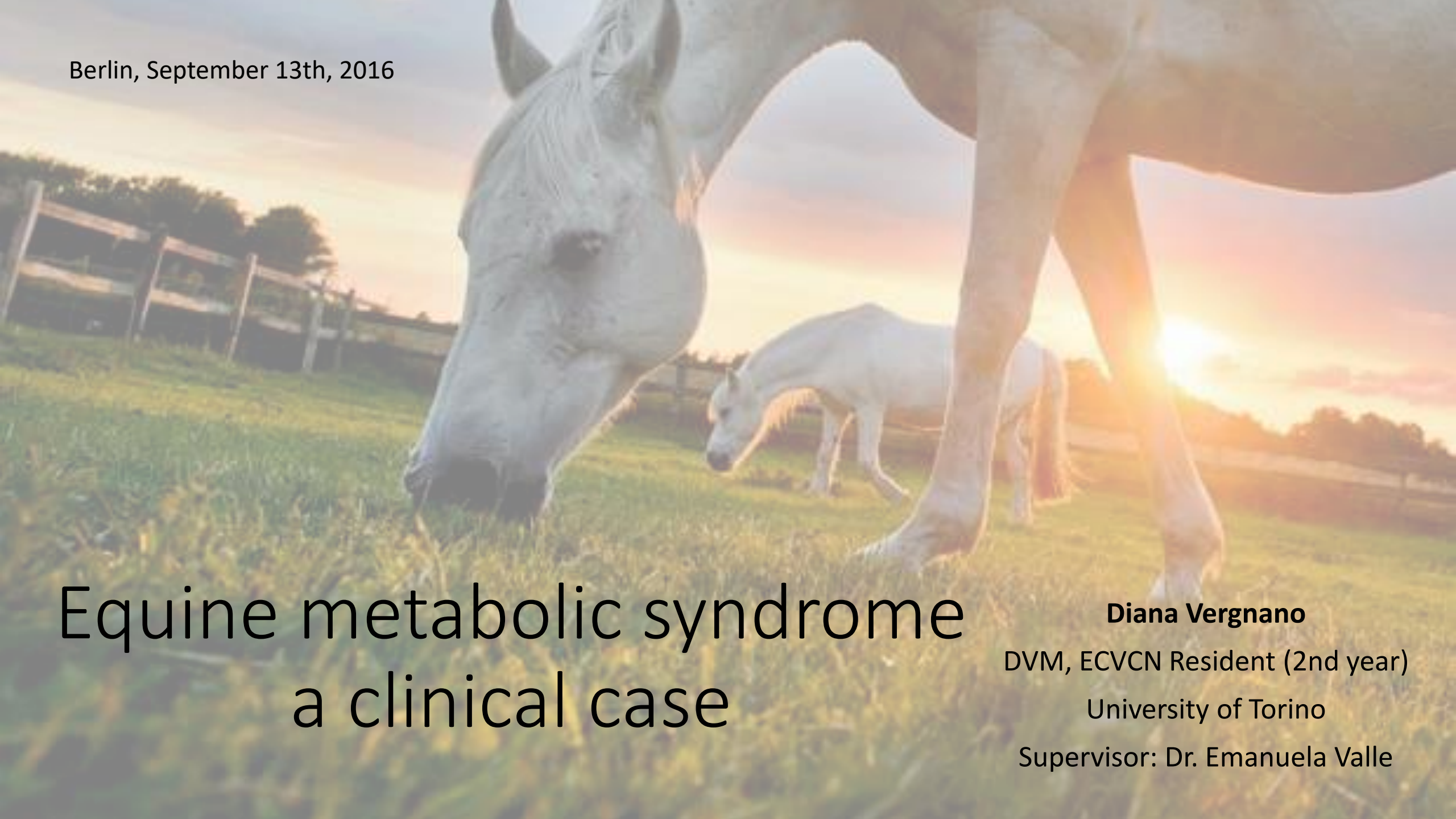


Berlin, September 13th, 2016

Equine metabolic syndrome a clinical case

Diana Vergnano

DVM, ECVCN Resident (2nd year)

University of Torino

Supervisor: Dr. Emanuela Valle

May 2016: the nutritional counselling service was called for a consultation…

LAMINITIS

Anamnesis

- Name:Loca
- Breed: Pura Raza Española
- Age: 12 years
- Sex: Female
- Management: box and dry lot

Nutritional anamnesis

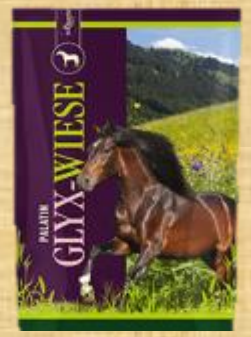
Until April: First cut meadow hay (8 kg) + mixed flaked cereals (2 kg)

