

# UPPER MIDWEST ENDURANCE AND COMPETITIVE RIDES ASSOCIATION



## RIDE SCHEDULE!

A more detailed Ride Schedule can always be found at UMECRA.com!

Date	Ride Name	Ride City	State
8/20 & 8/21	Bearfoot Boogie	Hinckley	MN
8/27 & 8/28	DRAW's Northern Highland	Gleason	WI
<b>9/5/2022 Labor Day</b>			
9/3-9/5	White River Fall	Hesperia	MI
9/10 & 9/11	Charity Cup	Pillager	MN
9/10 & 9/11	Keweenaw Ride	Marquette	MI
9/10 & 9/11	Lincoln Trails AHA	Kinmundy	IL
9/16 & 9/17	DRAW's Colorama Classic	New Prospect	WI
9/24 & 9/25	Pine Marten Run	Wetmore	MI
10/1 & 10/2	DRAW Finale	Palmyra	WI
10/1 & 10/2	Huntersville Hundred	Menahga	MN
10/8 & 10/9	Iron Oak	Arkdale	WI
10/8 & 10/9	Oak Leaf Run	Hamilton	MI
10/21 & 10/22	Point Chaser	Theilman	MN
10/29 & 10/30	AHDRA - Big River	Keithsburg	IL

## Letter from your UMECRA President....

I hope that everyone is having a good summer. There have been many challenges this season, high gas prices, rain or drought and the heat. Some rides have suffered from low entries. Hopefully with gas prices going down riders will be able to attend more rides.

As we gather for award ceremonies and potlucks remember that our group does include children. It has been brought to my attention that some conversations have not been family friendly.

I hope that the season continues on a high note. As always have fun.

*Sarah Mowrer*

## RIDE RESULTS

AHDRA's Field of Dreams - 7/23/22 - Comp HW 25			
Sarah	Mowrer	A Time To Shine	1
AHDRA's Field of Dreams - 7/23/22 - Comp LW 25			
Jessica	Sonnek	Jazmine	1
Katarina	Candee	Zephyrus TF	2
Lori	Windows	Ella N Fires Jane Doe	3
AHDRA's Field of Dreams - 7/23/22 - End HW 50			
Kaila	Cornell	Romeo	1
Rebecca	Horihan	LC Ernani	P
Sheryl	O'Brien	Wild River Sundancer	P
Carol	Weber	Belesema Exclusiva	P
Crystal	Esqueda	Lopin in Diamonds	P
AHDRA's Field of Dreams - 7/23/22 - End LW 50			
Rebecca	Holthouse	Smokeys Miss Liberty	P
Marianne	Guilfoyle	Gianni Ali Oops	P
Elizabeth	Frieders	Hotsprings Fandango	P
Danielle	Lease	Boo Kids Aster Knight	P

AHDRA's Field of Dreams - 7/23/22 - LD HW 25			
Joshua	Ramon	TRJ Just Jake	1
Jennifer	Frerichs-Ramon	Halley's Comet	2
Monicka	Remboldt	Teddy	3
Diana	Hayes	Buck	P
AHDRA's Field of Dreams - 7/23/22 - LD LW 25			
Amy	Ellingson	Gideon	1
Chute	Alyssa	Finesse MSF	2
Melissa	Esser	Habib Al Mar	P
Jennifer	Mlocek	Onwindntide	P
AHDRA's Field of Dreams - 7/23/22 - Novice 12			
Mary Alice	Addis	Mega Peppy Jac	1
Lessie	Glosser	Merlot	2
Karen	Wineinger	Lilly	3
Nicole	O'Dell-Horie	Shiraz	4
Katrina	Shaner	Rodeo (Halley)	5
Emmy	Carroll	Velvets Hard Rock	6
Skylar	Tolbert	Red	C
Michaela	Treimer	Bebe	C
Kristine	Jubeck	Silver	MO
Joshua	Mowrer	KW Magnum Archie	MO
Amy	Mowrer	EAF Sweet Clementine	MO
Kaylie	Hulsey	Rsecret Dun SoPretty	MO
Emily	Schupp	RedAxel	MO
AHDRA's Field of Dreams - 7/24/22 - Comp HW 25			
Sarah	Mowrer	A Time To Shine	1
AHDRA's Field of Dreams - 7/24/22 - Comp LW 25			
Lori	Windows	Ella N Fires Jane Doe	1
Kristine	Jubeck	Silver	2
Jennifer	Haras	Maverick	3
AHDRA's Field of Dreams - 7/24/22 - LD HW 25			
Monicka	Remboldt	IBN Al Riyah Razeel	1
Kimberly	Rosecrans	Magic	2
AHDRA's Field of Dreams - 7/24/22 - LD LW 25			
Chute	Alyssa	Finesse MSF	1
AHDRA's Field of Dreams - 7/24/22 - Novice 12			
Megan	Kane	Coffee Break	1
Sam	Dreyer	Blue Razzberry	2
Emily	Schupp	RedAxel	MO
Cecilia	Dirks	Sam	P

