

## BASIC NUTRITION – LIQUID VIEWPOINT

Let's start with some perspective:

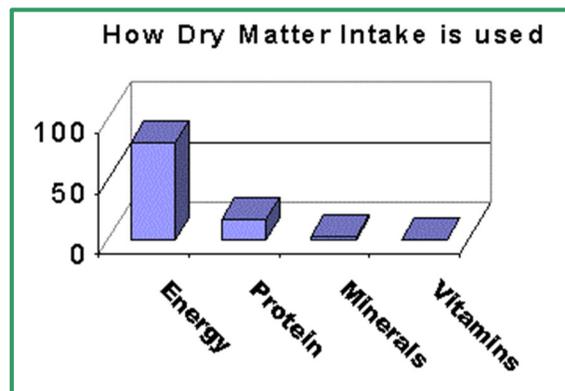
*There's no such thing as dry feed.*

Nothing dry can be digested. Everything an animal (or you) eats has to go into a water-based solution or suspension before it can be digested and absorbed into the body. An animal chews the dry stuff it's fed and drinks water in order to get everything into solution so its digestive process can get started. Liquids are one step ahead of other feeds because they are already in digestible form.

Now don't run out and set fire to the hay shed or grain bin yet. Hay and other dry materials have plenty of nutrients in them, even if they don't have the advantage of being liquid. Let's look at the nutrients one at a time:

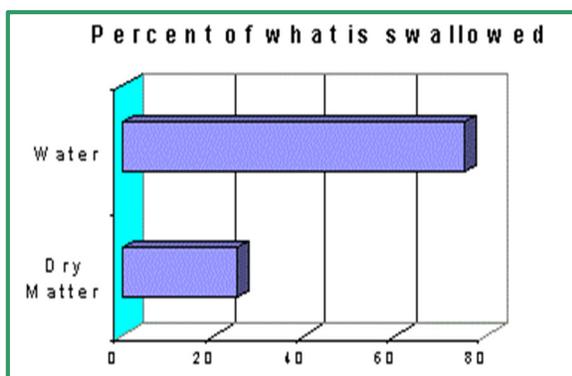
There are 5 groups of Nutrients: Water, Energy, Protein, Minerals, and Vitamins

All nutrients are essential, but the physical quantity required of each is greatly different. This graph shows how the amounts of each nutrient needed compares to total dry matter intake. I know we said that there is no such thing as dry feed, but measuring the amount of intake on a dry basis is a good yardstick, so we'll use it.



### WATER

More water is needed than any other nutrient. The total amount needed depends on the environment and the animal, but on average, cattle need about three times as many pounds of water as of dry matter intake.



Water is the most critical of the nutrients. Animal performance will go downhill faster when water intake is low than from lack of any other nutrient. Remember, none of the other nutrients can be digested unless they are dissolved in water. All feedstuffs contain some water, but the amounts aren't enough for the needs of animals. If someone complains that their livestock aren't performing, always check the water to be sure there is plenty of clean accessible water. Remember, if the water system isn't working, nothing else will work either.

### ENERGY

About 80-90% of the digestible portion of a ration will be used for energy. Energy comes primarily from fiber, carbohydrates, volatile fatty acids, excess natural protein, and fats.

Sugar is the simplest carbohydrate, and is the most readily digestible source of energy. Sugar is the main form of energy in Westway supplements, so the energy in Mol-Mix, Converter, Multi-Mix, the E-Z Glo and E-Z Flo mill products is ready for absorption and utilization immediately upon consumption.

Starches are chains of sugars linked together. Starches are abundant in grains and root crops. Starches must undergo some breakdown before the sugars in them can be utilized.

Fiber is abundant in feeds such as grass, hay and silage. Microbes in the rumen of cattle and sheep convert some of the fiber to volatile fatty acids (VFA; primarily acetic, propionic, and butyric) which in turn are digested and used for energy, and for production of butterfat. Liquid ingredients contain no fiber, so there is no fiber in Westway liquid supplements. However, the sugars in Westway liquids provide readily available energy that helps rumen bacteria break down fiber. For cattle receiving forage-based diets, the VFA produced from rumen fermentation are actually the primary source of energy used by the animal.

