
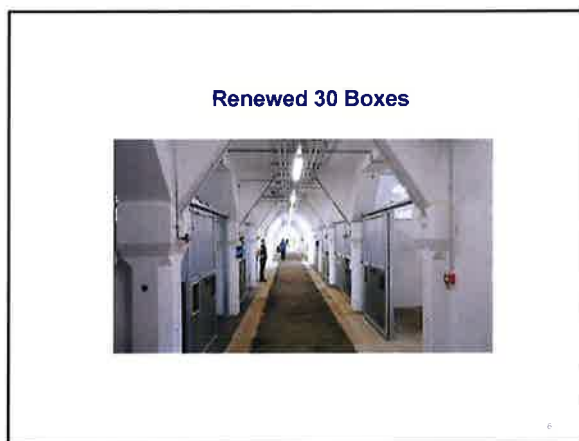
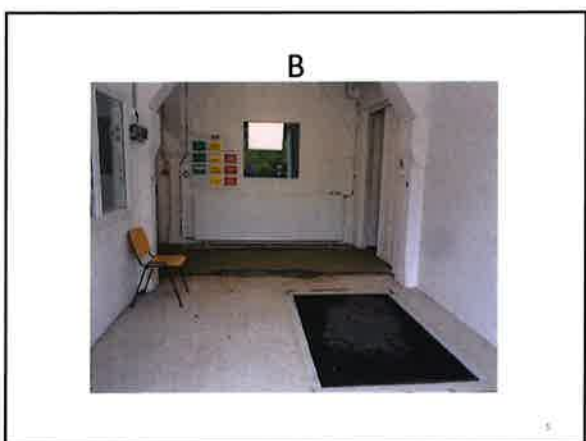


Gábor Bodó, DSC, Dipl. ECVS
World Breeding Federation for Sport Horses
02.12.2018.

Clinical relevance of routine stallion screening with focus on X-rays and endoscopy



Equine Department and Clinic,
University of Veterinary Medicine - Budapest



Isolation Boxes with HEPA Filter



Suspension



Welfare from a Stallion selection point of view – veterinary aspects

- I. Osteochondral Fragmentation in Different Joints
- II. Navicular Syndrome
- III. Bone Spavin
- IV. RLH (Roarer)
- V. Skin Diseases

Juvenile osteochondral conditions

OCF = Osteo-Chondral Fragmentation
≠ i.a. fractures





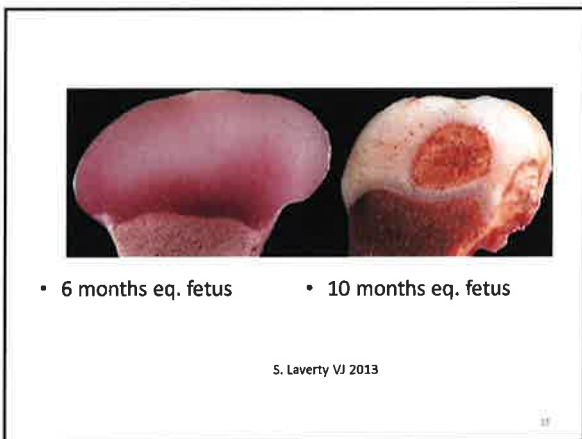
Osteochondritis Dissecans
OCD, OC...



S. Lavery: 2013 VI

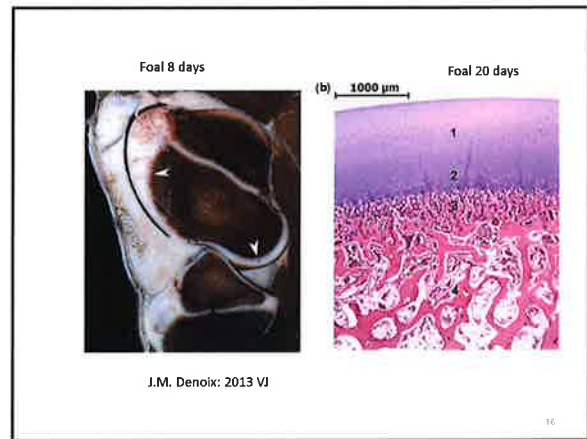
Factors influencing OCD:

- Nutrition, High Energy Intake
- Growth Rate
- Exercise
- Hormonal factors
- **Genetics**



