



Hand-raising a baby calf requires a commitment to providing adequate nutrition, housing, and care to give the calf the best chance to grow into a healthy, productive adult. This information is designed to help provide a better understanding of generally accepted calf management guidelines and how each recommendation benefits the calf. It is not intended to provide treatment recommendations - there is no substitute for sound information from your veterinarian.

**SELECTING THE RIGHT MILK REPLACER IS VERY IMPORTANT – TAKE TIME TO READ THE TAG**

For a bottle calf, milk replacer will be the primary source of nutrition for several weeks. The young calf can already digest high-quality milk replacer, but it will need to gradually develop the ability to digest grain and hay in the first few weeks of life. The tag or label will be an important source of information when selecting a milk replacer. Manufacturers are required to provide the guaranteed nutrient analysis, list of ingredients (in order of highest to lowest inclusion), and mixing and feeding instructions. The major ingredients (protein and fat sources) are usually found in the first few lines of the ingredient statement – it is here that you should be able to identify the protein source(s), probably the single most important factor when choosing a milk replacer. The only important ingredient you will not find here is the medication – this can be found above the Guaranteed Analysis in a section called “Active Drug Ingredient(s)” if the formula is medicated. The example tag below is a non-medicated formula with all-milk derived proteins (the protein ingredients are highlighted in yellow).

**THERE ARE 3 MAJOR CHARACTERISTICS TO CONSIDER WHEN SELECTING A CALF MILK REPLACER**

1. **Protein source** is the most important factor you should consider when choosing a milk replacer. Milk-derived proteins (whey, whey protein concentrate, skim milk, casein, dried whole milk and buttermilk), and plasma and serum proteins are the most digestible sources of protein and will support the best growth and health. In addition to being an excellent protein source, plasma and serum also provide functional globulin proteins that can help the calf ward off pathogens that cause scours (diarrhea) and other diseases. Egg protein and plant proteins (modified or hydrolyzed wheat protein, soy isolate, soy protein concentrate, or soy flour) are less digestible but can be an economic alternative to the more expensive milk and plasma proteins. In general, processing vegetable-based proteins makes them more digestible. Soy flour is the least digestible protein ingredient that is commonly used, and should not be fed to calves less than 3 weeks old. If you decide to start with a higher quality protein source, and then switch to a more economical formula when the calf is older, it will be very important to transition to the new milk replacer over several days time, gradually mixing in increasing amounts of the new with the old. This gradual change allows the calf time to adjust to the new formulation and develop the digestive enzymes needed to utilize the new proteins.

2. The **amount of protein, fat, and fiber in the formula** must be guaranteed on the tag or label and should be carefully considered. The most common nutrient profile for milk replacers is 20% protein and 20% fat, but the range in available products is wide (18% to 28% protein, and 10% to 24% fat). The standard “20/20” is still a good choice for most feeders, and the best place to start for comparing products. The benefits of higher nutrient levels must be balanced against the additional cost. Higher protein will generally support faster, leaner growth if your management is good. Higher fat might be considered if you live in a cold climate – the extra energy will be beneficial to the calf. Formulas containing less than 15% fat are not recommended for calves, because it may not supply enough energy to support health and growth. Fiber is a good indicator of digestibility in a milk replacer formula – all-milk and plasma formulas should show less than 0.20% fiber maximum on the tag. Some soy protein formulas (typically those with soy flour) can contain as much as 1.00% fiber and should not be fed to very young calves.

**EXAMPLE CALF MILK REPLACER TAG**  
Milk replacer to be fed to herd replacement calves from the second day of life until weaning.

**GUARANTEED ANALYSIS**

Crude Protein, minimum.....	20.00%
Crude Fat, minimum.....	20.00%
Crude Fiber, maximum.....	0.15%
Calcium, minimum.....	0.75%
Calcium, maximum.....	1.25%
Phosphorus, minimum.....	0.70%
Vitamin A, minimum.....	30,000 IU/lb
Vitamin D <sub>3</sub> , minimum.....	5,000 IU/lb
Vitamin E, minimum.....	100 IU/lb