CP	10,5 %
CF	2,7 %
Cfb	5,1 %
CA	2,4 %

After the laminitis onset: complete feed for horses (7 kg)
prescribed by a horse nutritionist

NO improvement after 1,5 month

Raw protein 10,5 %
Raw fibre 25,0 %
Raw fat 2,4 %
Raw ash 9,0 %
digestible raw protein 81,0 g/kg
digestible energy 7,9 MJ/kg
Calcium 0,9 %
Phosphorus 0,3 %



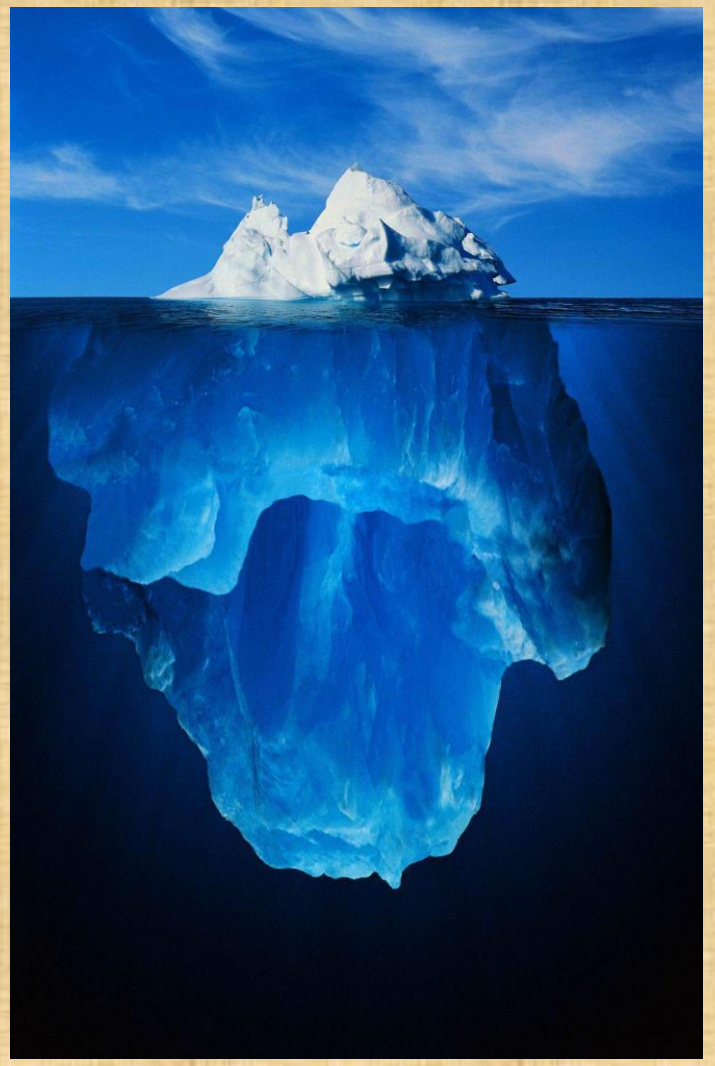
Nutritional approach to laminitis

Laminitis = tip of the iceberg of a multifactorial condition

Causes??

Three categories:

1. Sepsis/systemic inflammation
2. Endocrine/metabolic
3. Miscellaneous (mechanical, intoxication)



Geor and Harris, 2013

Nutritional approach to laminitis

Understand which type of laminitis we have to face

How?

Onset: was there a triggering factor?

The proper collection of clinical data is fundamental!

Sepsis/sistemic inflammation

Metritis, colic, pneumonia, carbohydrate overload

Endocrine/metabolic

PPID, EMS

Miscellaneous causes

Mechanical overload,
Black walnut shavings intoxication

Geor and Harris, 2013

Nutritional approach to laminitis

ONSET

No apparent triggering factor

No changes in the diet or in the management,
no pathological conditions,
no exercise overload,
no black walnut shavings

Nutritional approach to laminitis

Understand which type of laminitis we have to face

How?

Onset: was there a triggering factor?

The proper collection of clinical data is fundamental!

S[illegible]sis/sist[illegible]c

I[illegible]

M[illegible]

p[illegible]nonia,

carbohydrate overload

Endocrine/metabolic

PPID, EMS

M[illegible]llaneo[illegible]

Mec[illegible]ver[illegible]

Black W[illegible]nut shaving[illegible]ntoxication

Nutritional approach to laminitis

Understand which type of laminitis we have to face

Endocrine/metabolic

Pituitary Pars Intermedia Dysfunction (PPID)
or
Equine Metabolic Syndrome (EMS)?