Fats are the most concentrated energy source, having over twice the energy value of carbohydrates. However, some types of fats can depress fiber utilization by rumen microbes, so the type of fats used and the amount fed must be carefully regulated. Generally, animal fats are better than vegetable fats, though vegetable fats can be used up to a certain level. A common standard for lactating dairy cattle is about 1 lb. of added fat/hd/day. Some specialized Westway products contain added fat, some of which is from animal and some from vegetable sources. Feeding directions on the specific product will explain the use levels for those products.

More than 80% of the weight of the nutrients digested is energy, so energy is needed in greater quantity than any other feed nutrient group.

The energy supplied in Westway liquids is a small proportion of the total needed, but it is important because the energy is in solution, ready for use by the rumen microbes immediately.

## **PROTEIN**

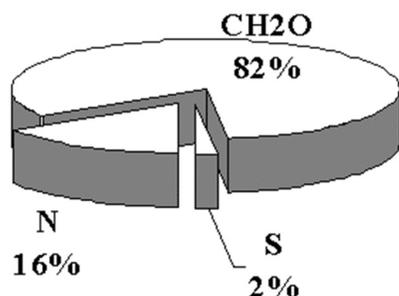
Natural proteins are composed of a chain of amino acids which are made of carbon, hydrogen, oxygen, nitrogen, and sulfur.

The term "crude protein" is an estimate of the amount of protein in a feed, based on the nitrogen content. Lab analysis for true proteins or amino acids is expensive and complex, but a simple nitrogen analysis is quick and inexpensive. Natural protein contains 16% nitrogen. Therefore, the crude protein content of a feed is estimated by dividing the % nitrogen by 0.16.

Non-Protein Nitrogen (NPN) is included in the crude protein content of a ruminant feed because microbes in the rumens of ruminant animals can synthesize natural protein by using the nitrogen in NPN sources. Therefore the NPN and the natural protein are included in the "crude protein" content of Westway Liquid Feed Supplements which are intended for ruminant animals.

Sulfur is also needed to make a complete protein. Westway supplements contain the proper ratio of sulfur to nitrogen for maximum protein synthesis by rumen microbes. Dry feeds containing NPN often do not include sufficient sulfur.

## Composition of Protein



This chart shows the relative amounts of nitrogen (N), sulfur (S), and carbohydrates (CH<sub>2</sub>O) in proteins.

You can see that over 80% of the diet can come from more economical "home-grown" sources of carbohydrates, if the proper amounts of nitrogen and sulfur are supplied in the diet.

Westway Liquid Feed Supplements have this proper balance, and include readily fermentable sugars for maximum utilization of NPN.

Also, the NPN in Westway Liquid Feed Supplements is in a form that is more stable in the rumen than NPN from dry feed sources.

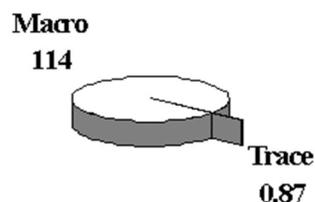
## MINERALS

Minerals are inorganic elements that are absorbed into the body and used for many purposes.

**Macro** minerals are needed in relatively large amounts while only tiny quantities of **Trace** minerals are required.

This chart shows the relative quantity of Macro vs. Trace minerals needed daily by a growing calf. Remember, the amount of a mineral required is not related to its importance. A shortage of copper is just as damaging as a magnesium deficiency.

### Grams of Mineral/Calf/day

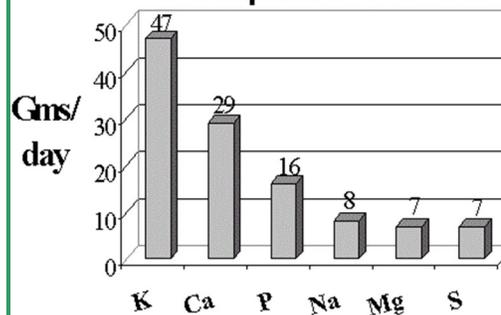


The **Macro** mineral group includes Calcium, Phosphorus, Potassium, Sodium, and Magnesium. The daily amount of any of the major minerals needed by a mature beef or dairy cow is large enough to be measured in ounces or fractions of a pound, and is easily visible.

