

# Calf Milk Replacer Guide



Developed by  
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The Performance Leader in Baby Animal Nutrition

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## Why Feed Milk Replacer?

Most of the dairy calves in the United States are fed milk replacer during their liquid feeding period. Economics, convenience and biosecurity are among the major factors that make milk replacer feeding desirable to dairy calf growers.

**Economics.** It is typically cheaper to feed milk replacer to dairy calves than it is to feed saleable whole milk. Milk replacers are made from byproducts of the milk manufacturing industry. Whey, the major protein source for milk replacers, is a byproduct of cheese manufacturing and is usually much cheaper than other milk protein sources such as casein and skim milk. The use of high quality, lower cost ingredients makes milk replacer a more economic choice than whole milk.

Directions: Enter the required values in boxes a and c. Carry out the calculations and enter the results in boxes b and d.

Example: You receive \$12.00 per hundredweight (cwt) of milk and pay \$42.00 for a 50 lb bag of milk replacer. Your savings is \$6.00 per 50 lb bag of milk replacer used.

Potential Savings When Feeding Milk Replacer Instead Of Whole Milk		
Price you receive for 100 lb of whole milk (\$/cwt)		a
	Times	4
Value of 400 lb of whole milk (50 lb solids <sup>1</sup> )	Equals	b
Cost of 50 lb of milk replacer	Minus	c
	<b>Savings</b>	Equals
		d
Source: BAMN 1998 <sup>1</sup> Whole milk is approximately 12.5% solids: 400 lb x 12.5% = 50 lb solids. Therefore 50 lb of calf milk replacer will replace 400 lb of whole milk. This is the average amount of milk required to feed a calf from birth to weaning		

**Convenience.** Milk replacers offer a variety of choices when it comes to ingredients and nutrient levels. This provides flexibility that makes it easier for a variety of farms to meet their management needs. Additives such as vitamins and medications (antibiotics, coccidiostats and ionophores) can easily be supplied through milk replacer. Adding them by hand can be a challenge in whole milk feeding systems. In addition, protein and fat levels in milk replacers can be selected to enhance calf growth objectives and to respond to climatic conditions.

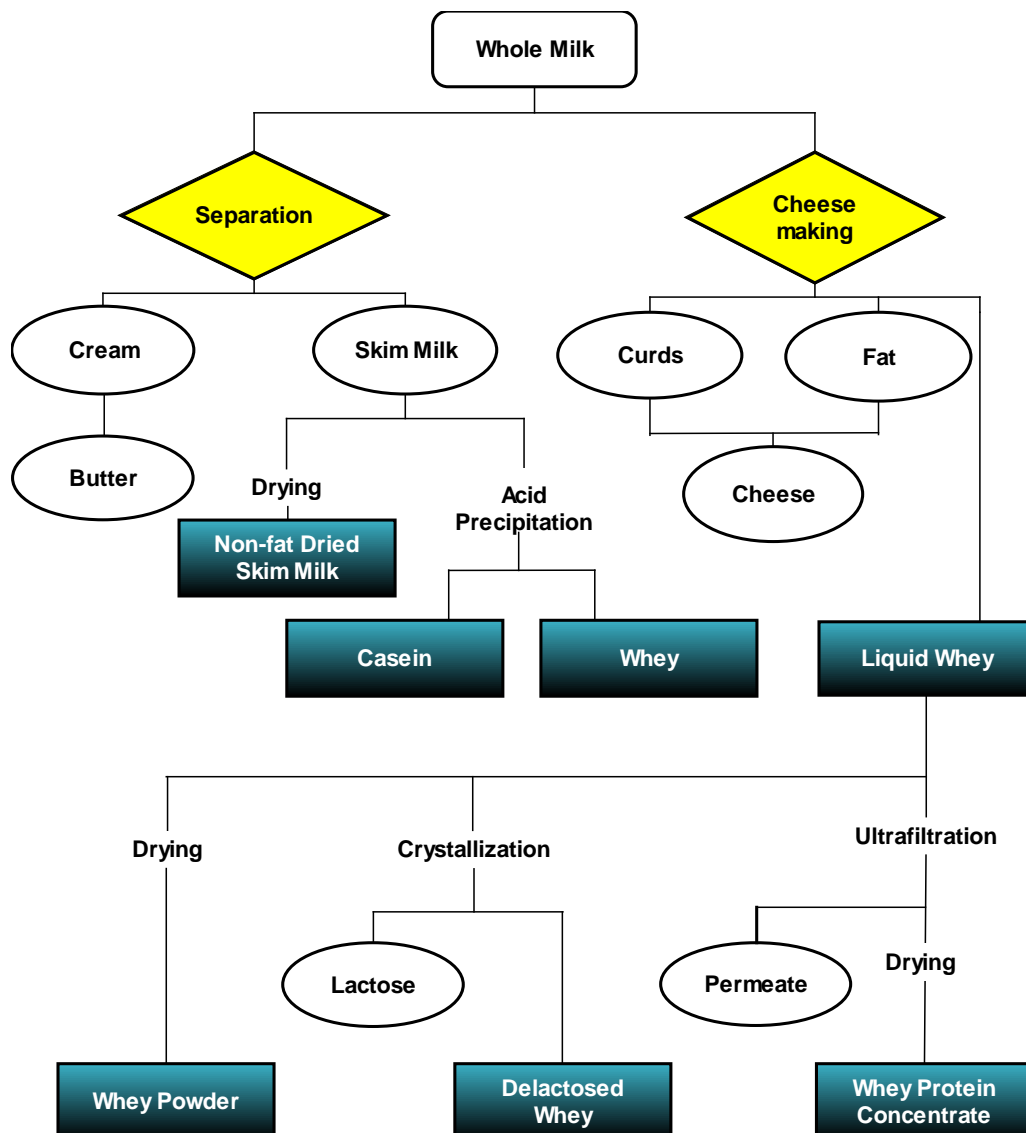
**Biosecurity.** Calves are especially vulnerable to disease. Diseases such as Johne's, Bovine Viral Diarrhea, Bovine Leukosis Virus, pasteurilla, salmonella, E. coli and mycoplasma can be transmitted from cow to calf through unpasteurized milk. Biosecurity and disease prevention issues contribute greatly to the popularity and use of milk replacers. Merrick's not only purchases pasteurized milk ingredients for making milk replacers, but we also include pasteurization as a key step in our manufacturing process.