Blood analysis: ACTH concentration

Frank et al., 2008

Nutritional approach to laminitis

Blood Analysis

Parameter	Unit	Result	Reference values
ACTH (november-july)	pg/ml	7 	0 - 29*

Pituitary Pars In dia Dysfunction

*Lab reference values

Nutritional examination

Equine metabolic syndrome

- Predisposition to laminitis
- Increased general and/or regional adiposity
  (BCS ≥7 and CN ≥ 4, Morgan et al., 2015)
- Insulin resistance (IR): basal insulin >20 µIU/ml

Phenotype panel
(ACVIM consensus statement, 2010)

Other parameters:
- easy keeper breeds
-5-15 years

Nutritional examination

Equine metabolic syndrome

- Predisposition to laminitis ✅
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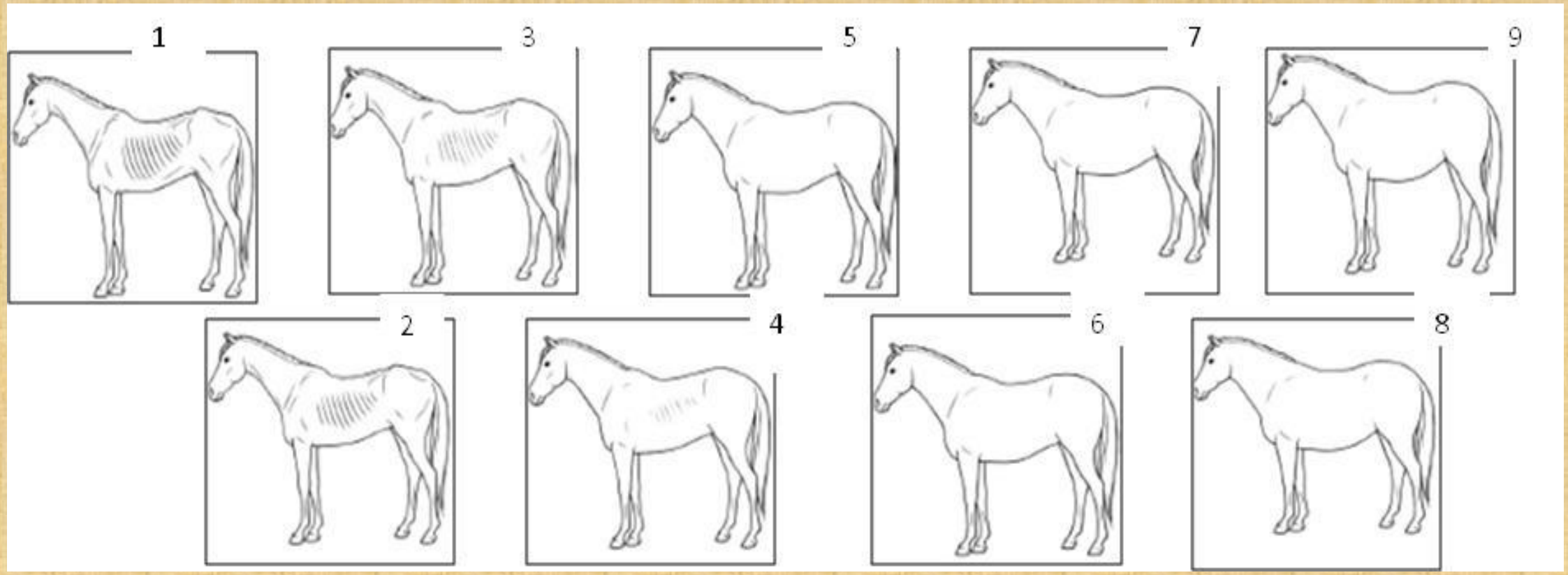
Nutritional examination

BCS

9 point scale (Henneke et al., 1983)



