Balancing Equine Diets

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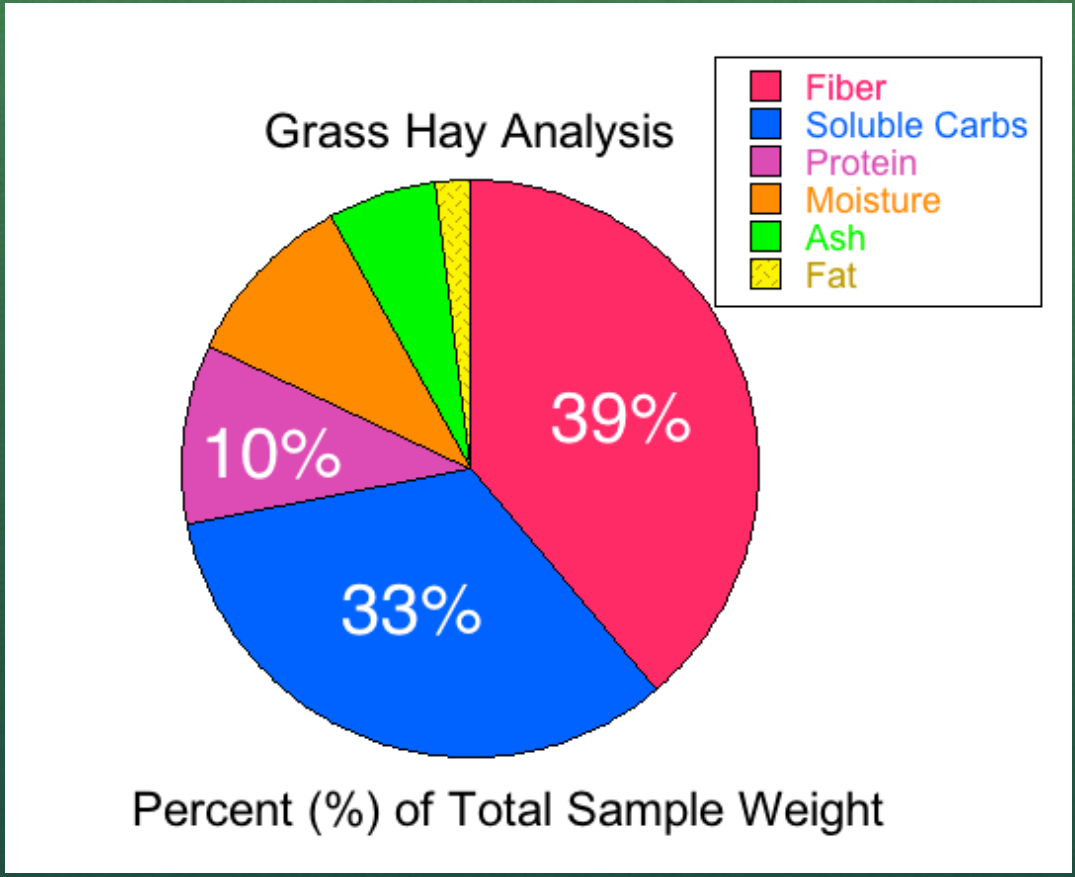
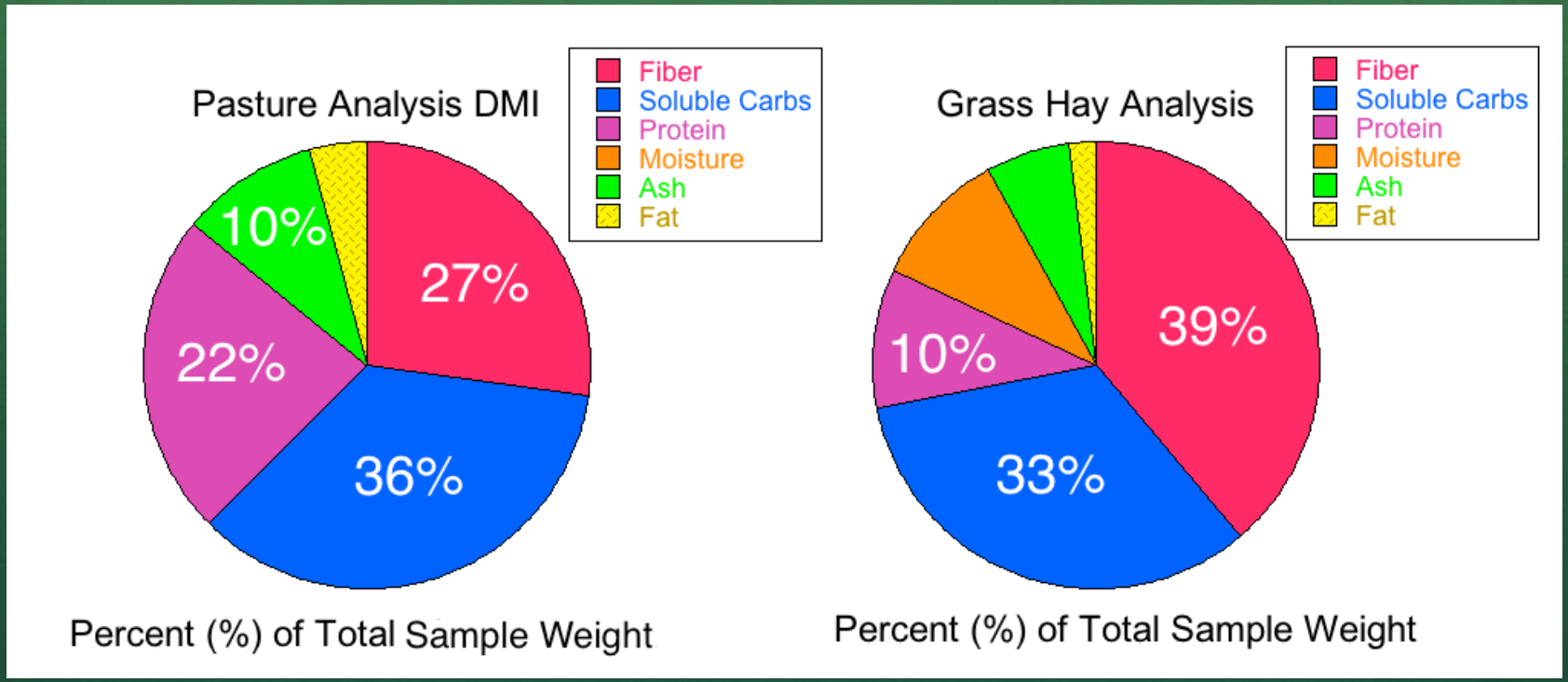
What is a balanced diet?