## Milk Replacer Ingredients

### Protein

The general recommendation for milk replacer protein level is 20 to 27 percent. The most common levels used by calf raisers are 20 to 22 percent. Higher protein levels are usually reserved for intensive milk replacer feeding programs designed to increase calf growth rate. With these programs, the increase in protein percentage coincides with an increase in milk replacer feeding rate and a decrease in milk replacer fat percentage.

**Milk Proteins** are typically more highly digestible than non-milk proteins and provide a desirable amino acid profile for calf growth. Many different milk products are used in manufacturing milk replacers. These include whey, whey protein concentrate, delactosed whey, skim milk, and casein. Whey products are currently utilized as principal protein sources in milk replacers. Protein sources are typically the most expensive milk replacer ingredients.



**Egg Proteins** have been incorporated into commercial milk replacers for several years with excellent results. Egg proteins are often referred to as the perfect protein and have been used as the standard for evaluating proteins. Their amino acid content and digestibility are the reference against which all other proteins are compared. Egg proteins are also less expensive than milk proteins, thereby reducing the cost of milk replacer.

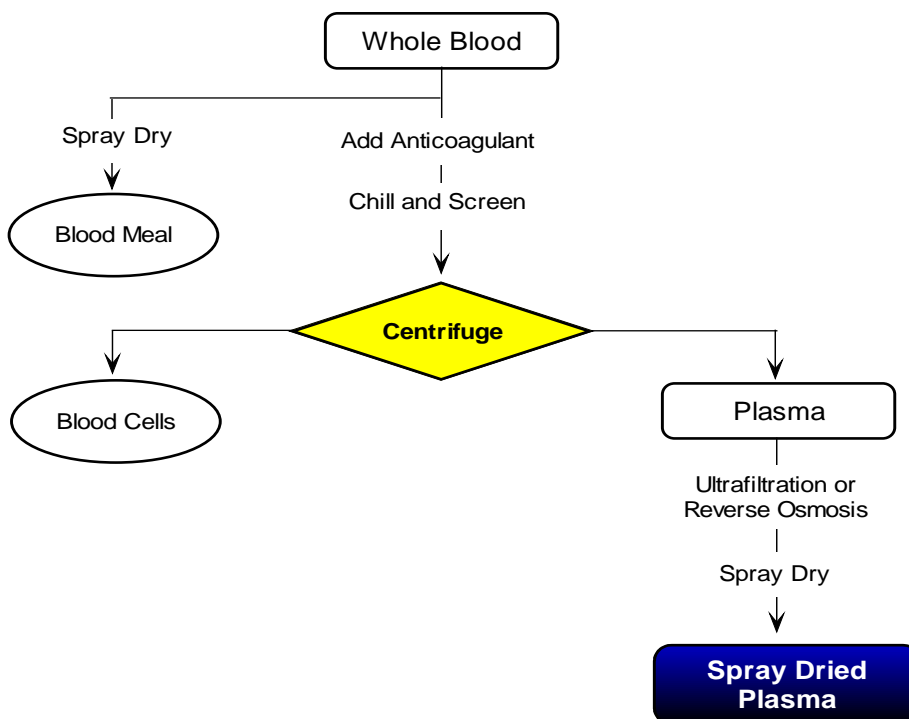
Eggs can also be utilized as a source of energy (eggs are 37% fat), iron, phosphorous, trace minerals and vitamins. They are an important source of lecithin (about 8-9% lecithin in egg yolk). Lecithin acts as a natural antioxidant as well as a skin and hair conditioner, and is a source of choline which is associated with positive hair coat characteristics.

