

## Milk Replacer Ingredients and Additives

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In the United States, most dairy heifers in the pre-weaning phase are fed milk replacer rather than whole milk. Some of the major considerations behind this management decision include convenience, consistency, biosecurity and economics.

Calf milk replacers vary not only in their protein and fat ratios but also in the type and quality of the proteins and fats used. Additionally, different additives and medications can be brought into the calf milk replacer formula to fit the specific needs and goals of each calf-raising operation, making milk replacers a valuable and highly customizable feedstuff for a farm.

### Protein

- **Milk proteins** are typically recommended in calf milk replacers, as they are more digestible for calves than non-milk protein sources. Offering a desirable amino acid profile, sources of milk proteins include whey, whey protein concentrate, whey solubles, de-lactosed whey, skim milk and casein. Of these options, whey proteins are the most prominent source of protein for calf milk replacers. The milk replacers from Hubbard that use all-milk proteins include the [Blueprint](#) and [Calf Beginner](#) product lines.
- **Animal plasma protein** is an exception to the rule as far as non-milk proteins go and is not only an excellent source of nutrition for calves but also delivers additional benefits in the gastrointestinal tract. Animal plasma carries antibodies in the form of immunoglobulin G (IgG), which provides a consistent source of protection against undesirable pathogens and bacteria in the calf's small intestine. The Hubbard milk replacers that utilize animal plasma include the [Vitalizer](#) product line.
- **Other non-milk proteins** include hydrolyzed wheat gluten protein and soy protein, which can serve as an economic alternative to milk protein. While non-milk proteins can support calf growth and performance, their overall digestibility is lower compared to milk and animal plasma proteins, and as a result, they are considered an inferior alternative. Their amino acid profile is also different and needs to be balanced accordingly to meet the needs of the calf.

### Energy

- **Fats** provide a concentrated energy source in calf milk replacers and include both lard and tallow. Since fat is not water soluble, producers of milk replacers typically combine fat with proteins and emulsifiers to homogenize the mix, creating small, dispersed particles that readily stay in suspension in water.
- **Oils** also provide a concentrated energy source and include vegetable oils, such as palm and coconut. Similarly to fats, oils are insoluble in water, which means that they undergo the same emulsifying process. Vegetable oils are highly digestible energy sources and provide health benefits to the calf thanks to their antimicrobial properties.
- **Carbohydrates** can also supply energy in calf milk replacers. Lactose is the major carbohydrate found in whey and whey protein concentrate and supplies half of the energy value of fat. A typical milk replacer contains about 45% lactose, making it a major energy source for the calf.

### Vitamins

- **Vitamin A** is necessary for normal and low-light vision, helps maintain skeletal tissue and epithelial tissue, and is important for normal growth and development.
- **Vitamin D** is required for calcium metabolism and bone and tooth formation.
- **Vitamin E** acts as an antioxidant and is involved in the maintenance of cellular membranes, metabolism, immunity and reproductive function.
- **Vitamin B12** affects energy and protein metabolism and is used by enzymes.
- **Thiamin** plays a role in energy metabolism and helps support nerve and brain function.
- **Vitamin C** acts as an antioxidant, is important for tissue repair and connective tissue synthesis and is classified as an essential nutrient for calves that are 3 weeks of age or younger.

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# CALF SUCCESS

- **Biotin** acts as a cofactor for many enzymes, is involved in carbon dioxide fixation and decarboxylation and supports hoof health.
- **Choline** is involved in the transmission of nerve impulses and fat metabolism.
- **Folic acid** is used in amino acid synthesis, improves red blood cell formation and the oxygen-carrying capacity of the blood, and is necessary for the synthesis of nucleic acids.
- **Pyridoxine** plays a role in the enzyme systems involved with protein metabolism.
- **Vitamin K** is required for protein synthesis and blood clotting.
- **Riboflavin** is a constituent of several enzyme systems associated with metabolism.
- **Niacin** is essential for carbohydrate, lipid and amino acid metabolism.

## Minerals

- **Calcium** is essential for the formation of skeletal tissues, the transmission of nervous tissue impulses, the excitation of skeletal and cardiac muscle contraction, blood clotting and enzymatic activity.
- **Chlorine** maintains the acid-base balance, is a component of gastric secretions and is essential for the transport of carbon dioxide and oxygen.
- **Cobalt** is an essential component of vitamin B12, growth and energy status.
- **Copper** is crucial for many enzymes and is important for bone, collagen and elastin formation.
- **Iodine** is an essential component of hemoglobin and oxygen transport.
- **Iron** primarily functions as a component in hemoglobin and myoglobin.
- **Magnesium** is a major intracellular cation that is a necessary cofactor for the enzymatic reactions that are vital to every major metabolic pathway.
- **Manganese** is a component of enzyme systems and is essential for normal bone formation.
- Phosphorous is intimately involved in the acid-base buffer systems of blood and other bodily fluids, as well as almost all energy transactions in the body.
- **Potassium** is involved in osmotic pressure and acid-base regulation, water balance, nerve impulse transmission, muscle contraction, and oxygen and carbon dioxide transport and also serves as an activator in many enzymatic reactions.
- **Selenium** is involved in protein synthesis, muscle development, immunity and growth.
- **Sulfur** is a critical component of several amino acids, cartilage and B vitamins.
- **Zinc** plays an important role in energy and protein metabolism and gene expression and also supports the immune system.
- **Organic trace minerals** offer improved mineral absorption and bioavailability, which can improve feed efficiency, growth and intake while also decreasing trace mineral excretion in the manure.

## Medications

- **Decoquinat** is a coccidiostat designed to stop the growth of coccidia by inhibiting mitochondrial activity inside the cocci cell. The total oocyst reduction with decoquinat is around 98%.
- **Lasalocid** is a coccidiostat designed to kill coccidia. It functions as an ionophore that moves potassium, sodium, calcium and magnesium into the cocci cell, causing it to swell and burst. The total oocyst reduction with lasalocid is around 96%.
- **Oxytetracycline and neomycin sulfate** is an antibiotic combination that provides broad-spectrum antibacterial activity designed to treat and/or control bacterial enteritis and bacterial pneumonia. A veterinary feed directive (VFD) is needed to purchase and use this medication as of January 1, 2017.

## Other additives

- **Mannan oligosaccharides (Bio-Mos®)** enhances feed efficiency, immune system development and gut health, helping to normalize gut microflora, stimulate the natural defenses and reinforce the function of the digestive system.
- **Direct-fed microbials** are live organisms that provide health benefits to the calf by stimulating a healthy gut environment and preventing the growth of undesirable pathogens.
- **Essential oils** are plant extracts that contain an array of antimicrobial activity. Certain essential oils have shown to stimulate appetite, resulting in improved feed intake and growth.
- **Essential fatty acids** can support the calf's immune system and promote growth and feed efficiency.
- **Diflubenzuron** is a larvicide product that prevents the development of house flies, stable flies, face flies and horn flies in the manure of treated calves.

If you have questions about which Hubbard Feeds milk replacer is right for you, your goals and your calves, contact your [local Hubbard Feeds representative](#).

## References:

Calf Milk Replacer Guide, developed by Rob Costello, 2018.  
Nutrient Requirements of Dairy Cattle: Seventh Revised Edition, 2001.