For example, macro mineral requirements for growing beef calves are shown in this chart. For perspective, there are 28.5 grams in an ounce; one-eighth of a pound is a little over 50 grams.

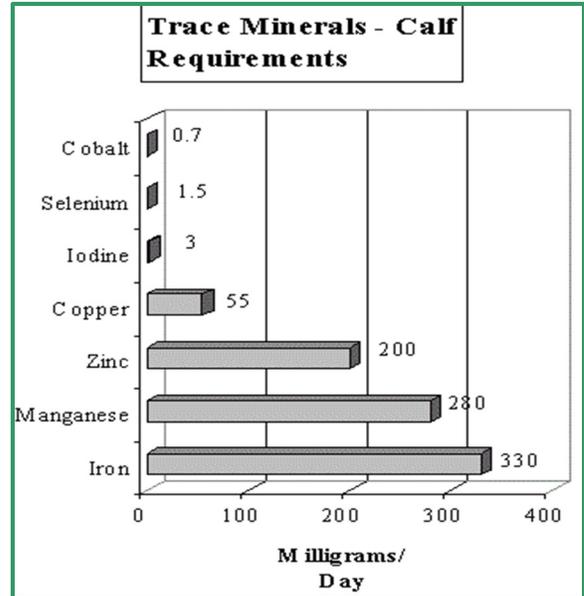
Most forages are adequate in calcium, potassium and magnesium. Supplemental phosphorus is needed in most feeding programs. Most of the phosphorus in Westway Liquid Feed Supplements comes from phosphoric acid, the most economical and nutritionally available source of phosphorus. Dry feeds cannot include phosphoric acid.

### Growing Beef Calf - Grams Required



**Trace Minerals** are just as essential as the major minerals, but are required in much smaller quantities. The daily amounts of trace minerals needed by cattle range from less than the weight of a human hair to as much as half the weight of a dime. This chart shows the requirements of a growing calf in milligrams. For purposes of comparison, a drop of water weighs about 50 milligrams.

The Trace Minerals include Cobalt, Iodine, Iron, Manganese, Zinc, Copper, and Selenium. All Westway Liquid Feed Supplements contain a basic amount of the essential trace minerals. Shortages of copper, zinc, and manganese are being recognized more often, leading at times to the need to further fortify products for a given geographic area.



## VITAMINS

Vitamins are a classification of organic compounds which are needed in minute amounts, but are essential. Vitamins are divided into two groups - fat soluble or water soluble.

The water soluble vitamin group includes all the B vitamins and Vitamin C. Ruminant animals don't normally need supplemental B vitamins because rumen microbial fermentation produces sufficient amounts. No practical requirement for Vitamin C has been demonstrated in cattle or sheep. Standard Westway Liquid Feed Supplements aren't fortified with B vitamins or Vitamin C. Some specialized Westway products for horses or stressed ruminants may include B vitamins.

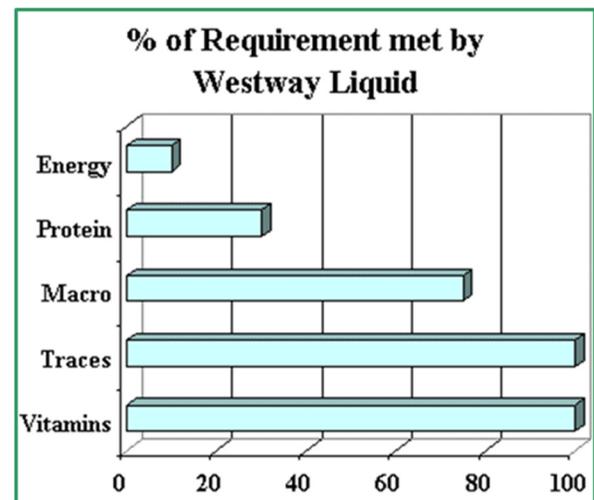
The fat soluble vitamins are A, D, E, and K. Vitamin K is synthesized by rumen microbes and is not needed supplementally. Vitamins A, D, and E are not synthesized in the rumen and must be supplied in the animals' diet. Westway supplements contain amounts of vitamins A, D, and E that will meet the accepted requirements at normal levels of intake.