Merrick's unique manufacturing process begins with liquid whole eggs and is fundamental in obtaining the excellent calf performance results achieved with our egg enriched milk replacers. Liquid eggs are thoroughly mixed with our other liquid ingredients. This mixture is pasteurized and then spray dried to make the milk replacer powder. Alternative processes that rely on mixing dried egg components in a dry blending process often result in reduced calf performance.

Feeding eggs to calves is not a new concept. It wasn't long ago that parents or grandparents cracked an egg into a calf's milk to give it something extra to help it to better start or help it through a case of calf scours. Obviously, egg is not just a home remedy.

**Animal Plasma Proteins** provide a unique protein source that contains active albumin and globulin proteins such as IgG and IgM. This highly soluble, high quality protein source has an amino acid profile and nutritive value comparable to nonfat dried (skim) milk and casein. In the digestive tract, IgG has a direct effect on pathogens and may also have a direct effect on the intestinal lining, or mucosa.

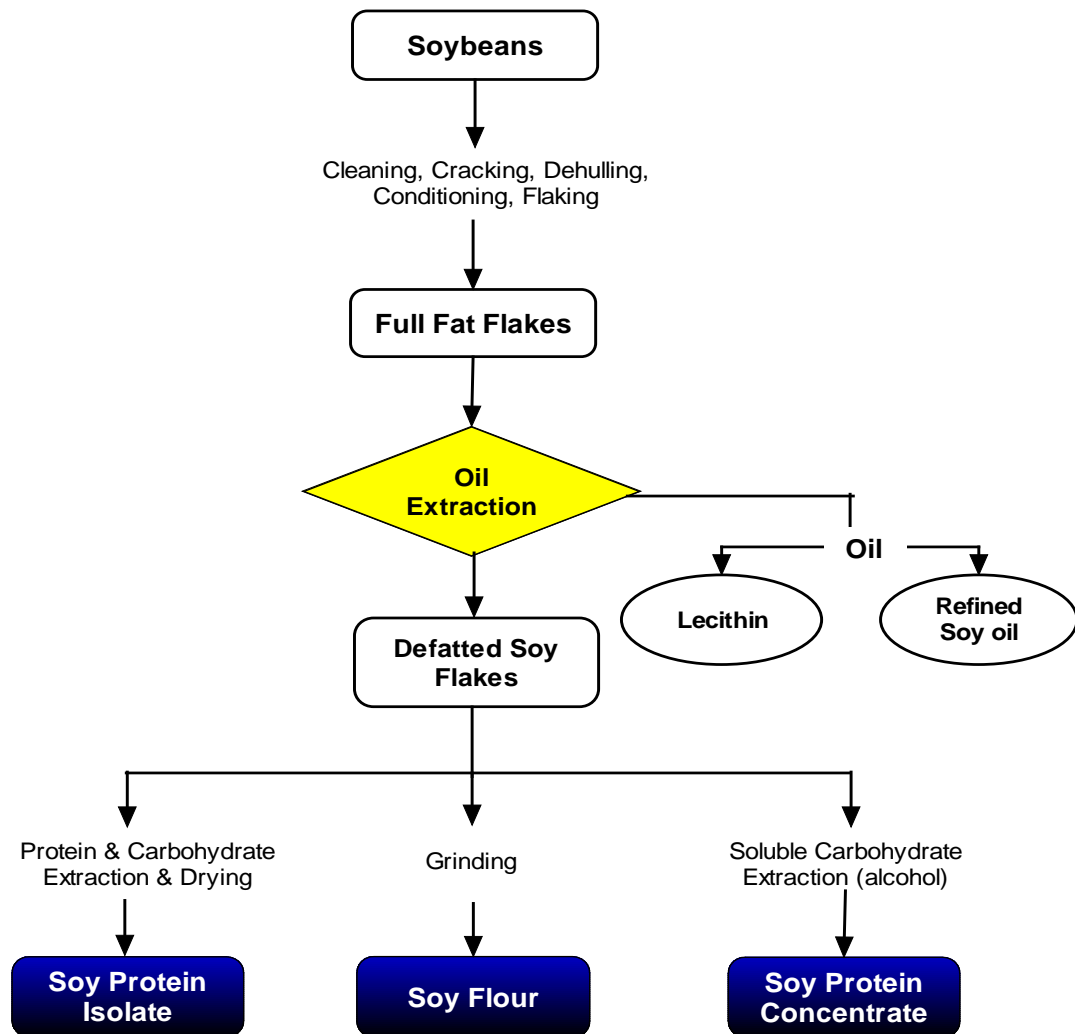
Animal plasma is obtained by centrifuging whole blood into its major components, plasma and blood cells. The two main types of animal plasma are bovine (ruminant) and porcine (swine). Animal plasma of porcine origin is exclusively used in Merrick's calf products.



**Wheat Protein Isolate** is the wheat ingredient used in Merrick's wheat protein milk replacers, providing a high quality, economical protein source. Wheat protein isolate is manufactured from wheat flour by separating the gluten protein from wheat starch. This protein is then enzymatically hydrolyzed and transformed to small proteins and peptides before drying.