**INGREDIENTS**  
Dried whey, dried whey protein concentrate, animal fat (preserved with BHA, BHT, citric acid & ethoxyquin), dried whey product, dried skimmed milk, calcium carbonate, L-lysine, sodium silico aluminate, DL-methionine, ferrous sulfate, magnesium sulfate, choline chloride, artificial flavor, vitamin E supplement, maltodextrin, selenium yeast, brewer's dried yeast, vitamin A supplement, zinc sulfate, lecithin, ethoxylated mono-diglycerides, propylene glycol, manganese sulfate, copper sulfate, ascorbic acid, niacin supplement, vitamin D<sub>3</sub> supplement, calcium pantothenate, menadione sodium bisulfite complex (source of vitamin K activity), biotin, riboflavin supplement, thiamine mononitrate, pyridoxine hydrochloride, vitamin B<sub>12</sub> supplement, folic acid, cobalt sulfate.

**MIXING DIRECTIONS**  
Using the plastic cup enclosed in the bag, add one level cup of milk replacer powder to 2 quarts of warm (115-120° F) water and mix thoroughly with a wire whisk. The enclosed measuring cup holds approximately 10 ounces by weight of dry powder. When feeding more than one calf, mix 1-1/4 pounds of dry powder per gallon of warm water.

**FEEDING DIRECTIONS**  
Feed colostrum only for the first 24 hours of life – 4 quarts at birth for large calves (over 80 pounds), 2-3 quarts for smaller calves. Provide a second feeding 8-12 hours later if possible. Begin feeding milk replacer on day 2. Feed 2-3 quarts twice daily.

**MANAGEMENT RECOMMENDATIONS**

1. Provide clean, fresh water free choice at all times.
2. Begin offering high quality calf starter feed free choice in the first week of life. Offer fresh feed in a clean pail to encourage consumption.
3. Wean calves at a minimum of 6-8 weeks of age, once starter intake reaches 2 pounds per day for three consecutive days.

Manufactured by:  
ABC Company, Anytown, USA



3. **Additives** and **Medications** can make a big impact on calf health and growth if they are chosen carefully based on your farm's management level and performance expectations. Non-medicated additive options are numerous – we have listed only a handful of the most popular here. The list of approved milk replacer medications is short, and likely to become even more limited in the near future due to concerns about development of antibiotic resistance in humans.

### Common Calf Milk Replacer Medications

\*It is important to note that no medication is effective for treating ALL causes of calf scours. Viral pathogens (example, Rotavirus or Coronavirus) and certain microscopic parasites (such as Cryptosporidium) do not respond to antibiotics and must be prevented, where possible, with good sanitation and colostrum management.

Neomycin and Oxytetracycline (commonly referred to as “NT”, “Neo-Terra<sup>®</sup>” or “Neo-Oxy”)

200 grams per ton Neo + 100 grams per ton Oxy – at this level the combination is labeled to “aid in the **prevention** of bacterial scours.”

400 grams per ton Neo + 200 grams per ton Oxy – at this level **and higher**, the combination is labeled to “aid in the **treatment** of bacterial scours.”

\*Neo-Oxy is most effective at treating scours associated with *E. coli*.

Oxytetracycline OR Chlortetracycline (commonly referred to as “OTC” and “CTC”)

10-20 grams per ton – at this level these drugs are labeled for “increased rate of weight gain and improved feed efficiency.” \*Note – this drug level is too low to impact calf scours.

Lasalocid (brand name Bovatec<sup>®</sup> – commonly abbreviated as “Bov”)

72-90 grams per ton to provide 1 milligram per kilogram (2.2 lbs) calf body weight daily – labeled for the **control** of coccidiosis caused by *Eimeria bovis* and *Eimeria zuernii*.

Decoquinate (brand name Deccox<sup>®</sup> – commonly abbreviated “DQ” or “DX”)

45.5 grams per ton to provide 0.5 milligram per kilogram (2.2 lbs) calf body weight daily – labeled for the **prevention** of coccidiosis in ruminating and non-ruminating calves (including veal calves) and cattle caused by *Eimeria bovis* and *Eimeria zuernii*.

\*Deccox is considered more effective than Bovatec for *Coccidia* control, but is also considerably more expensive.

### Common Non-Medicated Additives for Calf Milk Replacers

Plasma and Serum Proteins (commonly abbreviated “APL” or “AP”)

\*Ingredient listing is “dried animal plasma” (most likely Bovine origin), “Bovine plasma” or “Porcine plasma.”