- 6 months eq. fetus
- 10 months eq. fetus

S. Lavery VI 2013



Foal 8 days

Foal 20 days

J.M. Denoix: 2013 VI

The Veterinary Journal 137 (2013) 13–18
Contents lists available at ScienceDirect
The Veterinary Journal
journal homepage: www.elsevier.com/locate/tvj

Review
The genetics of equine osteochondrosis
Ottmar Distl*

Professor for Animal Breeding and Genetics, University of Veterinary Medicine Hannover, Bischoferring 15, 30559 Hannover, Germany

Royal Dutch Warmblood Studbook (KWPN) – Netherlands

- Van Veen, Kingmans et al: The frequency and heredity of **navicular disease**, sesamoidosis, fetlock joint arthrosis, **bone spavin**, **osteochondrosis of the hock**: radiographic progeny study. Koninklijk Warmloed Paardenstamboek Nederland, Zeist, 1994,
- Van Grevenhof, Schurink et al: Genetic variables of various manifestations of OCD and their correlations between and within joints in Dutch warmblood horses. J. Anim. Sci. 2009

P. René van Weeren: Osteochondrosis. In: Auer & Stick: Equine Surgery 4th Ed. 2012

General comments to OCD

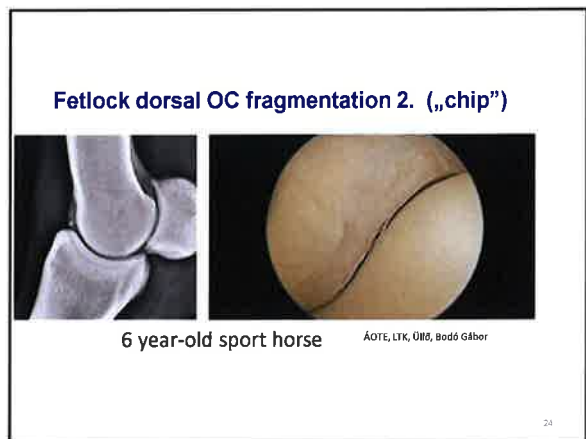
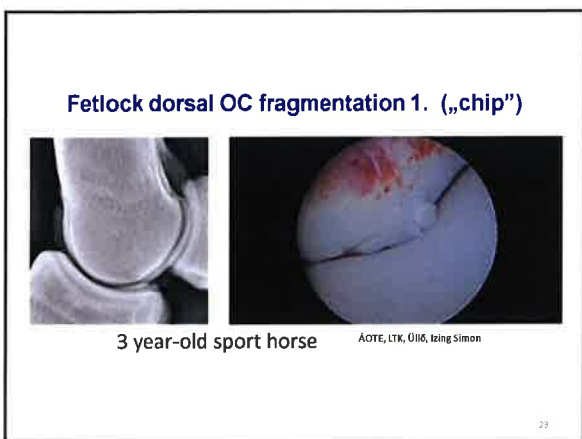
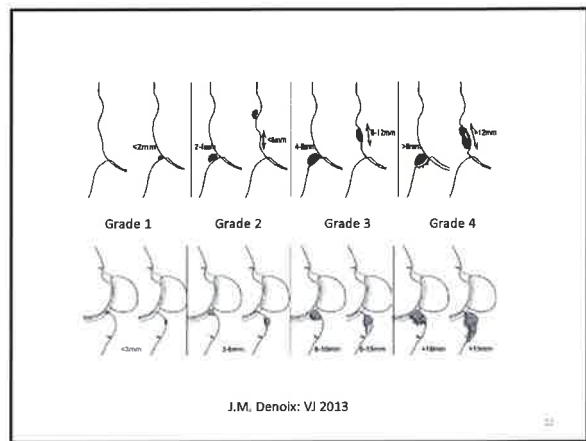
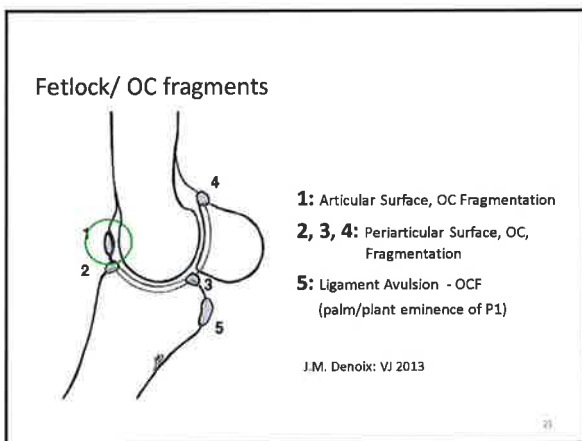
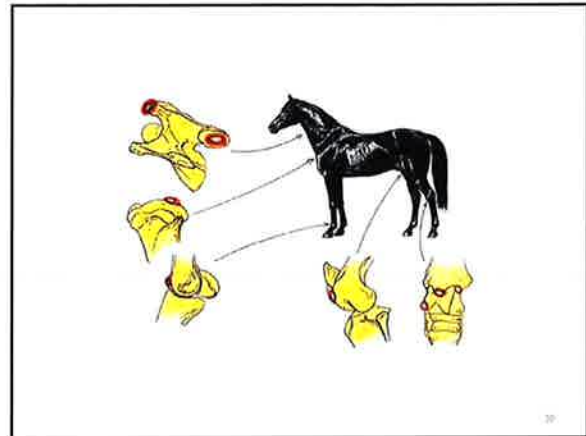
- Different genes are involved in different joints
- -> Different heritabilities of different joints
 - Study by Grevenhof et al 2009:
 - h^2 : hock OCD -> 0,36
 - h^2 : fetlock OC -> 0,11
 - h^2 : stifle (FP) OCD -> 0,06