Wheat protein isolate is ideally suited for incorporation into calf milk replacers. It is low in fiber and ash and contains a much higher percentage of protein compared to whey protein concentrate (80% protein vs. 34% protein). Digestibility of wheat protein isolate dry matter, organic matter and crude protein is very high and is estimated to be 95%. It is also free from anti-nutritional factors such as those common to soy proteins that are known to reduce animal performance.

**Soy Proteins** can provide an economic alternative to milk proteins. The popularity of soy proteins stems from their widespread availability, relatively low cost and generally favorable amino acid profile. These vegetable proteins can be substituted for a portion of the milk proteins in milk replacers, providing acceptable calf growth and performance. Soy proteins should be avoided when raising calves on an intensive milk replacer feeding program.



## Energy

**Fats and oils** provide a concentrated energy source for animal feeds. Fat levels in milk replacers typically range from 10 to 24 percent with 15 to 20 percent being the most common. Higher fat milk replacers are often selected for cold climates while low fat formulas are more often used in hot climates and in formulations designed for intensive milk replacer feeding programs.

Lard and choice white grease are of swine origin and are the animal fats used in Merrick's milk replacers. Excellent performing milk replacers can be made using vegetable oils exclusively such as soy, palm and coconut oil. However, they are substantially more expensive to use than animal fats.

Comparison Of Fat Source Digestibilities In Calves	
Fat Source	Digestibility %
Milk Fat (in whole milk)	95 - 97
Lard, Choice White Grease	88 - 96
Coconut Oil	92 - 96
Palm Oil	92 - 96

Source: adapted from Davis and Drackley, 1998

**Carbohydrates** also supply energy in milk replacers. **Lactose** is a carbohydrate and is the other major energy source in milk replacers. Lactose is a natural component of whey and whey protein concentrate and has about ½ the energy value of fat. A typical milk replacer formulation contains about 40-45% lactose. Since fat is typically 15-20% of the formula, lactose is obviously a major energy source in milk replacers. However, due to the reduced ability of young lambs to digest lactose, Merrick's Super Lamb milk replacer contains no more than 25% lactose.

Lactase is the primary enzyme produced by the young calf for digesting carbohydrates (lactose). Enzymes such as amylase and maltase for digesting starches are low at birth, but do increase in number and activity as the calf grows. Therefore, lactose, glucose and galactose are the only carbohydrates usable in large amounts by young calves.

Carbohydrates In Milk Replacers For Young Calves	
Acceptable:	Lactose, Dextrose (Glucose), Galactose
Unacceptable:	Starch, Sucrose (table sugar)

## Medications

Several medications are available for inclusion in milk replacer. The decision to use a medicated milk replacer can be based on a number of factors including calf facilities, disease history and personal preference. The appropriate medication to use depends on the pathogen(s) affecting calves. The three most common milk replacer medications are described below.

**Protozoa: coccidia.** Coccidia are very small parasites that invade the lining the intestines. The organism is passed from animal to animal via feces and is spread through contaminated feed, water and equipment. Coccidia damage the cells of the intestinal lining. Severe coccidiosis results in bloody diarrhea, weight loss, dehydration and death.

Deccox (Decoquinatate) - a coccidiostat that stops the growth of coccidia, but does not kill coccidia

- inhibits activity of the cells' mitochondria (the powerhouse of the cell)
- acts at 5 developmental stages of coccidia, providing the widest range of all the anticoccidial agents

Bovatec (Lasalocid) – a coccidiocide that kills coccidia

- an ionophore that moves potassium, sodium, calcium and magnesium into the cell causing the cell to burst
- works primarily on one developmental stage

**Bacteria: E. coli, Clostridia, Salmonella, Giardia**

Oxytetracycline/Neomycin Base – a broad-spectrum antibiotic combination

- not effective against viruses or protozoa, but can prevent bacterial infections that occur in combination with viruses and protozoa
- may also promote growth and reduce overall medication expenses
- broad spectrum antibiotics are effective against a variety of gram negative and gram positive organisms
  - advantage: high likelihood of efficacy against an unidentified pathogen
  - disadvantage: high likelihood of destroying beneficial bacteria in the digestive tract

## Calf Milk Replacer Medications

Medication	Use Level	Statement
Decoquinatate (Deccox)	45.4 g/ton (to provide 22.7 g decoquinatate per 100 lbs body weight daily)	For the prevention of coccidiosis in ruminating and nonruminating calves and cattle caused by Eimeria bovis and E. zurnii. Feed for at least 28 days during periods of coccidiosis exposure or when experience indicates that coccidiosis is likely to be a hazard. Coccidiostats are not indicated for use in adult animals due to continuous previous exposure.
Lasalocid (Bovatec)	90 g/ton (to provide 1 mg lasalocid per 2.2 pounds of body weight daily)	For control of coccidiosis caused by E. bovis and E. zurnii
Oxytetracycline/Neomycin Base <sup>1</sup>	max. 200g Oxy/400g Neo per ton	Aid in the prevention of bacterial diarrhea
	max 400g Oxy/800g Neo per ton	Aid in the treatment of bacterial diarrhea

<sup>1</sup> Withdraw 30 days before slaughter

## **Minerals**

Minerals are important for the structural development of the calf. They are an important part of body fluids, playing a critical role in maintaining acid-base balance and nerve transmission. Merrick's milk replacers are reinforced with the following minerals.