Nutritional examination

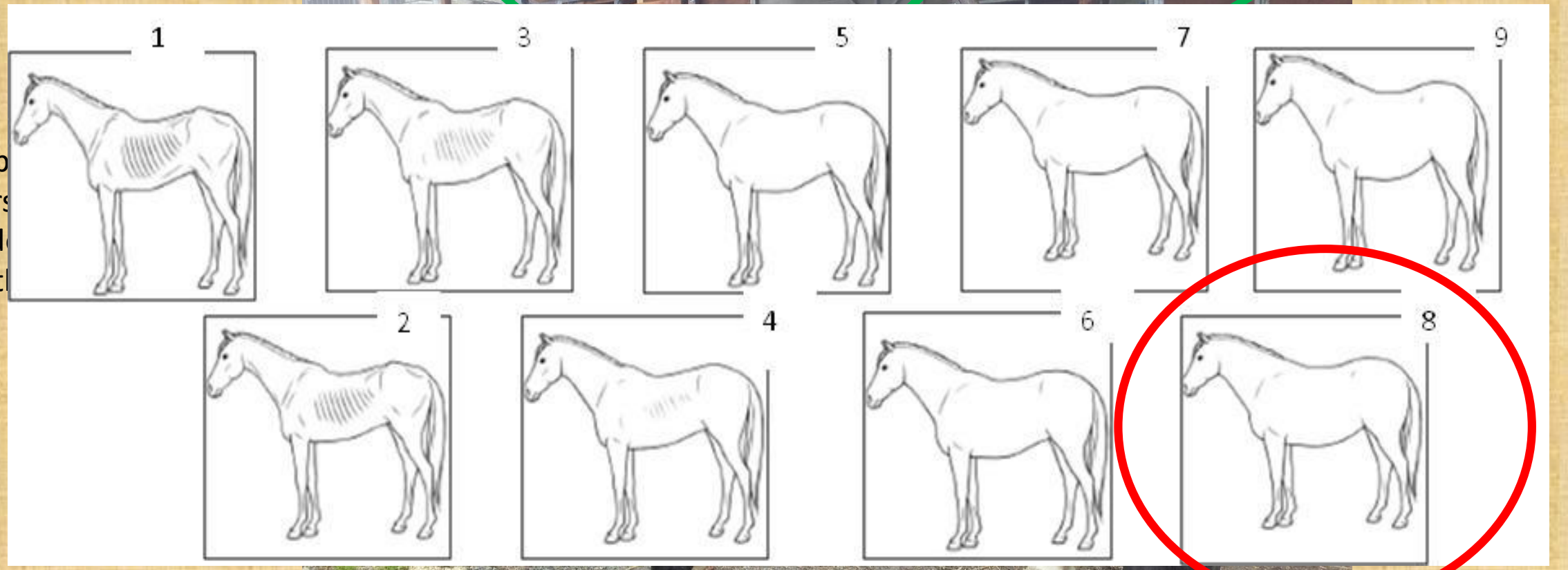
BCS

Apparent crease down spine
Cresty neck

ribs difficult to feel

soft fat surrounding tail head

fat dep
withers
should
inner t

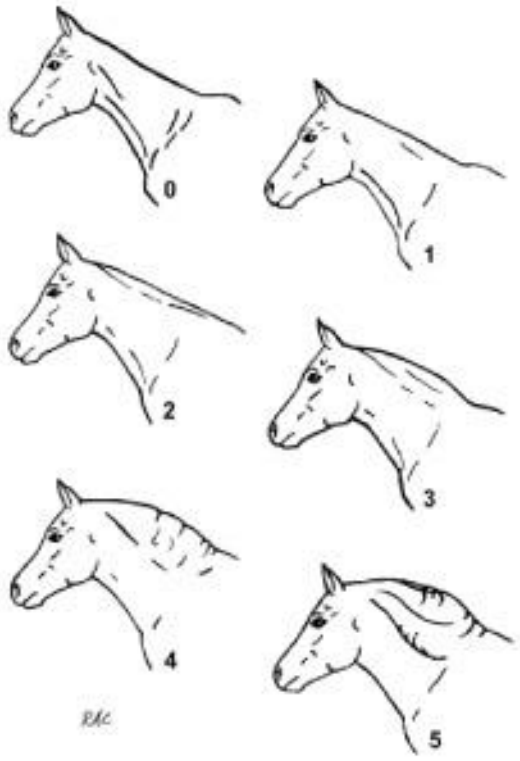


Nutritional examination

Cresty Neck Score (CNS)

5 point scale (Carter, et al., 2008)