Bonecrusher - 7/29/22 - Comp HW 25			
Bonnie	Mielke	BNB Khrome Azrael	1
Andrea	Pfeifer	Mytalisha's Titan	2
Gerald	Cummings	Easi Goer	3
Bonecrusher - 7/29/22 - Comp LW 25			
Lori	Windows	Ella N Fires Jane Doe	1
Katarina	Candee	Zephyrus TF	2
Debby	Weisbecker	JM Cest La Vie	3
Bonecrusher - 7/29/22 - End HW 50			
Sherry	Aune	Lily Creek Rhythm	1
Krystyna	Eischens	Chips Diamond Rehalla	2
Maria	Enge	Eleanor Ambrosia B	3
Robin	Schadt	RAL Sorceress (Chloe)	4
Deb	Searle	Sultann Sundance	5

Bonecrusher - 7/29/22 - End Jr 50			
Colton	Eischens	Sir Fettuccine Alfredo Tortellini	1
Miley	Eischens	Eldora	1
Bonecrusher - 7/29/22 - End LW 50			
Jessie	Finnila	Sterlings Starstrider	1
Kaila	Cornell	Romeo	2
Wendy	Maas	FT Firestorm	3
Claire	Godwin	Sundown Reveille+/-	4
Lisa	Delp	Catch me Ridin Dirty	5
Helen	Lynn	Pipers Prime Time	6
Diane	Meinders	Yo Dusty	C
Mary	Howell	Canadian Chrome	C
Elizabeth	Frieders	UpUp And Away JIF	C
Julie	Moore	Tosh Point O	C
Nikki	Blake	Londons Dark Night	C
Bonecrusher - 7/29/22 - LD HW 25			
Guy	Worthington	Dimitri	1
Ann	DeLang	Chocolate Martini	2
TJ	Edwards	Decorah's Double Delight	3
Bonecrusher - 7/29/22 - LD Jr 25			
Grace	Carter	Corona Breeze	1
Bonecrusher - 7/29/22 - LD LW 25			
Jan	Worthington	Golden Lightning	1
Roberta	Harms	Lady Jane	2
Katie	Bachhuber	Noble Promise	3
Laurie	Henschel	Bataania KSR	4
Bobbi	Belz	Spiderman	5
Lindsay	Jackson Nichols	Rockstar Kiss	6
Pamela	Garrison	DB A Bayberry	C
Bonecrusher - 7/30/22 - Comp HW 25			
Andrea	Pfeifer	Mytalisha's Titan	1
Bonecrusher - 7/30/22 - Comp LW 25			
Lori	Windows	Ella N Fires Jane Doe	1
Tracy	Johnson	Mombo Number Five	2
Bonecrusher - 7/30/22 - Drive 12			
Ray	Hubert	JimmyCrackedCorn	1
Amy	Broadie	No Flash Photography	2
Alice	Hubert	Gridlock	3
Bonecrusher - 7/30/22 - End HW 50			
Guy	Worthington	JG Randie	1
Krystyna	Eischens	Chips Diamond Rehalla	1
Kimberly Ann	Fosler	BZ Cojeseryn Sahar	2
Brandon	Brunner	La Grange RTA	2
Gerald	Cummings	Easi Goer	3
Deb	Searle	Sultann Sundance	3
Maria	Enge	Eleanor Ambrosia B	P
Bonecrusher - 7/30/22 - End LW 50			
Diane	Meinders	Yo Dusty	1
Jessie	Finnila	Sterlings Starstrider	1
Ann Marie	Barnett	VA Chazzmyne	2
Wendy	Maas	Jack	2
Bobbi	Belz	Duke	3
Lisa	Delp	WMA Sandpainting	3
Lindsay	Jackson Nichols	Ravenswood Nevermore	4
Helen	Lynn	Tugs Spring Fling	4
Claire	Godwin	Serene Zeliza	5
Mary	Howell	Gryphon	6
Shanon	Ployhart	Eternety De Valle	C
Elizabeth	Frieders	UpUp And Away JIF	C
Bonecrusher - 7/30/22 - LD HW 25			
Sherry	Aune	SA Rhythms Sky Rocket	1
Ann	DeLang	Chocolate Martini	1
Nikki	Boesch	Fia Dahlia	2