*Calcium* - important in bone and skeletal formation, muscle contraction, heart and nerve function and blood clotting

*Chlorine* – vital for maintaining acid-base balance and is an integral components of gastric secretion

*Cobalt* - an essential component of vitamin B<sub>12</sub>, which cannot be synthesized by rumen organisms without dietary cobalt

*Copper* - necessary along with iron for hemoglobin formation, is an integral part of many enzymes and is important for normal bone, collagen and elastin formation

*Iodine* – required for the syntheses of hormones that regulate energy metabolism

*Iron* - an essential component of hemoglobin and oxygen transport throughout the body

*Magnesium* - often low in whole milk; important to enzymes involved in energy metabolism and is a normal constituent of bone

*Manganese* - a component of enzyme systems and is essential for normal bone formation

*Phosphorous* – a major component of bones and teeth; involved in appetite and almost all energy transactions in the body

*Potassium* – involved in acid-base regulation, water balance, nerve function, muscle contraction and transport of oxygen and carbon dioxide

*Selenium* - closely linked to vitamin E function and is involved in protein synthesis, muscle development and growth. Merrick's milk replacers provide the organic form, selenium yeast, for improved selenium retention by the calf

*Sulfur* – an important component of several amino acids, cartilage and the B-vitamins thiamine and biotin

*Zinc* - plays an important role in enzyme systems involved in energy and protein metabolism

## **Vitamins**

Vitamins play an important role in metabolism and are involved in enzyme systems. The young calf, with its limited storage of vitamins, is dependent on dietary sources of these essential nutrients. Merrick's milk replacers are supplemented with the following vitamins.

*Vitamin A* – helps protect the body from infections by maintaining mucous membranes and is necessary for normal vision

*Vitamin D* – required for calcium metabolism, bone and tooth formation

*Vitamin E* - involved in immune system function and acts as an antioxidant to maintain cell integrity

*Vitamin B<sub>12</sub>* - an integral part of several enzymes used to metabolize energy

*Thiamine (vitamin B<sub>1</sub>)* - necessary for normal energy metabolism and supports nerve and brain function

*Vitamin C (ascorbic acid)* – an antioxidant that also functions in tissue repair and connective tissue synthesis and is an essential nutrient for calves 3 weeks of age or younger

*Biotin* – acts as a cofactor for many enzymes and is involved in both carbon-dioxide fixation and decarboxylation

*Choline* – involved in the transmission of nerve impulses and plays a major role in fat metabolism

*Folic Acid* – used in the synthesis of amino acids and the production of nucleic acids for DNA synthesis; improves red blood cell formation and oxygen carrying capacity of the blood

*Pyridoxine (vitamin B<sub>6</sub>)* – functions in several enzyme systems concerned in protein metabolism

*Vitamin K* – required for the synthesis of many proteins and blood clotting factors that prevent hemorrhage

*Riboflavin (vitamin B<sub>2</sub>)* – a constituent of several enzyme systems associated with metabolism

*Niacin* – plays a critical role in carbohydrate, lipid and amino acid metabolism and essential for mitochondrial respiration

*Pantothenic Acid* – a constituent of coenzyme A and is essential for metabolic reactions such as fatty acid oxidation, amino acid catabolism and acetylcholine synthesis

## **Other Additives Available for Inclusion in Merrick's Milk Replacers**

**Acidification** - Organic acids can be added to milk replacers. Lowering the pH of milk replacers, helps them stay fresher longer when reconstituted. A lower pH in the upper digestive tract may enhance the growth of beneficial bacteria and suppress the growth of pathogenic bacteria.

**APEX** - a blend of specific plant extracts formulated to encourage feed intake and improve calf performance in calves. The botanical ingredients in Apex enhance digestion by stimulating appetite and gastric secretion. Specific ingredients provide antimicrobial action against pathogenic bacteria and fungi, optimizing gut flora balance. Apex also has antioxidant activity which can help improve cellular function and reduce the negative physiological effects of stress conditions. *Apex is a registered trademark of BFI Innovations, Wheeling, IL.*

**BIO-MOS** - Mannan oligosaccharides (MOS) contain cell wall fragments of the yeast, *Saccharomyces cerevisiae*. These cell wall fragments provide antigenic binding sites that can bind pathogens such as *E. coli* and *Salmonella*. Since MOS is not digested by the animal, the attached pathogen likely passes from the small intestine without doing any further harm. MOS may also enhance health by stimulating antibody production. *BIO-MOS is a registered trademark of Alltech, Nicholasville, KY.*

**Chelated Minerals** - Mineral chelates are organic trace minerals that enhance mineral absorption and improve bioavailability. Research with organic trace minerals shows improvements in production characteristics such as feed efficiency, growth, breeding, body composition and hoof integrity. Calf research shows better retention of minerals during stress and improved response to vaccines when organic trace minerals are fed. Organic forms of zinc, copper and manganese are provided. Organic selenium is already included in all of our milk replacer products.