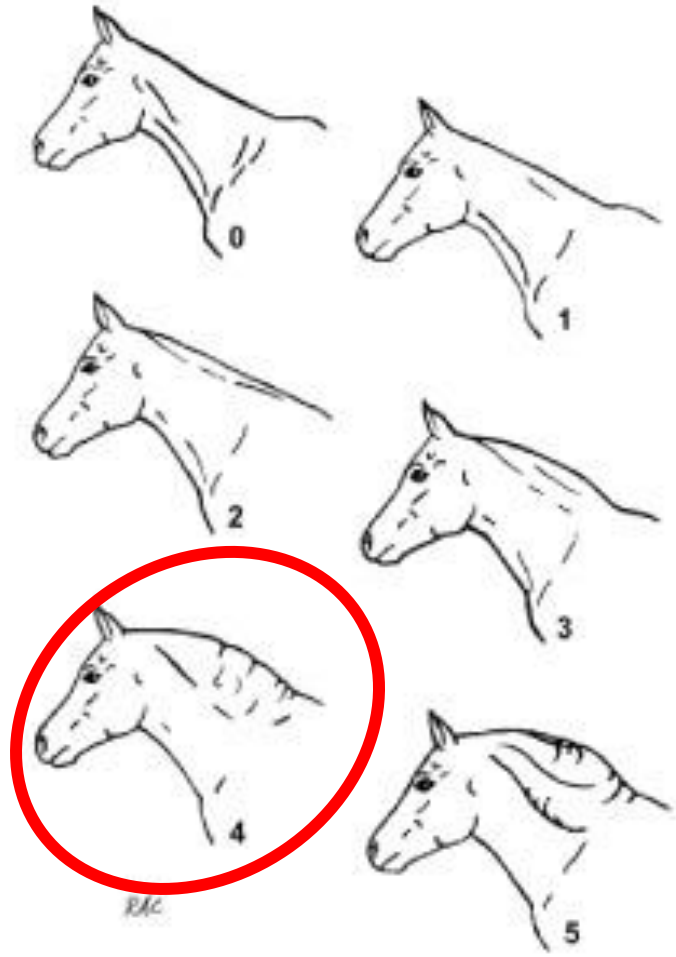
Only studied measurement for evaluation of regional adiposity



Score	Description
0	No palpable crest.
1	No visual appearance of a crest, but slight filling felt with palpation.
2	Noticeable appearance of a crest, but fat deposited fairly evenly from poll to withers. Crest easily cupped in one hand and bent from side to side.
3	Crest enlarged and thickened, so fat is deposited more heavily in middle of the neck than toward poll and withers, giving a mounded appearance. Crest fills cupped hand and begins losing side to side flexibility.
4	Crest grossly enlarged and thickened, and can no longer be cupped in one hand or easily bent from side to side. Crest may have wrinkles or creases perpendicular to the topline.
5	Crest is so large it permanently droops to one side.

Nutritional examination

Cresty Neck Score (CNS)



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(ACVIM consensus statement, 2010)

Other parameters:
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-5-15 years ✅

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Nutritional examination

Blood Analysis

Recommended tests for insulin and glucose measurement: dynamic tests

- Combined Glucose Insulin Tolerance Test (CGIT)
- Oral Glucose Test (OGT)

…but not very easy to perform in the field!

Our method: basal tests + proxy RISQI (reciprocal square root of insulin)
If basal hyperinsulinaemia is not present and yet the phenotype of the horses strongly suggests EMS, then dynamic tests are undertaken.

Morgan et al., 2015

Nutritional examination

Blood Analysis

Basal measurements: insulin and glucose concentration

Blood sampling 8-10 a.m. after fasting overnight (Frank et al., 2010)

Parameter	Unit	Result	Reference values
Glucose	mg/dl	143 ↑	75 – 115*
Insulin	microIU/ml	110 ↑	10 – 20*

Uncompensated insulin resistance (IR)

(Morgan et al., 2015)

Rare in comparison to compensated IR

*Lab reference values

Nutritional examination

Equine metabolic syndrome

- Predisposition to laminitis ✅
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Phenotype panel
(ACVIM consensus statement, 2010)