Bonecrusher - 7/30/22 - LD Jr 25			
Grace	Carter	Corona Breeze	1
Alice	Erickson	A Kings Delivery	1
Rayna	Russian	Silver Russian	2
Miley	Eischens	Eldora	3
Bonecrusher - 7/30/22 - LD LW 25			
Eileen	Kirsch	Hansi	1
Debby	Weisbecker	Ophelia Kkan	1
Pamela	Garrison	DB A Bayberry	2
Nikki	Blake	Londons Dark Night	2
Sally	Hoff	Gloryius Trinity	3
Jessie	Finnila	Marvelous Maven	3
Nikki	Blake	HTLB Stormy	4
Stepanie	Vavra	Herbee The Love Bug	5
Victoria	Robison	Bullett	6
Bonecrusher - 7/30/22 - Novice 12			
Bruce	Reek	Duke	1
Nicole	Becknagel	Sinatra	2
Gracyn	Schneider	A Kings Delivery	3
Jesica	Mell	Brix	4
Vienna	Finnila	Cheyenne	5
Becky	Overland	Mavis	5
Greg	Garrison	Zayn	C
Devan	Lewer	Nova	C
Jessica	Recknagel	Cupid	C
Laurie	Henshall	Bataana	MO
Alice	Erickson	Ophelia Kkan	MO
Jessie	Finnila	Marelous Maren	MO
Terry	Resch		P
Nan	Resch		P
Bonecrusher - 7/31/22 - End HW 50			
Krystyna	Eischens	Chips Diamond Rehalla	1
Maria	Enge	Faustos Flame	2
Deb	Searle	Sultann Sundance	3
Robin	Schadt	Kayheart	4
Bonecrusher - 7/31/22 - End Jr 50			
Colton	Eischens	Sir Fettuccine Alfredo Tortellini	1
Bonecrusher - 7/31/22 - End LW 50			
Jessie	Finnila	Renegade Raja	1
Julie	Moore	Tosh Point O	2
Helen	Lynn	Quick Sand Suzie	3
Lisa	Delp	Full of Fi Your	4
Bonecrusher - 7/31/22 - LD HW 25			
TJ	Edwards	Decorah's Double Delight	1
Bonecrusher - 7/31/22 - LD Jr 25			
Grace	Carter	Corona Breeze	1
Bonecrusher - 7/31/22 - LD LW 25			
Pamela	Garrison	DB A Bayberry	1

