ADM

AMPT™
ADVANCED MINERAL PERFORMANCE TECHNOLOGY

AMPT™ . . . Delivers a Positive Charge

Advanced Mineral Performance Technology

Building a Foundation

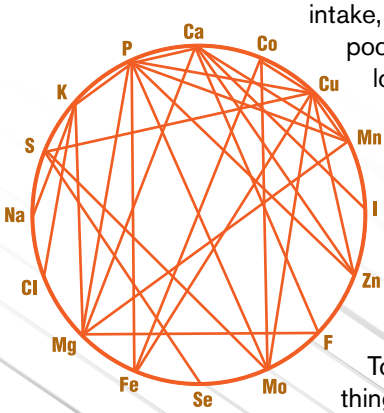
Forage is the foundation for grazing beef cattle diets. Unfortunately, the perfect forage simply doesn't exist even given ideal growing conditions. Depending on season and species, forage may provide sufficient energy and protein to meet brood cattle nutrient needs, yet that's not enough for even the healthiest of animals to attain the best performance genetically possible. What's lacking? Minerals, plain and simple.

Minerals?

Yes, minerals. And, that's more than just salt. Overall, body mineral status influences growth, reproduction, milk production and health. That's a proven fact. These amazing elements are crucial for a myriad of body processes (see Amazing Mineral Functions). The importance of mineral nutrition cannot be overstated…..without adequate mineral nutrition, production and health are compromised. The degree to which production and health are impacted will be dictated by forage mineral content/bioavailability and mineral needs based on production stage.

Stress, whether it is from calving, weaning, shipping, immunological challenges or environment, places a greater demand on the body for minerals, particularly trace minerals. More often than not, mineral deficiencies go undetected because they typically are manifested in sub-clinical forms in terms of lower forage intake, slower gains, poorer feed efficiency, lower reproductive efficiency and lower immunity. One must also consider the fact that minerals interact with each other, often not in a friendly manner. Too much of a good thing (specific mineral), just might actually create a deficiency by tying-up another mineral, making it unavailable. Consequently, it's not only the amounts, but the ratios of various minerals that must be taken into account when formulating mineral supplements.

Mineral Interactions



The rumen environment also impacts mineral availability. While there are rumen microbial mineral needs, these needs are small in comparison to the amounts needed by the body. One exception is the need for cobalt by rumen microbes for synthesis of vitamin B_{12} (more about that later). Rumen-soluble minerals interact with other components during rumen fermentation, resulting in forms of minerals that are less available for absorption from the small intestine into the blood stream for distribution throughout the body. How well a chosen mineral supplement can fill the gap between what the forage supplies and what the animal needs will be the deciding factor impacting production and possibly health.

Amazing Mineral Functions

Minerals, they're not just for skeletal and bone formation. Here's a list of vital functions that involve minerals.

- Enzymatic activation, function and component
- Metabolic functions
- Amino acid formation
- Nerve impulse and transmission
- Muscle building and contraction
- Energy metabolism
- Hormone function
- Formation of B vitamins
- Tissue integrity (hoof and skin)
- Milk secretion
- Osmotic pressure regulation
- Acid-base balance
- Rumen microbial growth and metabolism
- Heart regulation
- Blood clotting
- Membrane permeability
- Oxygen and carbon dioxide transport in blood
- Respiratory gas exchange
- Glucose breakdown
- Genetic code transmission
- Protection against oxidative damage to tissues
- Skeletal structure

The Line Up

Minerals are classified as macro or micro, not because one group is more important than the other. Macro minerals are needed in larger amounts than micro minerals. The following minerals have proven important to beef cattle nutrition:

Macro Minerals

- Calcium (Ca)
- Chloride (Cl)
- Magnesium (Mg)
- Phosphorus (P)
- Potassium (K)
- Sodium (Na)
- Sulfur (S)

Micro Minerals

- Cobalt (Co)
- Copper (Cu)
- Iodine (I)
- Manganese (Mn)
- Molybdenum (Mo)
- Selenium (Se)
- Zinc (Zn)

Won't just any mineral source work?