Other parameters:
- easy keeper breeds ✅
-5-15 years ✅

Nutritional therapy

Goal: counteracting endocrine-metabolic risk factors

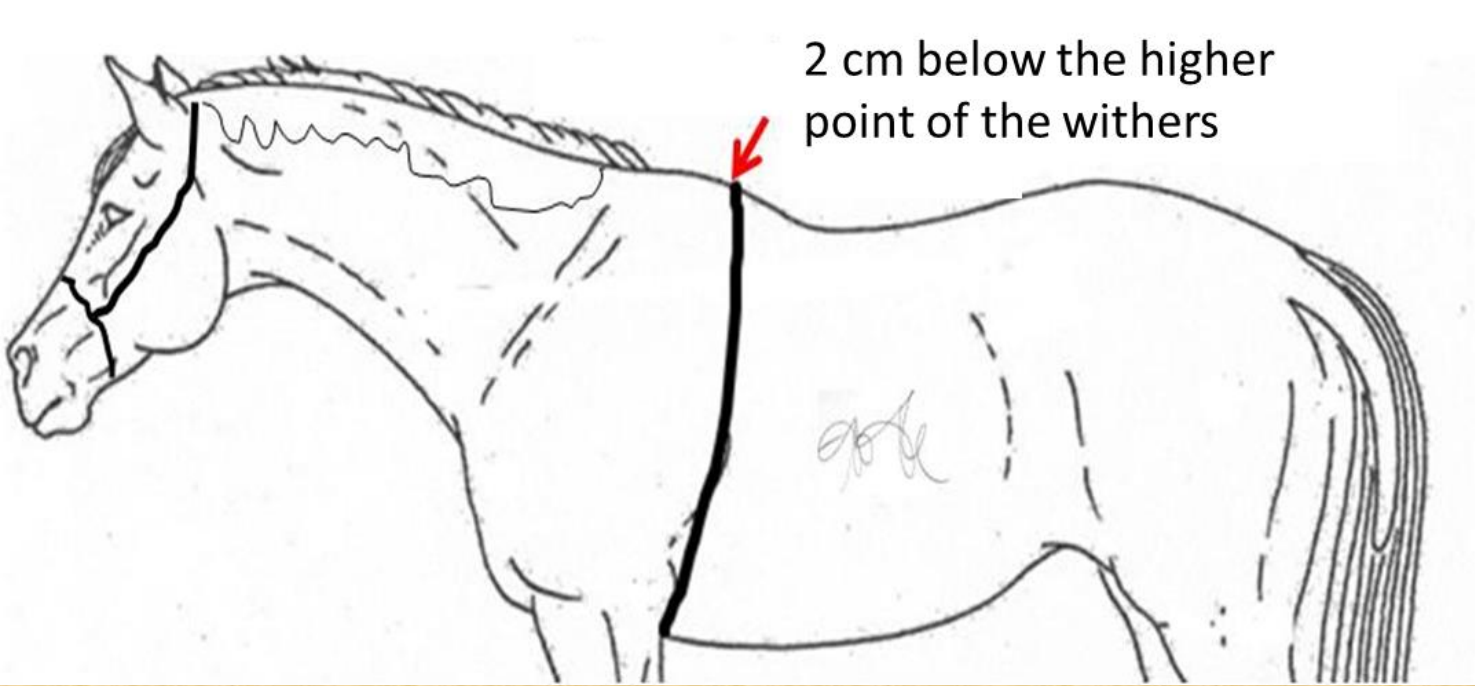
Induce weight loss to improve insulin sensitivity

Select the right feeds

Frank et al., 2008

Nutritional therapy

Induce weight loss



(Heart girth in m)^3 x 80 = BW in kg

(Marcenac and Aublet, 1964)

HG = 1.93 m

Estimated BW = 575 kg

Nutritional therapy

Induce weight loss

Actual BCS = 8
Estimated BW = 575 kg

Desired BCS = 7 (Carter et al, 2008)
Desired BW = 575 – 20 = 555 kg

1 unit of BCS = 20 kg Body Fat (Lawrence, 2001)

MER: 30.3 kcal *555 kg = 16.8 Mcal (70.32 MJ) (NRC, 2007)

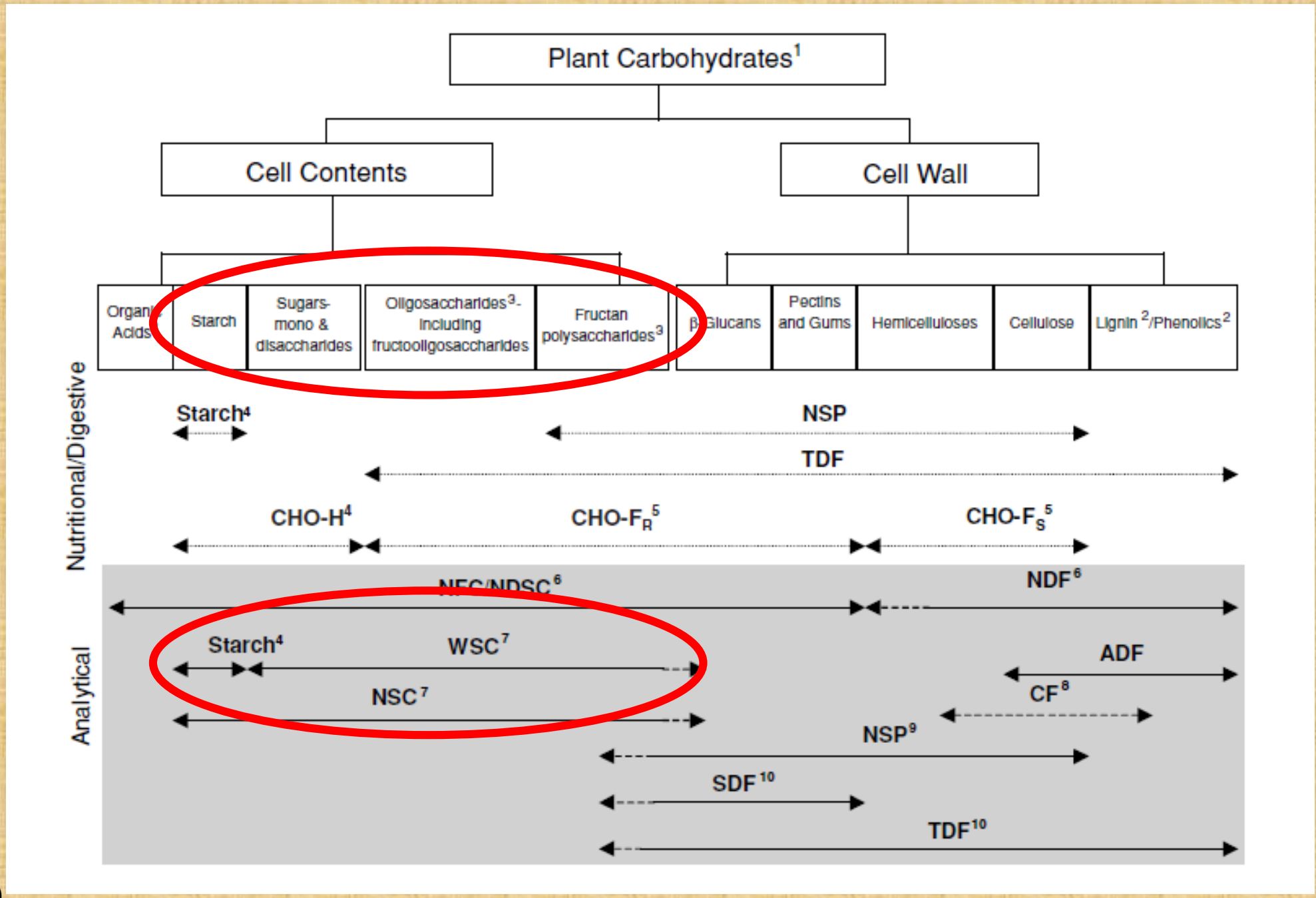
Max daily reduction: 20% MER (3.3 Mcal) (Wambaq and Hesta, 2014)