Detroit Horse Power Metropark Express - 8/5/22 - End HW 50			
Audrey	Hager	Da Bomb NPF	1
Sarah	Jax	Al Masree Najm	2
Karri	Wilson Bruskotter	BKR Seance N Moshahn	3
Detroit Horse Power Metropark Express - 8/5/22 - End LW 50			
Lisa	Delp	Catch me Ridin Dirty	1
Helen	Lynn	Pipers Prime Time	2
Mary	Howell	Canadian Chrome	3
Alicia	Mansueti	Foxfire Tradition	3
Diane	Meinders	Yo Dusty	5
Amy	Yatsko	Meritage MHF	6
Caroline	North	Glorfindel	C
Annie	Whelan	Moliero	C
Megan	Grant	FYF Wasabi	C
Susan	Dickinson	Sir Atlas Star	C
Patricia	DeMott	Angel Power	C
Danielle	Wilson	Bravo Tenacious	C
Barbara	Hubler	Skats Beautifull Dawn	P
Detroit Horse Power Metropark Express - 8/5/22 - LD HW 25			
William	Gage	Madjestic	1
Scot	Jensen	Detonatorr	2
Lani	Newcomb	Black Dog's Flynn River	3
Leah	Palestrant	SAA Good As Gold	4
Detroit Horse Power Metropark Express - 8/5/22 - LD LW 25			
Diane	Maxey	LW Constant Sohn	1
Shannon	Weston	Wyrath	2
Kathy	Broaddus	Flo	3
Sara	Hall	WP Yippe Ki Yay	4
Noelle	Synder	Calvados AC	5
Abby	Walker	Interstellar	P
Detroit Horse Power Metropark Express - 8/6/22 - End HW 50			
Karri	Wilson Bruskotter	BKR Poetry N Moshahn	1
Audrey	Hager	Da Bomb NPF	2
Detroit Horse Power Metropark Express - 8/6/22 - End LW 50			
Helen	Lynn	Quick Sand Suzie	1
Mary	Howell	Gryphon	2
Annie	Whelan	Wallace Hill Sundance	3
Renee	Bonsell	Sheebah Aly Essence	4
Carmen	Dahlhoff	Rose	P
Lisa	Delp	WMA Sandpainting	P
Caroline	Loos	Interstellar	P
Detroit Horse Power Metropark Express - 8/6/22 - LD HW 25			
Diane	Maxey	LW Constant Sohn	1
Tom	Babcock	April Storm	2
Kathy	Broaddus	Fougueux	3
Lani	Newcomb	Sinclair	4
Ken	Wright	MSU Soitgoes	5
Sandra	Wright	LW Raajas Chip	6
Lisa	Knapp	Toblerone	P
Don	Knapp	Drifter	P

Detroit Horse Power Metropark Express - 8/6/22 - LD LW 25			
Patricia	DeMott	Bravo Tenacious	1
Danielle	Wilson	VA Wisteriah	2
Maddie	Nagel	Al-Marah Fox Romeo	3
Megan	Grant	Central Park CCF	4
Barbara	Hubler	Band Red	5
Sara	Hall	WP Yippe Ki Yay	6
Lisa	Germann	Ainia DCR	C
Caroline	North	Heavenlei Days	P

Rock River Charity Ride - 8/6/22 - Comp HW 25			
Mike	Mocilan	Count On Psyche	1
Sarah	Mowrer	A Time To Shine	2
Karen	Romine	Jollymon Red	3

Rock River Charity Ride - 8/6/22 - Comp LW 25			
Jessica	Sonnek	Jazmine	1
Lori	Windows	Ella N Fires Jane Doe	2
Katarina	Candee	Zephyrus TF	3
Debby	Weisbecker	JM Cest La Vie	4
Kitt	Schaller	Forrest	5

Rock River Charity Ride - 8/6/22 - Drive 13			
Brooke	Moeller	Rusty Chris-te	1
Tammy	Carlo	Bucksnot's Special Dark	2
Ray	Hubert	JimmyCrackedCorn	P
Alice	Hubert	Gridlock	P