Not really. Mineral sources vary greatly in terms of bioavailability and concentration. Sulfate, oxide and carbonate-based trace mineral sources have been the industry standard for years. Oxide forms tend to be the least bioavailable with the degree of availability varying by mineral source. Magnesium oxide can be fairly available, but availability varies tremendously, and, to add insult to injury, magnesium oxide is not palatable to cattle, creating the need to "mask" its taste. Organic (chelates, complexes, proteinates and polysaccharides) minerals offer higher bioavailability; however, the cost is substantially more. Due to cost, the use of organic minerals, namely trace minerals zinc, copper, manganese and cobalt, are limited to periods where the animal is subjected to more stress, such as calving or weaning, and often a combination of inorganic and organic trace minerals are used in the mineral supplement.

AMPT™ . . . delivers a positive charge to beef mineral nutrition

Building a better beef mineral supplement from the ground up is the focus of AMPT's Advanced Mineral Performance Technology. First, we started with defining what forages can and can't provide and then tailored the supplement to fill the gaps, taking into account bioavailability of mineral sources and potential negative interactions with other biological substances (such as vitamins, extracts and methoprene). Providing a mineral that is supplied in ample amounts in the forage is simply wasteful, and putting more mineral than is needed in a supplement will definitely drive up costs. The answer – targeted, precise mineral formulation with highly bioavailable sources in the right amounts and ratios that enable cattle to respond with optimal production, that is **A**dvanced **M**ineral **P**erformance **T**echnology or **AMPT**.

Here's what you'll see or won't see with AMPT:

Potassium is typically provided in sufficient amounts in average forages for beef cattle production. So, you won't find added potassium in AMPT minerals.

Let's talk **calcium and phosphorus**. Calcium content is more closely aligned with cow needs in AMPT, enough to balance forage deficiencies without waste. And, phosphorus is an often talked about environmental concern not to mention being the most costly mineral in any animal supplement. It just makes sense to target the correct phosphorus levels needed to compensate for forage deficiency without overdoing it (Table 1).

The amount of **salt** is a reflection of consumption control and cattle needs. Sometimes there's a fine line between too much and too little! We've nailed the balance.

And, how about **magnesium**? Forage magnesium content has a low availability, creating a need for supplemental magnesium. Remember, magnesium oxide is unpalatable to cattle. AMPT formulations utilize magnesium carbonate, which has a higher bioavailability and the huge perk is that it's highly palatable, enhancing mineral palatability.

The objective of AMPT's trace mineral pack-

Table 1 Amount of Phosphorus Needed in Mineral Based on Stage of Production and Amount of Phosphorus in Forage/Basal Diet

	Amount of Phosphorus in Forage/Basal Diet				
Stage of Production	**0.100%**	**0.125%**	**0.150%**	**0.175%**	**0.200%**
Maintenance	5%	2%			
Last Third of Gestation	9%	6%	3%		
Lactation (milk production level)					
Low	8%	5%	2%		
Average	13%	9%	6%	2%	
High	17%	13%	10%	6%	2%

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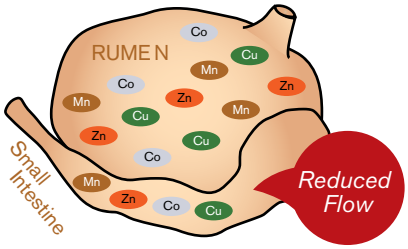
Figure One

Scenario of Trace Mineral Flow into the Ruminant's Small Intestine

Typical Beef Mineral Supplement



With the typical beef mineral supplement, the flow of critical trace minerals to the small intestine is reduced due to the solubility of the trace minerals in the rumen.