Hanoverian, Holsteiner, Dutch Warmblood Studies about Genetic Background

Heritability estimates for equine osteoarthritis

Population / Study	Pathologic finding	Heritability estimate	Method of analysis	Reference
Hanoverian (n = 1000)	OC (distal)	0.21	SEM, REML	Gronwald et al. (1994) Gronwald et al. (2001)
	OC (proximal)	0.27	SEM, REML	
	OC	0.21 / 0.14	SEM, REML	
	OC (distal)	0.22 / 0.13	SEM, REML	
French Trotter (n = 5251)	OC (distal)	0.43 / 0.11		Gronwald et al. (2001)
	OC (proximal)	0.13 / 0.11		
	OC (distal)	0.13 / 0.11		
	OC (proximal)	0.13 / 0.11		
Maremmano (n = 350)	OC (distal)	0.15 / 0.11 / 0.22-0.37	LAM, REML, DE	Perianni et al. (2003)
	OC (proximal)	0.09 / 0.24		
	OC (distal)	0.14 / 0.17	LAM, REML, DE	
	OC (proximal)	0.18 / 0.23	LAM, REML, DE	
Danish Warmblood (mean: n = 599) Hanoverian (n = 3723)	OC (distal)	0.31 / 0.25	LAM, REML, DE	Stech et al. (2005)
	OC (proximal)	0.31 / 0.25	LAM, REML, DE	
	OC (distal)	0.31 / 0.25	LAM, REML, DE	
	OC (proximal)	0.31 / 0.25	LAM, REML, DE	
Comair riding horse (n = 2407)	OC (distal)	0.60 / 0.50	LAM, REML	Wuor et al. (1996)
	OC (proximal)	0.34 / 0.25	ATA, DE	
	OC (distal)	0.19 / 0.28	ATA, DE	
	OC (proximal)	0.60 / 0.50	LAM, REML	
Holsteiner stud (n = 486) Holsteiner stud (n = 144)	OC (distal)	0.68 / 0.65		Srinivasan et al. (1999)
	OC (proximal)	0.12 / 0.27		
	OC (distal)	0.12 / 0.27		
	OC (proximal)	0.12 / 0.27		
Danish Warmblood (n = 811)	OC	0.23 / 0.20	LAM, REML	Van Cesteren et al. (2009)
	OC (distal)	0.14 / 0.28		
	OC (proximal)	0.26 / 0.31		
	OC (distal)	0.26 / 0.31		
Swedish Warmblood (n = 810)	OC (distal)	0.22 / 0.28	LAM, REML, DE	Jensen et al. (2011)
	OC (proximal)	0.32 / 0.38		
	OC (distal)	0.32 / 0.38		
	OC (proximal)	0.32 / 0.38		
Swedish Warmblood (n = 121)	OC (distal)	0.33 / 0.16	LAM, REML, DE	Widmer et al. (2012)
	OC (proximal)	0.32 / 0.16		
	OC (distal)	0.33 / 0.16		
	OC (proximal)	0.33 / 0.16		