Rock River Charity Ride - 8/6/22 - LD HW 25			
Lucy	Stafford	H WineGlass Sangria	1
Ann	DeLang	Chocolate Martini	2
Frank	Langholf	BZ Sierra Sunrise	3
Marge	Dixon	Bethany Jet	4
Samantha	Echaves	Ritzzy Rozarita	5
Gerald	Cummings	Dakila Espress	6

Rock River Charity Ride - 8/6/22 - LD HLW 25			
Roberta	Harms	Lady Jane	1
Vera	Betzelberger	Cisco Quarter Pony	2
Amy	Betzelberger	Lexus	3
Emily	Smith	Starr Quest	4

Rock River Charity Ride - 8/6/22 - Novice 13			
Alana	McNutt	Ole	1
Hannah	Berran	Nikki	2
Sadie	Quest	Flower Pot	3
Julie	Bridges	Olaf	4
Sally	Hoff	Gloryius Trinity	MO

Rock River Charity Ride - 8/7/22 - Comp LW 25			
Jessica	Sonnek	Jazmine	1

Rock River Charity Ride - 8/7/22 - LD HW 25			
Brooke	Moeller	Aurora's Magical Luv	1

Rock River Charity Ride - 8/7/22 - LD LW 25			
Sally	Hoff	Gloryius Trinity	1

Rock River Charity Ride - 8/7/22 - Novice 13			
Lacie	Courtney	Perzulen Jewel	1

Louise Riedel - 8/12/22 - Comp HW 25			
Bonnie	Mielke	BNB Khrome Azrael	1
Andrea	Pfeifer	Mytalisha's Titan	2

Louise Riedel - 8/12/22 - Comp LW 25			
Jennifer	Haras	Maverick	1

Louise Riedel - 8/12/22 - Drive 12			
Alice	Hubert	Gridlock	1
Ray	Hubert	JimmyCrackedCorn	2
Amy	Broadie	No Flash Photography	3
JoAnne	Stewart	Shenandoah	4

Louise Riedel - 8/12/22 - End HW 50			
Guy	Worthington	PA Hi-Spirit	1
Robin	Schadt	Kayheart	2

Louise Riedel - 8/12/22 - End LW 50			
Jodi	Johannessen	SC Izzabella	1
Jane	Malischke	Hollywoods Brightest	2
Amy	Kerrigan	Tye	3

Louise Riedel - 8/12/22 - LD HW 25			
Ann	DeLang	Chocolate Martini	1
Marge	Dixon	Bethany Jet	2

Louise Riedel - 8/12/22 - LD Jr 25			
Grace	Carter	Corona Breeze	1

Louise Riedel - 8/12/22 - LD LW 25			
Roberta	Harms	Lady Jane	1
Leigh Ann	Sytsma	Heza Bright Future	2
Linda	Jacobson	AE Gimli Strength	3
Nancy	McCoy	Khepera Immileegy	4
Victoria	Robison	Bullett	5
Pam	Cotton	Rio BA	6
Debby	Weisbecker	JM Cest La Vie	P

Louise Riedel - 8/13/22 - Comp HW 25			
Andrea	Pfeifer	Mytalisha's Titan	1

Louise Riedel - 8/13/22 - Drive 12			
Ray	Hubert	JimmyCrackedCorn	1
Amy	Broadie	No Flash Photography	1
Alice	Hubert	Gridlock	2

Louise Riedel - 8/13/22 - End HW 50			
Robin	Schadt	RAL Sorceress (Chloe)	1
Sarah	Carlson	HMR Sshameus	2
Sherry	Aune	SA Rhythms Sky Rocket	3
Guy	Worthington	JG Randie	P

Louise Riedel - 8/13/22 - End Jr 50			
Alice	Erickson	Rushcreek Calia	1
Brooklyn	Hoverman	Thorhastrachan	2