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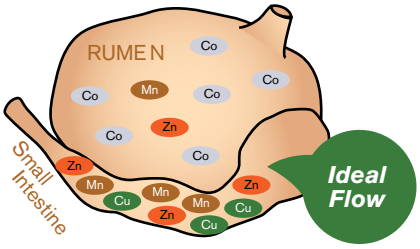


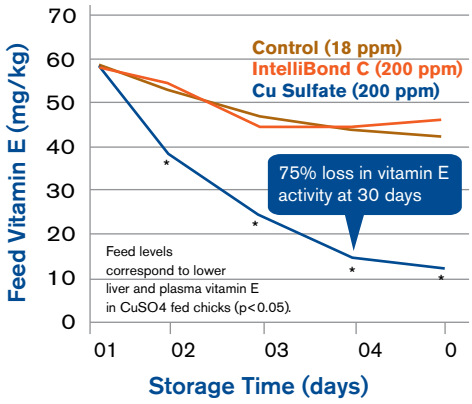
AMPT Minerals make it possible to attain a more ideal flow of critical trace minerals to the small intestine.

age is to ensure that an optimized level of essential trace minerals is absorbed by the blood stream as cost-effectively as possible while avoiding potential trace mineral interactions in the gastrointestinal tract that can reduce trace mineral availability. Crucial trace mineral assimilation is given a boost with the unique hydroxy forms of **copper, zinc and manganese** provided in AMPT. Hydroxy trace minerals have bioavailabilities similar to organic trace minerals due to similar covalent bonding compared to the ionic bonding of sulfate trace minerals. Hydroxy trace minerals bypass the rumen (less soluble in the rumen) for better absorption in the small intestine (Figure 1). Lower solubility in the rumen helps these trace minerals avoid interaction with known rumen antagonists and limits microbial interactions which can help enhance rumen function, increasing forage digestibility. Several minerals are known to affect the availability of copper, highlighting the importance of ensuring an adequate available source and amount is supplied to the animal. Since zinc and copper are absorbed via similar pathways, the availability and amounts supplied should be balanced to ensure adequate amounts are delivered to body tissues. Other great advantages of hydroxy trace minerals are their non-hydroscopic nature, great handling characteristics and stability in mineral mixes. Hydroxy trace minerals are not detrimental to stability of vitamin E (Figure 2) and possibly less detrimental to vitamins

Figure Two

Sulfate Minerals Negatively Impact Vitamin Stability

Diet with 3.6% added fat.



Vitamin E stability in feed has been shown to be better when hydroxy source of copper (basic copper chloride — IntelliBond®** C) was used as the supplemental source of copper versus copper sulfate.

Data adapted from Lu et al., 2010, Biol. Trace Elem. Res. 138:181-9.
*Within a time point, mean is significantly different from Control (p<0.05).
***IntelliBond is a registered trademark of Micronutrients.*

A and D along with other biologically active compounds, such as methoprene (the active component in feed-through horn fly control products).

Cobalt is unique in that it is needed specifically by rumen microbes for production of vitamin B_{12} which is an essential component of certain enzymes involved in metabolic reactions. Cattle supplemented with a unique, patented* source of cobalt used in **AMPT** formulations responded with far better fiber digestibility (Figure 3), and since forage is the base for grazing beef cattle diets, enhancing the utilization of available forage makes economic sense, a lot of economic sense. Better forage digestibility means more energy available for production purposes (Table 2).

*Ralco Animal Nutrition, Inc., patent number 8,575,212.

Weatherized? You bet!

All AMPT Minerals are weatherized. Deterring mineral losses due to moisture is an important aspect of protecting an investment. No more leaching of valuable nutrients, nor hard, caked mineral that cattle won't and can't eat.

AMPT Charged Choices

AMPT makes it easy to give cattle only what they need in a four ounce per day package.

AMPT-A 54229

This is the basic entry level AMPT product and is the AMPT mineral of choice when cattle are grazing wheat pasture or other higher quality forages that meet a substantial portion of nutrient requirements.

AMPT-M 54230

AMPT-M is charged with a higher level of magnesium for protection against grass tetany or other situations that require additional magnesium.

AMPT-P 54231

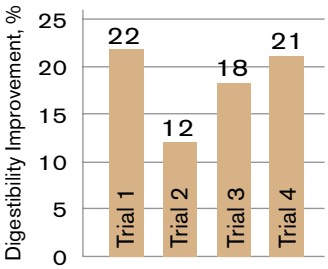
When managing cattle to take performance to the next level, AMPT-P is there to supply extra fortification along with the inclusion of several other production benefiting nutrients. It is an ideal mineral product to use before/after calving, during the breeding season, or during any stressful situation. Additional nutrient fortification includes:

- Boosted phosphorus content to help ensure needs are met during high production phases, post-calving or when forages are at their lowest phosphorus content.
- Inclusion of CitriStim®, an ADM proprietary feed ingredient, which is a source of yeast mannans and beta glucans that may favorably impact the gut microbial population.
- A portion of vitamin E as natural-source E** which research substantiates has up to three times more potent antioxidant activity compared to synthetic vitamin E.