OC: osteoarthritis of the fetlock joint; SEM: standard error of the mean; REML: Restricted Maximum Likelihood; LAM: Linear Mixed Model; DE: Derivative-free Expectation-Maximization; ATA: Animal Trait Analysis; REML: Restricted Maximum Likelihood; SEM: Standard Error of the Mean; OC: Osteoarthritis of the Carpal Joint



Fetlock joint dorsal – extensive cartilage loss

ÁÓTE, LTK, ÜB6, Bodó Gábor

8 year-old sport horse

Hanoverian, Holsteiner, Dutch Warmlood – Fetlock „chips”

Dutch Warmblood (mares; n = 590)	OF (hock)	0.14 ± 0.17
Hanoverian (n = 3725)	OF (fetlock)	0.19 ± 0.03
	OF (hock)	0.37 ± 0.06
Hanoverian (n = 5231)	OF (fetlock)	0.17 ± 0.03
	OF (hock)	0.28 ± 0.04
German riding horses (n = 2407)	OCD (hock)	0.07 ± 0.03
Holsteiner mares (n = 456)	OCD (hock)	0.34 ± 0.06
Holsteiner foals (n = 144)	OCD (hock)	0.19 ± 0.07
Hanoverian (n = 624)	OC (fetlock)	0.07 ± 0.05
	OC (hock)	0.08 ± 0.05
	OCD (fetlock)	0.15 ± 0.07
	OCD (hock)	0.10 ± 0.05
Dutch Warmblood (n = 811)	OC	0.23 ± 0.09
	OCD	0.22 ± 0.09
	OC (fetlock)	0.14 ± 0.08
	OC (hock)	0.16 ± 0.11
	OC (stifle)	0.05 ± 0.05
	OCD (fetlock)	0.06 ± 0.07
	OCD (hock)	0.26 ± 0.09
	OCD (stifle)	0.02 ± 0.04

Distl 2013, VI.

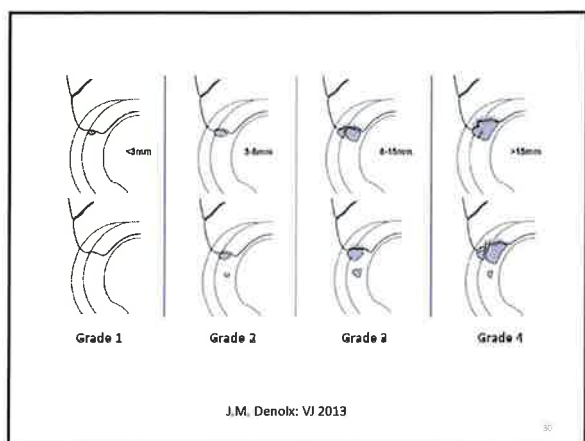
Heritability - Fetlock

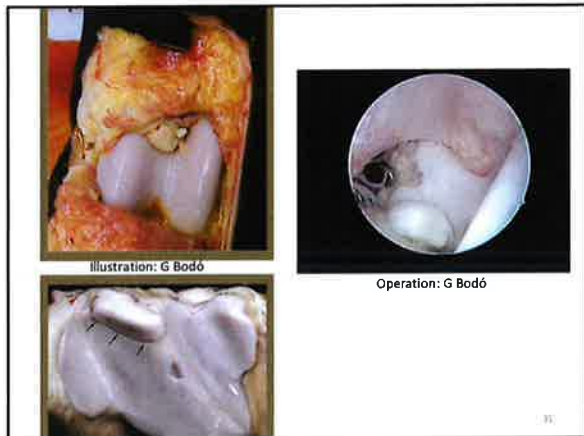
Heritability estimates for equine osteochondrosis.