Louise Riedel - 8/13/22 - End LW 50			
Shanon	Ployhart	Eternety De Valle	1
Jodi	Johannessen	Dante Muscara	2
Karen	Bahrman	Westwind Little Big Man	3
Eileen	Kirsch	Hansi	4
Stephanie	Vavra	Herbee The Love Bug	5
Nikki	Blake	HTLB Stormy	6
Lindsay	Jackson Nichols	Rockstar Kiss	C
Elizabeth	Frieders	Hotsprings Fandango	C

Louise Riedel - 8/13/22 - LD HW 25			
Brandon	Brunner	La Grange RTA	1
Amber	Mell	Brix	2
Desmond	Degroot	Wyatt's Dire Straits	3

Louise Riedel - 8/13/22 - LD Jr 25			
Ilona	Jarvi	Liberdee	1
Sarah	Larkin	Lexus	2
Grace	Carter	Corona Breeze	3
Louise Riedel - 8/13/22 - LD LW 25			
Amy	Kerrigan	Uptown Belle of the Ball	1
Jesse	Shaddrick	Jinjersnapp	2
Karen	Jarvi	Austdee	3
Tracy	Johnson	Mombo Number Five	4
Amy	Betzelberger	Starr Quest	5
Vera	Betzelberger	Cisco Quarter Pony	5
Ainsley	Suskey	RAL Khastaway (Khasper)	C
Pam	Cotton	Madras NA	C
Louise Riedel - 8/13/22 - Novice 12			
Riley	Hennig	Lucky Henry	1
Melia	Hennig	PAA Baylyn Seer	2
Ben	Davidson	NFF Hawkeye Tgaylor	3
Devan	Lewer	Nova	4
Gracyn	Schneider	A Kings Delivery	5
Nola	Westphal	Gretta	6
Jon	Bartlett	Misty Afternoon	C
Linda	Jacobson	Hazelrun Mighty Roark	MO
Amber	Hennig	Lucky John	MO
Maxine	Bernsdorf	CH Shamm Bashire	MO
Allison	Goetz	Shadowtrax	MO
Montana	Davidson	Sundancer Pazon	MO
Leigh Ann	Sytsma	Heza Bright Future	MO
Louise Riedel - 8/14/22 - Comp HW 25			
Bonnie	Mielke	BNB Khrome Azrael	1
Kari	Graves	Flying Oaks Zephyrus	2
Louise Riedel - 8/14/22 - Comp LW 25			
Jessica	Sonnek	Jasmine	1
Jennifer	Haras	Maverick	2
Louise Riedel - 8/14/22 - Drive 12			
Ray	Hubert	JimmyCrackedCorn	1
Alice	Hubert	Gridlock	2
Amy	Broadie	No Flash Photography	3
Louise Riedel - 8/14/22 - LD HW 25			
Guy	Worthington	Dimitri	1
Ann	DeLang	Chocolate Martini	2
Christina	Hyke	Mahalaleels Amazing Faith	3
Amber	Erickson	Ophelia Kkan	4
TJ	Edwards	Decorah's Double Delight	5
Jill	Piechowski	Souhern Jackpots little tucker	6
Louise Riedel - 8/14/22 - LD JR 25			
Logan	Erickson	A Kings Delivery	1
Grace	Carter	Corona Breeze	2
Louise Riedel - 8/14/22 - LD LW 25			
Jan	Worthington	Golden Lightning	1
Nikki	Blake	Dreaming in the Dark	2
Nancy	McCoy	Khepera Immileegy	3

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## **Equine Eye Anatomy and Physiology** **Learn the basics of equine eye anatomy and physiology with glossary terms.**

Posted by Dennis E. Brooks, DVM, PhD, Dipl. ACVO | Oct 22, 2013 | Article, Back to Basics: The Equine Eye, Other Eye Problems

*The equine eye is very sensitive, and even the slightest injury can result in blindness. While vision in only one eye does not mean the horse must be euthanized, it does somewhat limit the athletic and working potential of that animal. This article discusses the anatomy and physiology of the eye, complete with drawings and photographs.*

### **Anatomy and Physiology**

**Orbit**—Orbit refers to the bony socket of the skull that contains the eyeball or globe, and the surrounding nerves, blood vessels, fat, connective tissue, and muscle. The equine orbit is a large, conical cavity protected by a complete bony rim. Respiratory sinuses border the horse orbit on the midline (center of the head).