- In human nutrition, *balancing* your diet means eating the right types of food to provide optimal energy and nutrition.
- In equine nutrition, energy and nutrition provided by forage and any additional nutrients required to *balance* deficiencies and excesses.
- Importance of carbohydrates and fiber in equine diet

Grass Hay Pie Chart



Pasture versus Hay



Steps to a balanced diet

- Test forage to determine both macronutrients (major minerals) and micronutrients (trace minerals), crude protein, digestible energy (calories).
- Compare hay and pasture analyses to nutrient requirements of horses (National Research Council, 2007).
- Balance both deficiencies and excesses with single ingredients, or custom mixes, formulated specifically for your area.

A Primer On Metric System

- Because mineral ingredients are present in small concentrations in feeds and supplements, the metric system is preferred over the English system for diet calculations.
- All prefixes to metric units are expressed in powers of 10.
- It is unnecessary to use fractions, or decimals in metric system.

Metric to English Conversions

Conversions

1 gram = 1/28 ounce = 0.0357 ounce, or 28 grams = 1 ounce

1/1000 gram = 0.001 gram = 1 milligram (mg) = 0.0000357 ounce

1/1,000,00 gram = 0.000001 gram = 1 microgram (mcg)

1000 grams = 1 kilogram (kg) = 2.2 lb

1 part per million (ppm) = 1 mg/kg = 1 mg/2.2 lb

Human Minerals/Vitamins

Suggested Usage: As a dietary supplement, children over 100 lbs. and adults, take one (1) to three (3) capsules by mouth one (1) to three (3) times per day with food, or as directed by a physician.

WARNING: Keep out of reach of children. Keep tightly closed. Store in a dry place. Avoid excessive heat.

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.