Also an excellent protein source, plasma and serum provide functional immune proteins which can impact calf health when included in calf milk replacers at 3-7% of the formula. \*Also important to note is that research supports that plasma can have an impact on viral causes of scours and parasites like cryptosporidium, in addition to bacteria.

Mannan-Oligosaccharides (commonly abbreviated “MOS” – the best known brand is Bio-MOS<sup>®</sup>)

\*Ingredient listing is “yeast primary dehydrated and brewer’s dried yeast” or “yeast extract.”

The manufacturer’s description: “Derived from the cell wall of yeast, MOS helps block pathogens from adhering to the intestinal wall and enhances cell-mediated immunity that allows for improved animal performance.”

Fructo-Oligosaccharides (commonly abbreviated “FOS” – the best known brand in Ultra-FOS<sup>®</sup> ST)

\*Ingredient listing is “extract of chicory” or “inulin.”

The manufacturer’s description: “Non-digestible polysaccharide that works to selectively stimulate the growth and activity of beneficial bacteria in the intestines and at the same time help to reduce potential pathogens in the colon and feces in young calves.”

Direct-Fed Microbials (commonly abbreviated “DFM”, also called Probiotics)

\*Individual bacterial strains must be listed in the ingredient statement and the total level of bacteria must be included in the guaranteed analysis.

Numerous combinations and levels of various beneficial bacteria are available in milk replacer with varying results. In general, addition of large numbers of “good” bacteria help to maintain the proper balance of bacteria in the calf’s intestine by competing with “bad” bacteria for available nutrients.

APEX<sup>®</sup>

\*Ingredient listing “natural flavor extract.”

The manufacturer’s description: “Blend of specific plant extracts and Alinex<sup>™</sup>, a nature-identical form of allicin found in garlic, formulated to encourage feed intake and improve calf performance.”



### MILK REPLACER MIXING CHARACTERISTICS

Whenever possible, select a milk replacer that is **agglomerated** (also called **instantized**) to mix easily in warm water. A product that mixes well will also provide more consistent nutrition for your calf by ensuring that he consumes the same product throughout the entire meal. High-quality, instantized milk replacer made with all milk proteins, or milk and plasma proteins, should not separate after mixing. **Separation** is most commonly seen as **settle out**, when some or all of the milk replacer components drop out of solution to the bottom of the pail or bottle, or as **fat separation**, when you can see or feel a greasy layer on the top and/or sides of the pail or bottle. Some settle out should be expected with soy protein, as it is less soluble than milk proteins. This does not necessarily indicate lower digestibility, but it does make it necessary to mix (or re-mix) the milk replacer immediately before feeding.

### CALVES THRIVE ON ROUTINE - FEED MILK REPLACER CONSISTENTLY AT REGULAR INTERVALS

Calves should be fed at least twice daily at the same time each day, preferably early morning and evening. A third milk feeding during the day may be needed to provide extra nutrients and energy during cold weather, or for very small or weak calves.

### The recommended equipment list for milk replacer feeding is the following:

1. 2 or 3 quart bottle and nipple, or a 2 gallon pail (separate one for each calf)
2. 2 gallon or larger bucket to mix milk replacer in if you are feeding by bottle
3. Source of clean, hot water, and a thermometer for measuring water temperature
4. Wire whisk, preferably stainless steel, for mixing
5. Bucket and bottle brushes, clean rinsing liquid detergent, and bleach for cleaning and sanitizing feeding equipment
6. Rack to allow feeding equipment to air-dry after sanitizing – thorough drying and exposure to sunlight will also help disinfectant equipment.

### ALWAYS USE THE MEASURING CUP PROVIDED IN YOUR BAG OF MILK REPLACER

Most milk replacers have a plastic measuring cup provided in the bag, and all products must include mixing and feeding directions on the label or tag. It is important to always use the measuring cup provided in the bag, because milk replacers can vary in density (weight per unit of volume) between formulas and brands. If you use a measuring cup that was not sized for your milk replacer, you may not be providing the correct weight of milk replacer powder, and this can result in over or under feeding. For best accuracy, weigh the full measuring cup of milk replacer periodically to verify the correct amount is being fed. Remember to weigh the empty cup and subtract the cup weight from your result.