Daily requirements for weight loss = 16.8 Mcal - 3.3 = 13.5 Mcal (56.51 MJ)

Estimated decrease in DE intake necessary to change the condition score of a 500 kg horse of 1 BCS

Time period to accomplish loss	DE below maintenance (Mcal/d)	Percent decrease in DE below maintenance
60 days	5.3-6.7	32-41%
90 days	3.6-4.4	22-27%
120 days	2.7-3.3	16-21%
150 days	2.1-2.7	13-16%
180 days	1.8-2.2	11-14%

(NRC, 2007)


Plant Carbohydrates[1]
Cell Contents
Cell Wall
Organic Acids
Starch
Sugars- mono & disaccharides
Oligosaccharides[3]- including fructooligosaccharides
Fructan polysaccharides[3]
β-Glucans
Pectins and Gums
Hemicelluloses
Cellulose
Lignin[2]/Phenolics[2]
Nutritional/Digestive
Starch[4]
NSP
TDF
CHO-H[4]
CHO-F_R[5]
CHO-F_S[5]
Analytical
NFC/NDSC[6]
NDF[6]
Starch[4]
WSC[7]
ADF
NSC[7]
CF[8]
NSP[9]
SDF[10]
TDF[10]

(NRC, 2007)

Nutritional therapy

Feed selection

- NO grain or sweet feeds: rich in NSC
- Restricted or NO access to pasture: rich in NSC
- NO bran mashes: rich in starch (15-28%)

Diet based on grass hay with low (10-12% DM) NSC content

Geor and Harris, 2013

Nutritional therapy

Feed selection

Why the previous diet was not working?

Complete feed made by grass hay

Mean starch %: 2.26
Mean WSC %: 10.9

WSC = water soluble carbohydrates = sugars + fructans

Starch + WSC = NSC
NSC % = 13.16

High NSC content!