**Vitamin E (150 IU/lb)** – an antioxidant that helps protect cells and improve both cellular and humoral immune responses. Vitamin E supplementation of calves has been shown to increase dry matter intake and growth rate. Calves fed 125 or 250 IU/d of vitamin E gained significantly more body weight compared to non supplemented calves. The optimum inclusion level in milk replacers is 150 IU/lb.

**Enteroguard** – provides a blend of specific plant extracts and direct-fed microbials. Allicin (garlic extract) is a non-antibiotic sulfur-containing plant ingredient proven to inhibit the growth of pathogenic bacteria, viruses and protozoa. FOS (fructooligosaccharides) are special sugars, indigestible by the calf, that provide a nutrient source for beneficial bacteria in the large intestine. Direct-fed microbials provide a source of live, beneficial organisms and are the third component in this trio of ingredients designed to optimize gut flora balance. *Enteroguard is a registered trademark of Pharmax Biologicals, West Des Moines, IA.*

**Gel** – A gelling agent is available for inclusion in milk replacer. When reconstituted with water the milk replacer will have a somewhat thicker consistency than regular milk replacer.

**Inulin/FOS (fructooligosaccharides)** – are complex sugars that nourish beneficial bacteria in the gut, such as *Bifidobacteria*, allowing them to out-compete potential detrimental organisms. Health benefits ascribed to *Bifidobacteria* include: inhibiting the growth of harmful bacteria, stimulating of components of the immune system and aiding the absorption of certain ions and the synthesis of B vitamins. Inulin/FOS also improve the production of volatile fatty acids for energy, calcium and magnesium absorption. Inulin/FOS are poorly utilized by major intestinal pathogens.

**Lactobacillus** – Lactobacillus are beneficial organisms that rapidly colonize the young calf's digestive tract and become the predominant microorganisms in the young calf's small intestine. Lactic acid lowers the intestinal pH to create an environment unsuitable for harmful organisms. Lactic acid bacteria secrete hydrogen peroxide and bacteriocins that restrict bacterial growth and compete with pathogens for nutrients and colonization sites. Lactobacilli are especially effective competitors with *E. coli*.

## Key Benefits Of Merrick's Manufacturing Process

*Liquid Ingredients.* Use of liquid ingredients ensures thorough mixing and distribution of each ingredient throughout the product. It is not possible to achieve equal results with a dry-blending manufacturing process. Our liquid mixing process is fundamental to our ability to pasteurize and spray dry ingredients.

*Human Grade Ingredients.* We use the finest ingredients for high digestibility and consistency in our products. These human grade ingredients include whey, oils and fats. Insisting on high quality fat ingredients in our milk replacers lets us incorporate the highest digestible energy to achieve maximum performance.

*Pasteurized Ingredients.* Our milk replacer fat and protein bases are pasteurized, ensuring product safety and quality.

*Quality Assurance.* Laboratory technicians test and evaluate all incoming ingredients. Testing continues throughout the manufacturing process to ensure specifications are met in the final product. This strict quality control assures consistent, high quality products.

*Double-sealed bags.* To protect product quality during shipping and handling, milk replacers are packaged in double sealed bags within separate, heavy-duty plastic liners. The plastic liner is heat-sealed while the outer paper bag is stitched separately.

*Excellent Mixability.* Due to our unique manufacturing and instantizing process, our milk replacers “flash mix”. Our products mix so well they go into solution instantly.



## Milk Replacer Tags



**GOLD STAR™**

# INSTANT CALF MILK REPLACER MEDICATED

For aid in the treatment of bacterial enteritis (scours) when fed as directed.

### ACTIVE DRUG INGREDIENTS

Oxytetracycline .....	200 grams per ton
Neomycin Base.....	400 grams per ton

(From Neomycin Sulfate)

### GUARANTEED ANALYSIS

Crude Protein, Minimum .....	20.00%
Crude Fat, Minimum .....	20.00%
Crude Fiber, Maximum .....	0.15%
Calcium, Minimum .....	0.50%
Calcium, Maximum .....	1.00%
Phosphorus, Minimum .....	0.60%
Ash, Maximum .....	9.00%
Moisture, Maximum.....	3.00%
Vitamin A, Minimum.....	35,000 IU/lb
Vitamin D <sub>3</sub> , Minimum.....	7,500 IU/lb
Vitamin E, Minimum.....	150 IU/lb

### INGREDIENTS

Dried Whey, Dried Whey Product, Dried Milk Protein, Dried Skimmed Milk, Animal Fat preserved with BHA, Lecithin, Dicalcium Phosphate, Calcium Carbonate, Vitamin A Supplement, Vitamin D<sub>3</sub> Supplement, Vitamin E Supplement, Vitamin B<sub>12</sub> Supplement, Thiamine Mononitrate, Ascorbic Acid, Biotin, Riboflavin, d-Calcium Pantothenate, Niacin Supplement, Choline Chloride, Menadione Sodium Bisulfite Complex (source of Vitamin K Activity), Folic Acid, Pyridoxine Hydrochloride, Magnesium Sulfate, Zinc Sulfate, Manganese Sulfate, Copper Sulfate, Cobalt Sulfate, Iron Sulfate, Selenium Yeast, Calcium Iodate, Mineral Oil, Sodium Aluminosilicate, Natural and Artificial Flavors.