### MIX MILK REPLACER AT THE CORRECT TEMPERATURE FOR BEST PERFORMANCE

Most milk replacers are designed to be mixed with warm water at a temperature of approximately 110° -120°F. Making sure the water is warm enough is important because you must melt the fat for it to go into solution. If the water is too cold, the fat may separate or a portion of the powder may sink to the bottom. If the water is too hot (over 140° F), the proteins coating the fat can be damaged, causing the fat to separate and leave a greasy residue. Damaged proteins lose nutritional value, and can sometimes be seen as white flecks or chunks in the solution.

To ensure complete mixing, always mix in a pail or bucket even if you are going to feed the milk replacer by bottle. Add the warm water, adjust the temperature if needed, and then sprinkle the milk replacer powder on top of the water. Mix thoroughly with a wire whisk until the milk replacer is completely dissolved. Allow the mixed solution to cool to 100°-105° F before feeding. Stir the solution immediately before feeding or pouring into a bottle for feeding. Do not leave milk replacer sitting out (in a bottle or pail) for longer than 1 hour – bacteria can grow rapidly in warm milk.

### COLD WEATHER FEEDING – MORE MILK REPLACER CAN HELP KEEP CALVES HEALTHY AND GROWING

During cold weather, the calf's energy requirements increase because they use more calories to keep warm. Young calves (less than 3 weeks old) are most vulnerable to cold stress, mostly because they have very little body fat to burn for energy. In fact, a young calf starts to feel cold at 50°F, and can actually starve to death in really cold weather if not provided with extra energy in the diet. A good rule of thumb is to add a third feeding of milk replacer during the day for calves less than 3 weeks old if the daytime temperature is below freezing (32°F), and the calf is in cold housing (outdoor hutch or in an unheated barn). Start with a half bottle on the first day or two, and then increase gradually to a full bottle if needed. This will increase energy and nutrient intake to help keep the calf healthy and growing. The extra feeding will also have a "warm soup" effect, making the calf more comfortable with a warm belly full of milk.

**FEEDING MILK REPLACER IN A PAIL CAN SAVE TIME BUT REQUIRES A LITTLE TRAINING**

Feeding milk replacer in a pail can save time and make cleaning the feeding equipment easier, but it does leave the liquid milk replacer exposed to more contamination than a bottle. Training the calf to drink from a pail requires a little patience but is relatively simple. A hungry calf will eagerly suckle on a finger placed in its mouth. Insert a clean, preferably gloved finger into the calf's mouth with the pail of warm milk replacer directly below. Once the calf begins suckling, gently lower your hand into the pail until the calf's muzzle is in the milk. After a few tries the calf will learn to drink milk from the pail. It may take several feedings before the calf learns to go straight to where his milk is. If the calf resists, try using a shallower pail (a clean gallon ice cream pail is handy) or one made from more translucent plastic – sometimes having his head too deep in a dark pail (above his eyes) can make a calf nervous to start. Consistency and patience are keys to successful training.



**CALF FEED AND WATER INTAKE STARTS SLOWLY BUT RAMPS UP QUICKLY**

Calves typically consume only a little water and calf starter before two weeks of age. Start by offering a small amount of calf starter (a handful up to about 1/2 pound) to provide enough for the calf to nibble on while avoiding waste. Providing fresh calf starter and clean water in clean pails every day is the best way to stimulate consumption. Dirty or old calf starter should be discarded and the pail scrubbed and sanitized – bacteria grow rapidly in soiled or damp feed. Closely monitor water availability during hot weather, because young calves can easily become dehydrated if they do not have enough fresh water available.

**CALF STARTER CONSUMPTION SHOULD DETERMINE WEANING TIME, NOT AGE**

Most calves can be weaned from calf milk replacer between 6 and 12 weeks of age, as long as they are healthy and are consuming at least 2 pounds of calf starter each day. A calf that is eating starter consistently can be weaned “cold turkey” or you can reduce the amount of milk fed per day for a short period to promote starter intake and prepare the calf for weaning. A common approach is to cut back to a once-daily milk feeding for 7-10 days before weaning. Remember, the calf must be consuming enough calf starter to support health and growth without milk. It is also best to avoid weaning during other stress, such as transport, vaccination, dehorning, etc., or when the calf is sick.

**ADDITIONAL RESOURCES**

Your livestock veterinarian and local university extension agent are excellent resources for calf management information, as well as many online sources. Please visit the Learning and Resource Center at [www.savacaf.com](http://www.savacaf.com) for some helpful online links.

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