Supplement Facts

Serving Size 3 Capsules Servings Per Container 90

Amount Per Serving		%Daily Value
Vitamin A (as mixed carotenoids)	5000 IU	100%
Vitamin C (as ascorbic acid)	500 mg	833%
Vitamin D (as vitamin D-3)	1000 IU	250%
Vitamin E (as mixed tocopherols)	90 IU	300%
Vitamin K (as phytonadione)	27 mcg	34%
Thiamin (as thiamine HCl)	50 mg	3333%
Riboflavin	11 mg	647%
Niacin (as niacinamide)	33 mg	165%
Vitamin B-6 (as pyridoxine HCl)	50 mg	2500%
Folic Acid	200 mcg	50%
Vitamin B-12 (as cyanocobalamin)	100 mcg	1667%
Biotin	2 mg	667%
Pantothenic Acid (D-Cal Pan)	100 mg	1000%
Iodine (from kelp)	75 mcg	50%
Magnesium (from magnesium citrate)	50 mg	13%
Zinc (as zinc citrate)	10 mg	67%
Selenium (as selenium chelate)	50 mcg	71%
Copper (as copper chelate)	1 mg	50%
Manganese (as manganese chelate)	3 mg	150%
Chromium (as chromium picolinate)	600 mcg	500%
Molybdenum (as molybdenum chelate)	100 mcg	133%
Potassium (as potassium aspartate)	99 mg	3%
Alpha Lipoic Acid	100 mg	+

+ Daily Value not established

Other ingredients: Rice Flour, Cellulose, Magnesium Stearate, Silicon Dioxide

This product is derived from natural sources. This product is free of wheat, corn, egg, milk, and yeast. This product contains no sugar, no saccharin, no preservatives, and no artificial flavors or dyes.

Physician's Preference®
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1-800-579-6545

Interpreting feed labels: Local Sweet Feed

Crude Protein (min.) 12.00%, Crude Fat (min.) 2.50%, Crude Fiber (max.) 18.50%, Calcium (Ca) (min.) .40%, Calcium (Ca) (max.) .80%, Phosphorus (P) (min.) .35%, Salt (NaCl) (min.) .25%, Salt (NaCl) (max.) .75%, Potassium (K) (min.) .75%, Copper (Cu) (min.) 30.00 ppm, Selenium (Se) (min.) .30 ppm, Zinc (Zn) (min.) 100.00 ppm.

Step 1: Express % and ppm in weight

Calcium (Ca)

0.8% Ca = 0.8 g Ca /100 g feed = 8 g/1000 g

8 g/1000 g = 8 g Ca/1 kg feed

Zinc (Zn)

100 ppm Zn = 100 mg Zn/1 kg feed

Step 2: Calculate mineral weight in daily ration

For 5 lbs sweet feed

8 g Ca/kg feed = 8 g/2.2 lbs

8 g/2.2 lbs x 5 lbs = 18 g Ca in 5 lbs sweet feed

100 ppm Zn = 100 mg Zn/kg feed

100 mg/2.2 lbs x 5 lbs = 227 mg Zn in 5 lbs sweet feed

User-friendly feed label

California Trace pelleted formula guaranteed analysis per 2 oz. (2 scoop) serving:

California Trace Pelleted Formula
Guaranteed Analysis Per 2 oz. Serving:

Copper	175 mg
Zinc	500 mg
Selenium	2 mg
Iodine	2 mg
Biotin	20 mg
Vitamin A	15,000 IU
Vitamin E	750 IU
Lysine	7 g
Methionine	2.5 g

See how your current product compares with California Trace! Click here to use our handy Conversion Calculator

Ingredients: **Rice Bran, Almond Hull Meal, L-Lysine Hydrochloride, DL-Methionine, Zinc Polysaccharide Complex, Copper Polysaccharide Complex, Vitamin E Supplement, Biotin, Rice Hulls (as a vitamin carrier), Selenium Yeast, Vitamin A Supplement, Naturally Preserved with Mixed Tocopherols, Rosemary Extract, Ascorbic Acid, Citric Acid and Lecithin, Natural & Artificial Flavoring, Ethylene Diamine Dihydroiodide, Iodine.**

Sampling forage for analysis

Insert corer into square bale, sample 20 bales, mix cores and seal in 1-gallon Ziploc bags.

Sampling round bale

Sampling pasture for carbohydrate analysis

Sample only *grazed* pasture areas, seal in 1-gallon Ziploc bags, freeze sample within 30 minutes of collection and ship overnight in insulated containers with dry ice.

Harrison County forage analysis

Table 1. Nutrient profile for samples of mixed grass hay and pasture grass collected from fields near Central, Indiana.

	Ca (%)	P	Mg	K	Na	CP	DE (Mcal)
Grass Hay-Y	0.49	0.30	0.16	1.66	0.02	9.9	1.91
Pasture-G	0.54	0.36	0.20	3.47	0.01	22.4	2.49
	Fe (ppm)	Cu	Zn	Mn	Mo	Se	Co
Grass Hay-Y	76	8	20	62	1.2	0.09	0.26
Pasture-G	126	15	31	44	1.8	n/a	n/a

Chemical symbols and abbreviations: Ca (Calcium), P (Phosphorous), Mg (Magnesium), K (Potassium), Na (Sodium), Fe (Iron), Cu (Copper), Zn (Zinc), Mn (Manganese), Mo (Molybdenum), Se (Selenium), Co (Cobalt), CP (Crude Protein), DE (Digestible Energy in Megacalories, Mcal/kg), n/a (not analyzed), mg = milligram, kg = kilogram = 2.2 lbs.