The fat soluble vitamin cattle are most likely to be short of is Vitamin E. Vitamin E works together with the trace mineral selenium for several important functions in the body.

### Westway liquids are not protein supplements.

They are all-round supplements designed to supply the nutrients that a forage may be short of.

In a typical situation, Westway Liquid Feed Supplements can supply all the supplemental vitamin and trace mineral needs, most of the supplemental major minerals, about a third of the protein, and 5 to 10% of the energy required by cattle.



Three other feedstuff components are important feed management considerations.

## **FIBER**

Fibers are components of plants that are relatively resistant to digestion. Rumen microbes can break down and utilize many types of fibers. Dairy ration formulation includes careful consideration of the amount and type of fiber in a diet. The classifications important in dairy rations are Crude Fiber, Acid Detergent Fiber (ADF), and Neutral Detergent Fiber (NDF). These terms are based on the chemical techniques used in analysis. The current trend is to use ADF or NDF values in dairy rations, rather than Crude Fiber.

Fiber serves several functions in a ruminant animal.

- 1) Stimulate the rumen, causing muscular contractions which mix the contents, improving fermentation and digestion.
- 2) Provide a site for establishment of microbial colonies.
- 3) Converted by microbes to volatile fatty acids, primarily acetic, propionic, and butyric, which are important energy sources for the cow, as well as building blocks for butterfat production.
- 4) Act as a buffer, helping hold the rumen pH at a level above 6.2, which is the most efficient range for proper fermentation.

Westway Liquid Feed Supplements contain nutrients needed by the rumen microbes which break fiber down and convert it to energy. This is why Westway supplementation will improve utilization of poor quality roughages.

## **ADDITIVES**

Additives are substances added to a feed which perform non-nutritive functions. These may include:

- Flavors - to stabilize the flavor of the product and of the feed it is mixed with
- Mold and Yeast Inhibitors - to improve shelf-life
- Surfactants - to improve handling characteristics
- Conditioners - to enhance value of the dry feed mixes
- Suspending agents - for physical stability of insoluble material in the product
- Pellet Binders - to enhance pellet durability
- GRAS (Generally Recognized as Safe) compounds which research suggests have biologic activity related to rumen function, feed efficiency, gut health, immune function, or manure characteristics
- Feed-through biopesticides - for control of external parasites
- Drugs - for extra performance, efficiency or stress protection

Westway supplements may contain any or all of the classes of additives, depending on the special requirements of the supplement.

## **UNIDENTIFIED FACTORS**

This is an area which keeps scientists humble. Unexplained benefits are sometimes seen from some ingredients, helping remind us that we don't know everything. Among the types of ingredients giving unidentified improvement are those derived from a fermentation process. Many types of fermentation by-products are available for use in Westway formulations. These include fermented

corn extractives, molasses fermentation solubles, condensed whey, distiller's solubles, and brewer's solubles.

### **UNCONSUMED NUTRIENTS**

The best feed formulation in the world does no good if cattle won't or can't eat it. About 5% (in some cases, much more) of pelleted feeds and meal mixes are lost due to fines created during handling, sorting in the bunk, insect and rodent damage, and mold. Cubes and cake are lost as fines or trampled into the ground uneaten. Some cattle get more than their share, and some don't get any. Rations that look good on paper may not perform because the animal doesn't really swallow the feed that his owner paid for.

Liquids are totally consumed. They are also transported, stored, and fed in virtually closed systems, essentially eliminating shrink. If you buy it, you can feed it. If you feed it, they all can get it. This is one of the big advantages of liquid feed.