Animals with laterally positioned orbits (one on each side of the head), such as horses, have tremendous peripheral vision but reduced binocular vision and depth perception.

**Eyelids**—Anatomically, the eyelids are divided into the skin, a fast-acting and powerful muscle (for rapid blinking), and an inner lining of palpebral conjunctiva. The eyelids are thin and contain many blood vessels. Eyelids protect the eye, produce and distribute the tears, aid tear drainage, and help

control the amount of light entering the eye. Eyelid swelling can be an early sign of corneal ulceration (more about corneas in a moment). Meibomian glands, which secrete the fatty component of the tear film that lubricates the eye, are found at the eyelid margins. Horses have large eyelashes or cilia on their upper eyelid margin and none on the lower lid. Long sensory hairs or vibrissae provide sensation to the skin surrounding the eyes of horses.

**Nictitans**—The nictitans or third eyelid (TE) of the horse is located medially (toward the midline of the body; the medial edge of the eye is the one toward the nose) and contains the third eyelid gland that produces tears. It has supportive cartilage and a covering of conjunctiva (the same delicate membrane that lines the eyelids). It displays rapid, almost horizontal movement as it protects the cornea and distributes the tear film (it moves from the inside corner of the eye across the eye). The TE conjunctiva of horses might be darkly pigmented or might be pink.

**Conjunctiva**—The conjunctiva is important to the immune system of the eye. It covers the inner eyelids, TE, and sclera (more on this later). Components of the immune system that protect the eye and tear-producing cells are present in the conjunctiva, which is pigmented near the limbus (more on this later) in some horses.

### **Anterior Anatomy**

The tear film layer, cornea, iridocorneal angle, iris, lens, and ciliary body comprise the anterior (forward) segment of the eye.

**Precorneal tear film**—The precorneal tear film is produced by the meibomian glands (outer fat layer), the lacrimal and nictitans glands (watery layer), and the conjunctiva (inner fat layer). The tear film provides an optically smooth surface to the cornea, helps deliver nutrition to the cornea, and contains vitamins, enzymes, and other substances that affect corneal health. It is of very high volume in the horse. Tears enter the tear drainage system at the medial canthus (pocket formed at the inside of the eye), pass through the bony nasolacrimal duct in the skull, and drain in the horse's nose.

**Cornea, limbus, and sclera**—The cornea is a very prominent, transparent, and physically strong tissue that supplies a large part of the eye's light-bending power. Light rays pass through the cornea to begin the visual process and are focused on the retina.

The horse cornea has four layers. The outermost epithelium is a barrier to microbes and to the tears.

The epithelium is attached to the stroma. The stroma constitutes approximately 90% of the corneal thickness and is mostly collagen (a fibrous protein). The next layer is Descemet's membrane, the basement membrane that's secreted by the inner corneal endothelium and produced throughout life. It is only about six red blood cells in thickness! (The significance of this will become apparent in the upcoming article on corneal disease.) The innermost endothelium consists of only one cell layer, but it contains a little pump that drains water out of the cornea so it stays clear. Endothelial disease results in pump failure and corneal swelling.

The cornea is one of the most sensitive tissues in the body. Corneal nerves are concentrated in the superficial (outer) cornea, with no nerves present in the Descemet's membrane. The average thickness of the middle of the cornea is approximately 1.0-1.5 millimeters. The peripheral horse cornea (the edge) is slightly thinner at 0.8 mm.

The limbus is located at the peripheral edge of the cornea and forms the transition zone between the clear cornea and the white sclera. In most horses, there is an obvious gray line at the limbus where ligaments bridging the iris and cornea are visible.