Population and number of investigated horses	Radiographic finding	Heritability estimate
Danish trotters (n = 325)	OF (hock)	0.26 ± 0.14
Norwegian Trotters (n = 644)	OC (hock)	0.21
Swedish trotters (n = 793)	OC (hock)	0.27
French Trotters (n = 525)	OC	0.32 ± 0.14
	OC (fetlock)	0.27 ± 0.12
	OC (hock)	0.45 ± 0.11
	OC (other joints)	0.13 ± 0.11



OCD - Hock





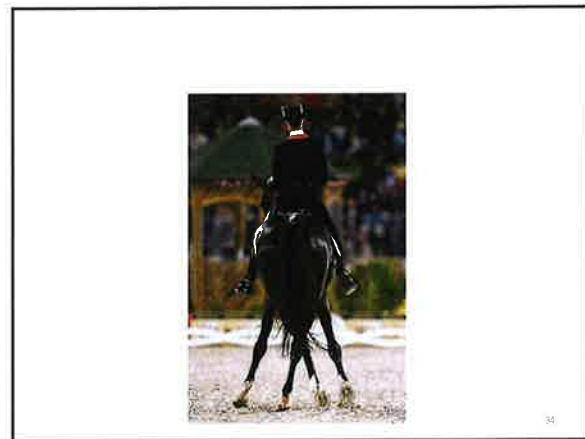
Heritability – Hock OCD

Heritability estimates for equine osteochondrosis.

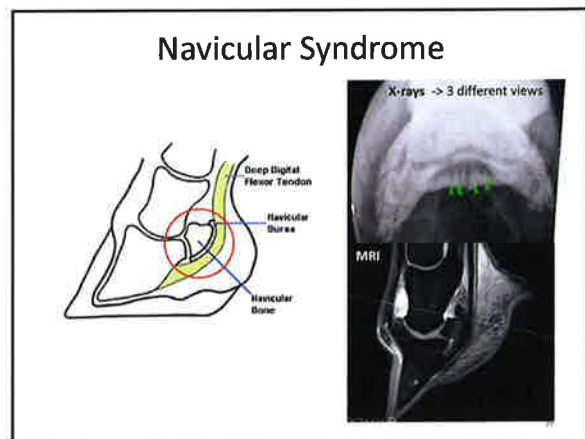
Population and number of investigated horses	Radiographic finding	Heritability estimate
Danish trotters (n = 325)	OF (hock)	0.25 ± 0.14
	OC (hock)	0.21
Norwegian Trotters (n = 644)	OC (hock)	0.27
	OC	0.32 ± 0.14
Swedish trotters (n = 793)	OC (fetlock)	0.27 ± 0.13
	OC (hock)	0.45 ± 0.11
French Trotters (n = 525)	OC (hock)	0.13 ± 0.11
	OC (other joints)	

Hanoverian, Holsteiner, Dutch Warmblood – Hock OCD

Dutch Warmblood (mares; n = 590)	OF (hock)	0.14 ± 0.17
	OF (fetlock)	0.19 ± 0.03
Hanoverian (n = 3725)	OF (hock)	0.37 ± 0.06
	OF (fetlock)	0.17 ± 0.03
Hanoverian (n = 5231)	OF (hock)	0.28 ± 0.04
	OC (hock)	0.07 ± 0.03
German riding horses (n = 2407)	OC (hock)	0.34 ± 0.06
	OC (fetlock)	0.19 ± 0.02
Holsteiner mares (n = 456)	OC (hock)	0.07 ± 0.08
	OC (hock)	0.08 ± 0.05
Holsteiner foals (n = 144)	OC (fetlock)	0.15 ± 0.07
	OC (hock)	0.10 ± 0.05
Hanoverian (n = 624)	OC (fetlock)	0.23 ± 0.09
	OC	0.22 ± 0.09
Dutch Warmblood (n = 811)	OC	0.14 ± 0.08
	OC (hock)	0.36 ± 0.11
	OC (stifle)	0.05 ± 0.05
	OC (fetlock)	0.06 ± 0.07
	OC (hock)	0.26 ± 0.09
	OC (stifle)	0.02 ± 0.04

