary body. Photo: David Ramsey

### The MCOA phenotype

- **Homozygous** for the mutant allele
- More severe phenotype with multiple abnormalities
- Examples of clinical signs are cysts, congenital cataracts, iris hypoplasia, iridocorneal angle abnormalities, miosis and cornea globulosa



MCOA affected eye. Note protuberance and enlarged cornea **B**) A healthy eye with normal cornea. **C**) MCOA affected eye. The iris fails to develop normally and the pupil respond incorrect to light. **D**) A healthy eye with normal iris and pupil. Photo: David Ramsey

## Results

We have characterized a 305 kb region that is identical by descent among affected horses. Nineteen genes are harbored within this interval.

Breed	MS1	MS14	PMEL17	MS3	TKY284	MS13	9365	#
RM	269	247	T	233	177	222	T	303
RM	269	247	T	233	175	222	T	53
RM	263	247	T	233	177	222	A	12
IS	263	247	T	231	177	222	A	4
Mini	263	247	T	233	177	222	A	14

**Table 1.** Phased microsatellite and SNP marker data. Only haplotypes containing the mutant allele are shown. # is the number of chromosomes having each haplotype. *PMEL17* is the missense mutation associated with the Silver coat color.

**Table 2.** Horses used for identical by descent mapping

Breed	Phenotype		
	MCOA (AA)	Cyst (Aa)	Unaffected (aa)
Rocky Mountain horse	76	228	82
American Miniature	1	12	35
Icelandic horse	1	2	3

1. Ramsey *et al.* 1999. Congenital ocular abnormalities of Rocky Mountain Horses. *Vet Ophthalmol* 2:47-59  
 2. Ewart *et al.* 2000. The horse homolog of congenital aniridia conforms to codominant inheritance. *J Hered* 91(2):93-8  
 3. Andersson *et al.* 2008. Equine Multiple Congenital Ocular Anomalies maps to a 4.9 megabase interval on horse chromosome 6. *BMC Genetics* 2008 Dec 19:9:88  
 4. Brunberg *et al.* 2006. A missense mutation in *PMEL17* is associated with Silver coat color in the horse. *BMC Genetics* 2006 Oct 9:7:46

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