Hoffman, 2013

Nutritional therapy

Dietary plan

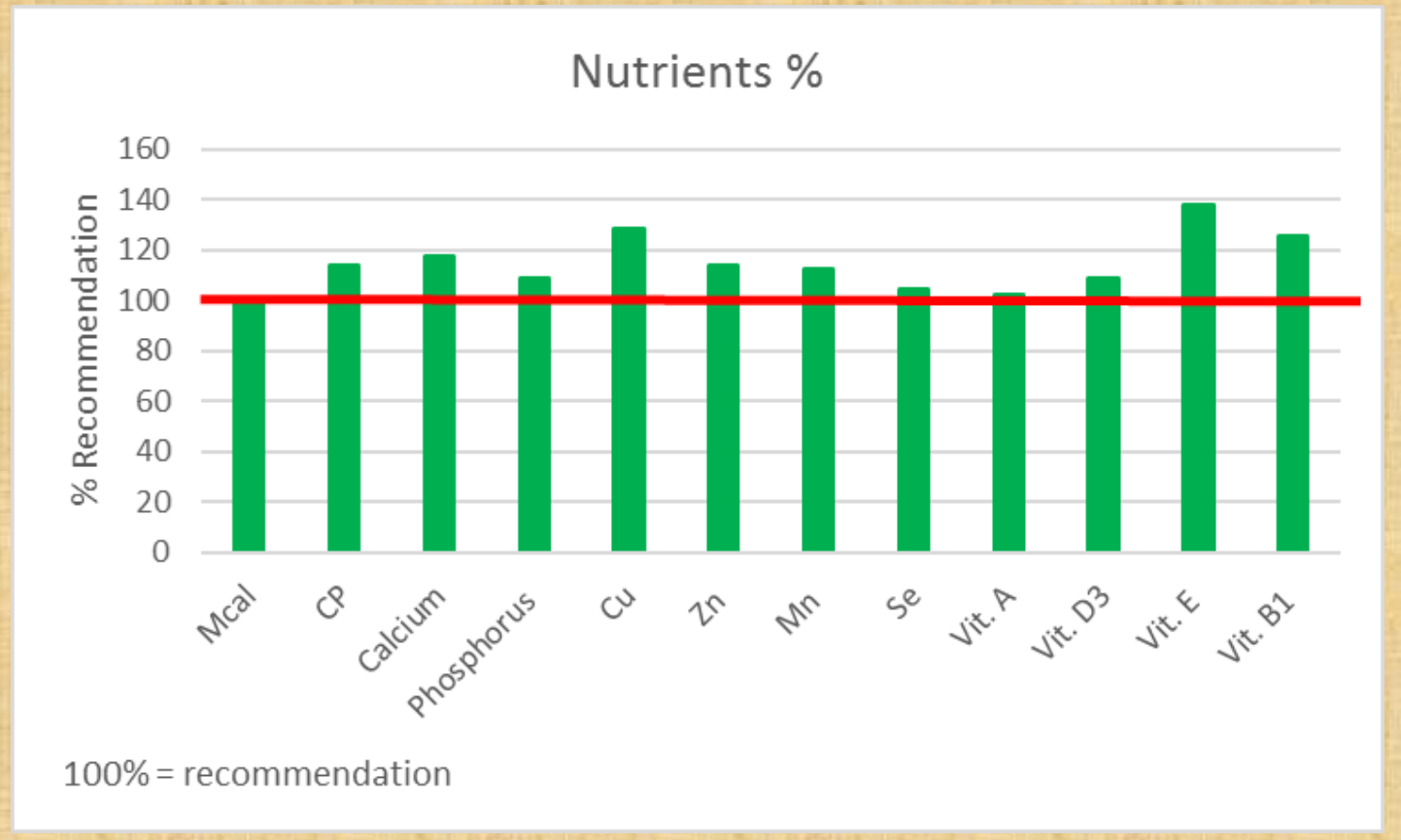
- 5.5 kg First cut meadow hay, **soaked*** in water for 40 minutes, administered in a net to increase consumption times
- 2.2 kg Palatin Glyx-Wiese feed
- 150 g Feed balancer

*soaked hay loses a part of the total water soluble carbohydrate (WSC) content (Longland et al., 2011; Argo et al., 2015)

Theoretical
NSC content = 9%

Nutritional therapy

Dietary plan



Nutrient	Ration	Recommendation
Mcal	13.5	13.5
Crude protein(g)	617.00	540.00
Crude Ash (g)	634.15	-
Crude fat (g)	64.25	-
Crude Fiber (g)	2,284.95	-
Calcium (g)	35.00	29.70
Phosphorus (g)	19.46	17.89
Cu (mg)	148.20	115.50
Zn (mg)	550.50	484.00
Mn (mg)	555.50	495.00
Se (mg)	1.26	1.21
Vit. A (IU)	35,116.50	34,375.00
Vit. D3 (IU)	3,900.00	3,575.00
Vit. E (mg)	760.00	550.00
Vit. B1 (mg)	38.00	30.25

Nutritional therapy

Dietary plan

4 meals per day
to keep the glycemic index low

	Morning (kg)	Lunchtime (kg)	Afternoon (kg)	Evening (kg)
Hay	1,5	1	1	2
Complete feed	0,6	0,5	0,5	0,6
Feed Balancer	0,075			0,075

Nutritional therapy

… 1,5 month after the beginning of the diet!

Decrease susceptibility to laminitis and gradual return to normal insulin sensitivity

Prevention of further problems: adequate exercise program and restricted dietary management

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Berlin, September 13th, 2016

Thank you!

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