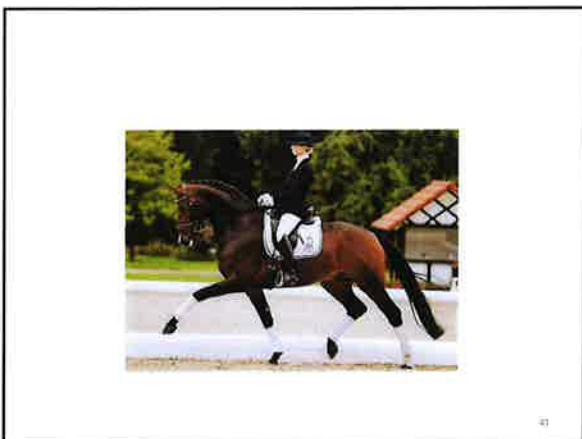
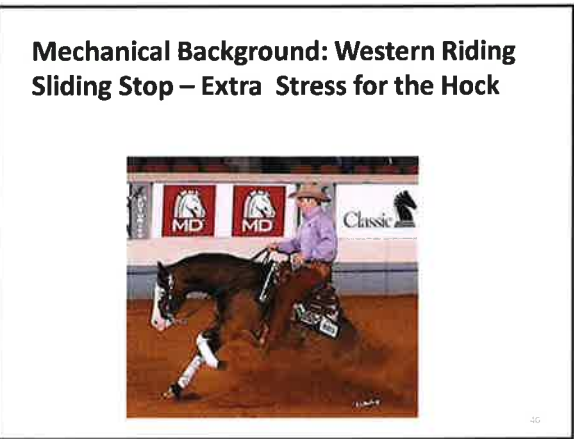


- I. Osteochondral Fragmentation in Different joints
- II. **Navicular Syndrome**
- III. Bone Spavin
- IV. RLH (
- V. Skin Diseases





- I. Osteochondral Fragmentation in Different joints
 - II. Navicular Syndrome
 - III. Bone Spavin**
 - IV. RLH (
 - V. Skin Diseases
- 34



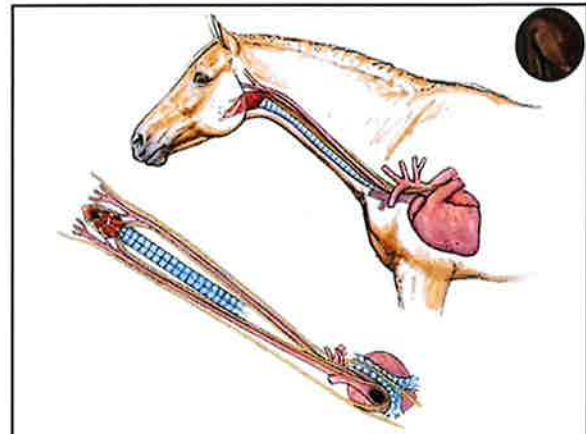
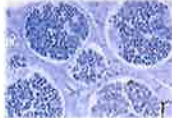
- I. Osteochondral Fragmentation in Different joints
 - II. Navicular Syndrome
 - III. Bone Spavin
 - IV. RLH („Roarer“, „Kehlkopfpeifer“, Cornard, Corneggio
 - V. Skin Diseases
- 38

Pathogenesis- Hemiplegia laryngis (RLN)

- Idiopathic
- Progressive degeneration of dist. fibres of NLR sin. (axonopathy)
- Genetic predisposition
- Large horse breeds
- At younger age
 - From a few months up to 10 years



CD room Fürst Unt. Zürich



Definition: paresis-paralysis of RLN, leading to m. atrophy, vocal cord collapse and arythenoid cartilage collapse during inspiration



Is RLN a Hereditary Disorder?

- Inherited axonopathy – is a hypothetical etiology
- „The etiology remains a mystery”
 - (Caroline Hahn, Joe Mayhew In: Equine Respiratory Medicine and Surgery 2007)
- „Genetic basis to the condition is most likely”
 - (Auer & Stick: Equine Surgery 4th Ed 2012)

- Manifestation of polyneuropathy?
- Is there a prenatal onset?
- Does the cause involve a mechanical component?