The sclera is connected to the cornea and constitutes the major portion of the outer layer of the eyeball.

**Anterior chamber**—The anterior chamber (AC) is the large aqueous humor-filled chamber located between the cornea and iris. It is observed as a thick grey band on the nasal and temporal regions of the limbus. Aqueous humor is a clear fluid derived from blood that aids corneal and lens health.

**Iridocorneal angle**—The drainage of aqueous humor from the eye to the blood occurs at the junction or angle formed by the cornea, iris, and ciliary body.

**Iris**—The iris is the front of the uveal tract, and it has lots of blood vessels. Iris muscles located near the pupil (more on the pupil next) cause pupillary contraction or miosis. Dilator muscles in the mid-iris cause the pupil to enlarge.

In general, the iris color of the horse is brown, varying from dark brown to golden brown to yellow. Blue or white iris color might be seen in some horses. Horses have cystic granula iridica or corpora nigra that appear to hang from the top of the pupillary rim; they are believed to shield the retina from overhead sunlight.

**Pupil**—The pupil (hole in the iris) changes in size depending upon environmental light intensity—it constricts in bright light and dilates in dim light to control the amount of light entering the lens. It is round in foals and horizontally oval in adults.

**Ciliary body**—The middle portion of the uveal tract is the ciliary body, which produces aqueous humor.

**Choroid**—The choroid is the rear portion of the uveal tissue. It lies between the retina and the sclera and contains many capillaries and larger blood vessels. The choroid is the primary blood supply to the equine retina. The triangular tapetum is also found in the dorsal (top) choroid of the horse; its function is to amplify light in low light conditions.

**Uvea**—Composed of the iris, ciliary body, and the choroid, the vascular uveal tract is involved in the production of aqueous humor, the exit of aqueous humor from the eye, nutrition of the eye, and the immune response of the eye to numerous diseases.

Inflammation of the uvea is called uveitis, and this is a serious problem in horses. The uveal tissue of the horse eye is fragile and easily damaged. During uveitis, the iris sphincter muscle contracts to cause profound closing of the pupil. The ciliary body muscles spasm, resulting in severe ocular pain and squinting. The capillaries (small blood vessels) in the uveal tissue become leaky and release proteins and cells during attacks of uveitis.

### **Focusing Light**

The lens is a transparent structure located behind the iris and held in place by zonular ligaments. The horse uses the lens to focus on nearby objects.

### **Posterior Segment or Fundus**

**Vitreous chamber**—This is the large space between the lens and retina that contains the very thick clear vitreous.

**Retina**—The retina is the most complex structure of the eye and is the most metabolically active tissue in the body. It converts light energy into chemical energy to generate the electrical signal that is conducted to the brain in order for the horse to see.

The retina is classically described as a layered structure. Rod photoreceptors dominate in number over cones in the horse. The rods are responsible for the very good night vision of horses, and the cones are responsible for daytime vision and the limited color vision (horses see blue colors best).

The retina also contains a high number of very large ganglion cells that conduct the visual impulses quickly, which explains the superb ability of horses to detect movement in their field of vision. The nerve endings of retinal ganglion cells form the optic nerve, which carries visual information from each eye to the brain for processing.

**Optic disk**—The horse's optic disk (which is also called the optic papilla or optic nerve head) contains ganglion cell nerve fibers and can be seen with the ophthalmoscope.

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## **Rules & Bylaws Suggestions or Changes**

The leaves will be falling on us soon and the board is planning the November Board of Directors Meeting. It is time to submit any rule or bylaw change suggestions to the Rules & Bylaws Committee. This committee takes those suggestions, looks at current and past language, AERC rules when appropriate, and considers horse welfare and other issues in crafting wording to make sure your idea is presented at the November meeting. Please contact us if you have change suggestions or new rule ideas:

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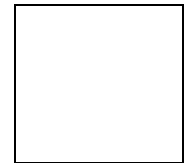
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