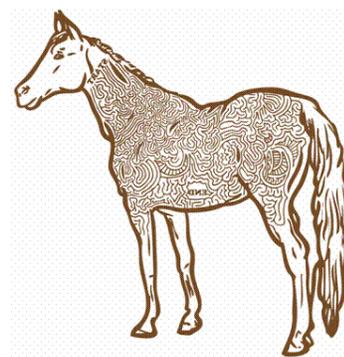




**ALWAYS “FIXED FORMULA”
FOR CONSISTENT
QUALITY, PERFORMANCE AND SAFETY**



Carbohydrates

DEFINITIONS: From HORSE.com & Dairy One

Water-soluble carbohydrates (**WSC**)—These include carbohydrates that are extracted from a sample by **dissolving them in water**. Simple sugars and fructans make up this measure, which is simply termed "sugar" on some analyses. Interpreting and using this value depends on the proportions of sugars and fructans in the sample; simple sugars are digested and absorbed in the small intestine and have **a significant impact on blood sugar** (glycemic response), while fructans are fermented in the large intestine and induce a much smaller response. However, when eaten in large amounts, **some fructans have been shown to cause laminitis** due to disruption of the bacterial population in the large intestine. Fructans are rarely analyzed separately from other WSC.

NDF (neutral detergent fiber) Total plant cell wall carbohydrates, including ADF (see below) and hemicellulose; often considered an indicator of forage quality and intake potential (lower NDF=less hard-to-digest fiber=higher "quality," higher intake).
ADF (acid detergent fiber) Less digestible carbohydrates in plant cell walls, including cellulose and lignin ; higher ADF=lower digestibility.

NFC (non-fiber carbohydrates) A calculated estimate of carbohydrates composed of starch, simple sugars, fructan, soluble fiber, and fermentation acids; calculation may vary, but generally equals 100% minus (CP+NDF+Fat+Ash). A rough estimate of carbohydrate value (high NFC generally indicates more digestible carbohydrates than indigestible fiber types).

NSC (non-structural carbohydrates) Intended to describe easily digestible carbohydrate components of a feed more specifically than those in NFC; usually calculated as WSC + starch or ESC + starch. **Questionable because of varying analysis methods and results.**

WSC (water-soluble carbohydrates) Carbohydrates solubilized and extracted with water, including simple sugars and fructans (see below); sometimes called "sugar" on analysis reports. Interpretation of WSC is dependent upon the relative proportions of simple sugars and fructan as they are metabolized at different sites in the gastrointestinal tract. High WSC might indicate high fructan levels in grasses or high simple sugars in nongrass forages and grains.

Fructans Carbohydrate compound made up of many fructose molecules (complex sugar);fermented and digested primarily in the large intestine. Occasionally analyzed separately from WSC. Present in primarily grass forages; one type is used at high doses in many laboratories to induce laminitis.

ESC (ethanol-soluble carbohydrates) Carbohydrates that dissolve in 80% ethanol solution; these carbohydrates are a subset of WSC that are primarily digested in the small intestine and give a true glycemic (blood sugar) response. However, some fructans can be included in this fraction. High ESC generally means a feed will generate a high glycemic response (unless there is a high level of fructans in this fraction). Might be helpful for hardworking horses that need lots of energy, not so good for horses that are sensitive to large blood sugar changes (i.e., insulin-resistant horses). However, low ESC does not necessarily mean the feed will have a low glycemic response, because starch could keep it high.

Starch A polysaccharide composed of many linked glucose molecules found mainly in grains; mostly digested in the small intestine, where they are broken down and absorbed as glucose (simple sugar). Some starches are resistant to small intestine digestion and are fermented in the large intestine; a typical analysis does not differentiate between the two types. Low starch content generally means little glucose will be absorbed in the small intestine (low glycemic response). This is good for horses that can't handle large blood sugar changes (i.e., insulin-resistant horses). High starch generally means a high glycemic response.

NSC: DAIRY ONE UPDATE

On February 01, 2007 we introduced the WSC/ESC concept and redefined the way "sugar" was reported (see http://www.dairyone.com/Forage/Newsletters/New_NIR_Services.htm.)

Recall that, although the results of both methods are being used to report sugar, neither measures sugar in the strictest sense. As such, both methods are best described by their **extractant** (water or ethanol) and reported as water soluble carbohydrates (**WSC**) or ethanol soluble carbohydrates (**ESC**). This is analogous to the reporting of fibers as either acid or neutral detergent fiber. The fiber fraction is defined by the extractant (acid or neutral detergent). **The WSC/ESC concept was readily grasped by all.**

At the same time, we redefined the calculation of nonstructural carbohydrates (NSC). **Formerly, it was calculated as "starch+WSC"** and was changed to **"starch +ESC"**. It was felt that the new definition better represented carbohydrates that were digested in the small intestine, particularly in monogastrics. This change caused concern in some sectors, as horse feeds were beginning to be labeled for NSC content based on starch+WSC. Since we're at a crossroads in carbohydrate nutrition, we contacted a panel of leading dairy and equine nutritionists from academia and industry to discuss how NSC should be determined. The consensus was that due to the variable nature in the calculation,

composition and utilization of the components in NSC, that it's nutritional relevance is circumspect.

Rations are best evaluated and balanced for starch, WSC and ESC as individual components.

KING CARBORAIKER SERIES WAS INTRODUCED TO PROVIDE A LOW SUGAR/STARCH DIET FOR METABOLICALLY CHALLENGED HORSES.

CARBORAIKER COMPLETE as analyzed by Dairy One:

Starch 1.8%, ESC 4.5%, WSC 5.0%

The Carboraider line from King is one of the lowest sugar/starch equine feeds on the market today. It is available in both a complete feed and a supplement. There are also Senior and Low Calorie formulas.

Carboraider also contains pre- and probiotics for digestive support and lecithin which enhances nutrition absorption and skin/coat condition and reduces the impact of ulcers.