After correction for daily hay ration

Table 2. Daily nutrient intake based on hay and pasture grass samples collected from fields near Central, Indiana. Dietary intake of hay at 2% body weight (BW).

	Ca (g)	P	Mg	K	Na	CP	DE (Mcal)
Grass Hay-Y	49	30	16	166	1.7	990	19.1
Pasture-G	54	36	20	347	1.0	2240	24.9
	Fe (mg)	Cu	Zn	Mn	Mo	Se	Co
Grass Hay-Y	760	80	200	620	12	0.9	2.6
Pasture-G	1260	150	310	440	18	n/a	n/a

Feed 2% body weight for average horse at maintenance (0.02 x 1100 lbs = 22 lbs or 10 kg)

NRC nutrient requirements

Base NRC recommended minimum major mineral intakes 500 kg mature body weight (mg). Intakes in red mixed grass hay Harrison County, Indiana

Calcium	0.043 x BW (21.5 mg)	(49 mg)
Phosphorus	0.028 x BW (14 mg)	(30 mg)
Magnesium	0.015 x BW (7.5)	(16 mg)

NRC nutrient requirements

Base NRC recommended minimum trace mineral intakes 500 kg mature body weight (mg)

Class	Fe	Cu	Zn	Mn	Se	I
Adult Maintenance	400	100	400	400	1.0	3.5
Moderate Work	450	112.5	450	450	1.1	4.0
Heavy/Very Heavy Work	500	125	500	500	1.3	4.4

Mixed grass hay Harrison County, Indiana

Adult Maintenance	760	80	200	620	0.9	n/a

Importance of mineral ratios in balanced diet

- Important mineral ratios

  Fe:Cu:Zn:Mn = 4:1:3:3

  Ca/Mg = 1.5 - 2:1

  Ca/P = 1.5 - 2:1

- Maintain tight range between ratios to compensate for interference (competition) between minerals

  Examples: Cu/S, Fe/Zn, Fe/Mn, Ca/P

Results from diet calculations

- Hay and pasture in Harrison County, Indiana are deficient in copper, zinc, and sodium. Selenium meets the minimum requirement established by the National Research Council (Nutrient Requirements of Horses, 2007). Iodine is not included in forage analyses; however, it is deficient in most Midwest soils. Iron always in excess of NRC requirements.
- If these minerals are supplemented at recommended levels, horses at average activity levels (pleasure) and working horses (light training and some endurance) can be maintained on grass hay and pasture, respectively.

Results from diet calculations

- High-iron hay and pasture require correspondingly higher levels of supplementation because iron limits the absorption of certain trace minerals, such as zinc.
- The nutrient content of hay and pasture will vary based on soil type, farming practices and type of grass, or other pasture plants. Therefore, it is important that you balance your horse's diet based on forage from your local area.

How important are these minerals to horse health?

- Copper: incorporation of iron in hemoglobin, bone and cartilage development, elastic connective tissue
- Zinc: insulin production and release, keratin formation (skin, hair coat and hoof horn), bone remodeling
- Selenium: thyroid function, selenoproteins in skeletal muscle
- Iodine: production of thyroid hormones
- Sodium: normal functioning of all nerve and muscle tissue

Custom mix versus ready-mixed commercial product

- Supplement amounts in custom mixes are based on your hay and pasture analyses
- Custom mixes will balance mineral deficiencies and excesses.
- Custom mixes do not include additional ingredients that your horse does not need.
- Off-the-shelf mixtures at farm stores are not formulated for our local area.

Comparative cost analysis

- Sweet feed = 5 lbs per day = 150 lbs per month = 3 bags per month @ $12.00 per 50-lb bag = $36.00
- Custom mix @ $100.00 per 25 lb bag = 2 oz per day = 60 oz per month @ 25 cents per oz = $15.00 per month
- Custom mix balances forage diet and is more economical than sweet feed!

Take-home message

- Most horses in Harrison County can be maintained on grass hay, or pasture, with only a few mineral supplements.
- Harrison County hay and pasture are deficient in Copper, Zinc, Sodium, Iodine and Selenium (marginal).
- Each of these minerals is *extremely* important for optimal health.
- Mineral supplements should be provided as single ingredients, or in a custom mix, based on your hay and pasture analyses.