Feeding Instructions on Back of Tag

**WARNING: Withdraw this feed 30 days before slaughter. A withdrawal period has not been established for this product in pre-ruminating calves. Do not use in calves to be processed for veal.**

Manufactured by  
**MERRICK'S, INC.**  
Middleton, WI 53562

Net Weight on Bag

\* Warning  
Statement

## Medicated

This indicates the product contains a medication and provides a statement about the use of the medication. Be aware of warning and/or withdrawals\*.

## Active Drug Ingredients

Under this heading, the medication in the milk replacer is listed along with its concentration. Medications for milk

replacers are:  
Chlortetracycline  
Oxytetracycline  
Lasalocid  
Decoquinatate OR

Oxytetracycline/Neomycin Base

## Guaranteed Analysis

### Crude Protein

Protein provided the building blocks (amino acids) for tissue growth. The amount of protein provided should be listed. 20% is standard. 24% and higher may indicate a milk replacer designed for intensive feeding.

### Crude Fat

Fat serves as an energy source in milk replacer. It also supplies essential fatty acids. Only high quality animal fats and/or vegetable oils should be present. 20% is standard. A lower level may indicate a milk replacer designed for intensive feeding or hot climates. A higher level may indicate a milk replacer designed for cold climates.

### Crude Fiber

Fiber is an indicator of protein quality. Products with 0.15% fiber or less contain milk, egg and/or plasma proteins, or may contain soy protein isolate. Fiber levels higher the 0.15% indicate plant origin proteins.

### Ash

% Ash indicates the overall level of minerals in the product. Excess ash content should be avoided.



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Feeding Instructions on Back of Tag

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Middleton, WI 53562

Net Weight on Bag

### Vitamins

Vitamins A, D and E are essential for health and normal growth. Vitamin E level is especially important. Research shows that 150 IU/lb of vitamin E results in improved rates of gain. Vitamin E supplementation also stimulates antibody formation in the calf and enhances immunity to disease.

### Ingredients

This list includes all ingredients used in the manufacture of the milk replacer. Careful inspection of this list is required to understand more about the quality of the product inside. Be sure that trace minerals and B-complex vitamins are included. Ingredients are typically listed by category, such as proteins, fats, minerals etc. Ingredients are generally listed by decreasing order within category according to inclusion level in the product.

### Feeding Instructions

Be sure to read the mixing and feeding directions. Different formulas require different mixing and feeding rates to assure adequate nutrition and desired performance results.

## Raising a Healthy Calf

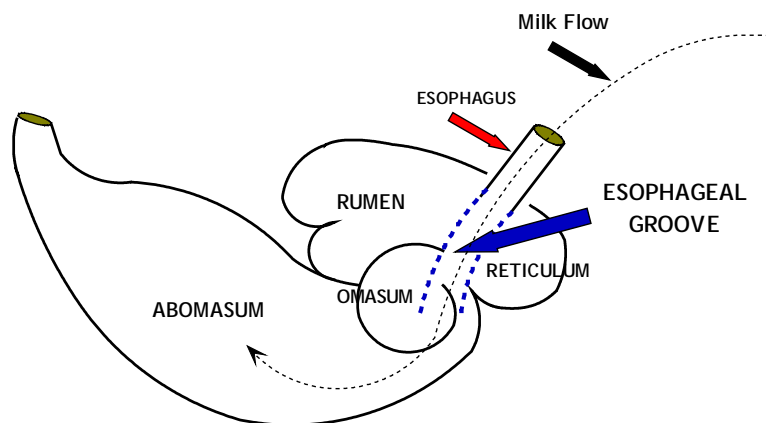
**Colostrum.** Colostrum is the first milk produced by the cow after calving. It is high in protein, fat and immunoglobulins (Ig), or antibodies. The protection a young calf has against disease challenges comes from colostrum. Calves should consume enough colostrum to provide between 100 and 150 g of IgG. Large breed calves must consume between 2 and 5 quarts of colostrum, depending on colostrum quality, for adequate disease protection. Smaller breeds should consume between 1.2 and 3 quarts. Since the calf's ability to absorb immunoglobulins decreases steadily after birth, colostrum must be administered as soon after birth as possible. The calf's digestive tract stops absorbing immunoglobulins by the time the calf is 24 to 36 hours old. Colostrum also has beneficial effects in the digestive tract and should be fed for the first two to three days of life.

**Milk replacer.** Begin milk replacer feeding as soon as colostrum feeding has ended. Calves should receive a minimum of 8 ounces (½ lb) of milk replacer powder dissolved in water to make about 2 quarts of milk replacer solution at each feeding. Calves should be fed this solution twice daily. We recommend that calves receive about 10 ounces of milk replacer powder at each feeding to increase the level of nutrition and decrease the likelihood of serious calf health issues.