Figure Three

Proprietary Form of Cobalt (CoMax®*)

In vitro and *In vivo* research studies with cattle on high-forage diets were conducted at West Virginia University, North Carolina State University and Oklahoma State University. **The results showed fiber digestibility was improved 12-22% when cattle were supplemented with a proprietary form of cobalt that acts as a microbial catalyst**



*A registered trademark of Ralco Animal Nutrition.

Ralco Nutrition, Inc.

Table 2 Kansas State Study Using Proprietary Form of Cobalt (CoMax)

Parameter	Control	Proprietary Form of Cobalt
Overall Cow Body Weight Change, lb	52.6	62.3
Overall Body Condition Score Change (BCS Units)	0.07	0.37
Pregnancy to AI, %	49.0	57.6
Overall Pregnancy, %	89.5	92.7
Calf ADG – Late Season, lb	2.24	2.62
Adjusted Weaning Weight, lb	622	636
Overall Avg. Daily Mineral Intake, lb	0.32	0.34

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- Addition of selenium yeast (organic selenium in the form of Se-methionine) offers higher bioavailability which could mean positive effects on health, reproduction and productivity. Se-methionine is passed into the milk and may be beneficial to calf health.

AMPT-T 54232

This solid, versatile product is the AMPT product of choice when a producer only wants to use one mineral year-round. AMPT-T is the preferred product optimizing economics and performance for a majority of the grazing season. Additional nutrient fortification includes:

- A botanical extract known to enhance key physiological parameters, which may enhance stress resistance and rumen function.
- A portion of vitamin E as natural-source E**.
- The popular Endo-Fighter® option is available (Endo-Fighter/Breeder #54177). Endo-Fighter, an ADM exclusive, offers a beneficial, natural-solution to counter the effects of fescue toxicosis and is comprised of a patent-pending combination of components specifically selected and research-proven to support production of cattle on endophyte-infected fescue pastures. This formulation also provides CitriStim, selenium yeast, and Availa®† zinc, copper, and manganese.
- Low salt option (4.5% salt, #54178) may be better suited for salty soil geographic areas where consumption might otherwise be a challenge with the regular AMPT-T formulation (20% salt).

**The source of natural-source vitamin E used in AMPT-P and AMPT-T is Nova-E™, an ADM product.

†Availa is a registered trademark of Zinpro Corporation,

The Pay Back

Mineral supplementation pays. Return on investment can be evaluated in terms of better gains and reproductive efficiency, the ability to digest forages more thoroughly and efficiently, and better immune response. In stocker cattle an average increase of 0.1 lb ADG due to mineral supplementation will overcome a $6.00 per bag price difference and still provide a 3:1 ROI. And, better reproductive response in terms of conception rates also yield dividends. Don't forget about better body condition score due to extracting more energy from available forages. Cows in better body condition have better reproductive efficiency and feed cost may be reduced as less energy supplementation is required.

The production returns for adequate and effective mineral supplementation far outweigh the cost. While cost will always be an important factor dictating mineral supplement selection, the "cheapest" product doesn't mean it will provide the greatest economical return. Producers need to consider the following factors:

- Mineral sources used in the product
- Research, formulation and manufacturing expertise backing the product
- Consistency of product
- Palatability
- Consumption rate and reliability of consumption
- Weatherization
- Results

You really do get what you pay for. Can you afford to give your herd less than what they need? Mineral know-how is not new to ADM, with roots in mineral manufacturing (MoorMan's®) dating back to the late 1800s. AMPT Mineral formulation and manufacturing is based on the expertise that can only be attained from a hundred plus year history of making minerals that cattlemen have relied on for decades.

AMPT Mineral products offer more than just mineral in a bag. **Its value goes beyond the bag into the feeder and onto your bottom line.**

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