- Recognition of RLN or operated cases is „easy”



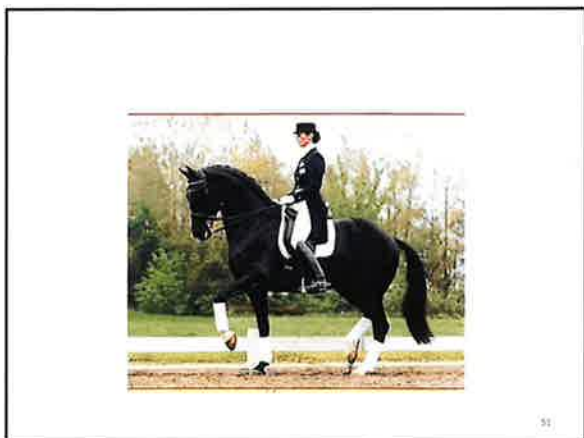
Case G.8odo



TABLE 5: Correlation of Havemeyer grades of resting and exercising laryngeal function and number of horses in each grade exhibiting vocal fold collapse during exercise (n = 272) Barakatz and Dixon EVJ 2011

Resting grade of laryngeal function	Exercising grade of laryngeal function			Vocal fold collapse during exercise (n)
	A	B	C	
1 (n = 49)	47 (96%)	2 (4%)	0	0
2 (n = 169)	155 (92%)	12 (7.7%)	2 (1.9%)	1 grade A, 1 grade B, 1 grade C
3 (n = 51)	17 (34%)	23 (46%)	11 (22%)	11 grade A, 21 grade B, 11 grade C
4 (n = 3)	0	0	3 (100%)	3 grade C
Total	219 (81%)	37 (14%)	16 (6%)	62 (23%)

Note: In the original image, the number 17 in the table is circled in red, and a blue arrow points from it to the 'Vocal fold collapse during exercise' column for grade 3.





- I. Osteochondral Fragmentation in Different joints
- II. Navicular Syndrome
- III. Bone Spavin
- IV. RLH („Roarer“, „Kehlkopfpeifer“, Cornard, Corneggio
- V. Skin Diseases**

Congenital and Inherited Skin Disorders

- Rare, and often not possible to treat
- Inheritance thread is unknown or recessive
 - Affected horse -> parents without symptoms – affected gene is distributed through sisters and brothers
- Genetic background is often very likely, however often not proved
- Affected horses should be disclosed from breeding
- Genetic tests – finding carriers of different genes responsible for different skin diseases

Congenital and inherited skin diseases in the newborn foal

- Epithelogenesis imperfecta (aplasia cutis congenita)
 - Autosomal recessive inheritance
- Epidermolysis bullosa

Congenital and inherited skin diseases in older foals and adults



- Hypotrichosis
- Follicular dysplasia (mane and tail dystrophia)
- Vitiligo (Arabian fading syndrome)







Not neoplastic skin disorders connected to breeds

- Appaloosa
 - Follicular dysplasia
- Arabian
 - Atopic dermatitis
 - Coat colour dilution lethal
 - Hypotrichosis
 - Insect-bite hypersensitivity, IBH
 - Spotted leukotrichia
 - Vitiligo (Arabian fading syndrome)
- Connemara, Friesian, Island pony
 - Insect-bite hypersensitivity, IBH


Not neoplastic skin disorders connected to breeds

- Quarter horse
 - Atopic dermatitis
 - Skin asthenia
 - Insect-bite hypersensitivity, IBH
 - Linear alopecia
 - Linear keratosis
 - Reticular leukotrichia
 - Unilatera papular dermatosis
- Shetland pony
 - Insect-bite hypersensitivity, IBH
 - Steatitis



Not neoplastic skin disorders connected to breeds

- Shire
 - Chronic, progressive lymphoedema
 - Coronary band dysplasia
 - Insect-bite hypersensitivity, IBH
 - Spotted leukotrichia
- Standardbreds
 - Calcinosis circumscripta
 - Linear keratosis
 - Multisystemic eosinophilic, epitheliotrop disease
 - Reticular leukotrichia
- Thoroughbred
 - Atopic dermatitis
 - Cellulitis
 - Linear keratosis
 - Multisystemic eosinophilic, epitheliotrop disease (MEED)
 - Reticular leukotrichia
 - Spotted leukotrichia



Equine Sarcoid

- Most frequent tumor in horses
- You can find it in most equidae (donkey, mule, zebra)
- More frequent in younger horses (≤ 7 years)
- Predisposing factors:
 - Genetic background
 - MHC/ELA (Equine Leucocyte Antigene)
 - W13 gene in MHC complex
 - Lipizans are resistant
 - Quarter Horses -> less susceptible
 - Trauma
 - Contact with cattle

Thank you for your attention!