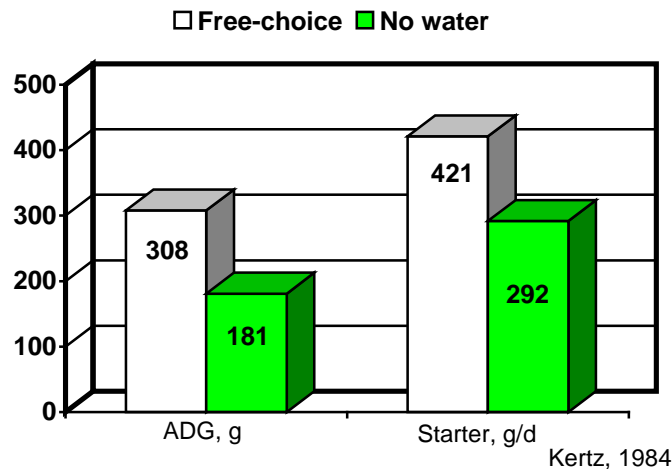
**Starter feed.** Offer starter feed to calves each day once the calves are receiving milk replacer. The most important components of a good quality starter feed are cereal grains. They provide texture and contain high levels of fermentable carbohydrates, providing a readily available energy source. The end products of grain digestion stimulate rumen papillae growth. Hay, on the other hand, does not have a major beneficial effect on rumen growth. Its presence in the diet reduces energy density, takes up space in the digestive tract and tends to increase the time to weaning. Hay should be reserved as an after-weaning feed, when it is important to develop rumen musculature. Research shows that starters containing 19-20% crude protein provide an optimum growth rate.

**Water.** Fresh, clean water is critical for successful rumen development and should be made available as soon as the calf begins drinking milk replacer. For rumen development to occur, bacteria must be present. Since the calf is born without rumen bacteria, it must build the bacterial population over time. Consumption of water is critical for this process since bacteria live and grow in a water environment.

Water must be fed separate from milk replacer for water to enter the rumen. This is due to the formation of a unique structure called the *esophageal groove*. When milk or milk replacer is fed, a groove forms that carries the liquid past the rumen and delivers it to the abomasum (stomach).



Since the groove remains for up to 10 minutes after feeding, water must be fed later if it is to enter the rumen. Research shows that calves receiving free-choice water had a 127g higher average daily gain compared to calves receiving no additional water. Starter intake was 129g per day more for the calves receiving free-choice water.



**Weaning.** A calf can be weaned when its rumen is sufficiently developed to support it without supplemental milk replacer feeding. The best measure of rumen development is feed intake. A calf raised on a conventional milk replacer feeding program can be easily weaned when it is consuming between 1 ½ and 3 lb of starter feed per day. The calf should be eating starter at this level for at least three consecutive days prior to actual weaning. Abrupt weaning is recommended. If desired, calves can be fed one milk replacer feeding for several days prior to complete weaning. However, if the rumen is sufficiently developed, there is no need for a gradual weaning.

Calves should remain on their current starter feed and in their current location for at least two weeks after weaning. Hay can be added to the diet after this time. Big changes such as large dietary adjustments and grouping calves into pens or other new housing should not occur all at once. To minimize stress and susceptibility to disease challenges, large changes should be made separately.

## Milk Replacer Start-up Tips & Feeding Suggestions

1. When upgrading to a Merrick's milk replacer be sure to note any medication in the previous milk replacer. Sometimes the medication is unnecessary, but other times, omitting the previous medication can result in health/scour problems.
2. Calves need to be *transitioned* onto milk replacer from whole milk or from other milk replacer. This process will take several days to accomplish. A 50/50 mix should be sufficient to accomplish the job.
3. Weigh a scoop/cup of the milk replacer to see how closely your measuring technique corresponds to statements in the mixing instructions. Personal preference and perception can result in large differences in the amount of powder and nutrients calves receive. Calf growth rate and health can easily be affected.
4. Any water the calf consumes should go into the rumen to help stimulate grain intake and digestion. Wait at least 10 minutes after the calf finishes drinking milk replacer before offering water. This helps assure water drops into the rumen and does not bypass to the abomasum through the esophageal groove. Free choice water should be made available between feedings.
5. Calf starter should have very few fines and be very palatable. Crude protein should be at least 18%. Starter quality and consumption are more important than milk replacer relative to overall calf growth and weaning time. An 18% CP calf starter that calves eat readily will produce faster growing, younger weaning calves than a 24% CP starter that calves eat only because there is nothing else.
6. Calves should be weaned on the basis of starter intake, not size or age. Calves should be consuming between 1.5 and 3 lbs of starter per day for 3 – 4 days in a row before they are weaned. High quality starter and access to clean water are major factors influencing weaning time.
7. In cold weather, the nutrients and energy provided by one scoop of a 20-20 milk replacer each feeding is not enough when calves are outside. Calves can quickly become very severely stressed. Increase the amount of powder provided at each feeding by 2 to 4 oz or add a high-energy supplement such as Super Calf Kit.

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### **MERRICK'S, INC.**

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