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PASSIVE TRANSFER

Why is successful passive transfer important?

- *Reduced treatment and mortality rates¹*
- *Improved growth rates and feed efficiency²*
- *Decreased age at first calving³*
- *Increased first and second lactation milk⁴*

Quality colostrum is one of the most important factors in getting a calf off to a healthy start. Harvesting and administering quality colostrum requires diligence, decision-making and ongoing training for everyone involved. The primary goal of feeding colostrum is to achieve successful passive transfer, which occurs when the antibodies from quality maternal colostrum or colostrum replacer are absorbed into the calf's bloodstream.

To achieve successful passive transfer feeding maternal colostrum, the following factors should be considered:

- **Quality** – Colostrum quality varies significantly from cow to cow within a herd. Colostrum quality can be determined using a Brix Refractometer. A Brix reading of 22 or higher indicates good quality maternal colostrum. (*40 grams of IgG per quart of colostrum)
- **Quantity** – To achieve successful passive transfer, a calf needs 1 gallon of good quality maternal colostrum.*
- **Quickness** – As soon as the calf is born, there are two critical time factors. IgG concentration in the cow's udder declines rapidly. At the same time, the calf's ability to absorb IgGs quickly declines as well.
- **Cleanliness and Biosecurity** – Sanitary collection, storage and feeding of colostrum, and necessary equipment are imperative. Maternal colostrum also presents risk of transmitting disease to the calf.

In some incidences, achieving successful passive transfer with maternal colostrum, while achieving the four factors above, may be difficult or impossible. A solution would be to feed a colostrum replacer. Recent research in one of the largest colostrum studies to date demonstrated virtually 100 percent successful passive transfer when calves were fed First Day Formula®CR colostrum replacer⁵ (150 grams of IgG per feeding).



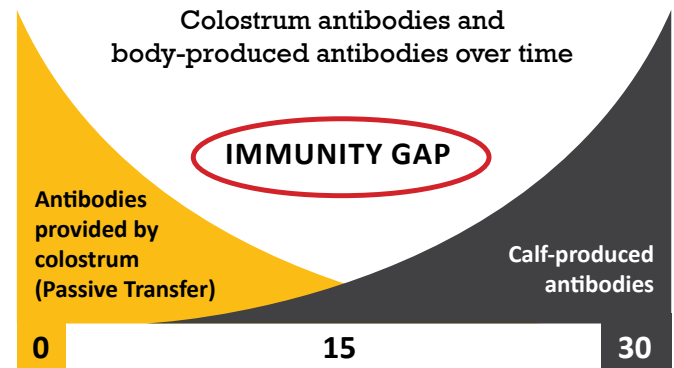
THE CRITICAL FIRST 21 DAYS

Challenges during the first three weeks:

The half-life of colostrum antibodies is about 16 days and active immunity is still low.

Mortality risk is highest during the first few weeks of life.

A calf must rely on antibodies from colostrum replacer or maternal colostrum until its own immune system is developed at 1-2 months of age. Half-life of colostrum antibodies is approximately 16 days. The absorptive surface of the small intestine is developing during the first weeks of a calf's life. Since a calf's immune system is not yet fully developed at that stage, there is a high risk of pathogens establishing in the digestive system causing damage and sickness. Protecting calves from health challenges during this critical time not only has short-term benefits, but also enhances the lifetime productive and reproductive performance of your herd replacements.



Research has shown that during this stage it is essential for the gut to be protected against pathogen invasion and there are several bio-active feed ingredients that have demonstrated efficacy. One class of feed additives proven beneficial is active antibodies. Feed active antibodies can be derived from three sources: bovine colostrum (IgG), spray-dried animal plasma (IgG), and spray-dried egg yolk (IgY). Another class of feed additives that is beneficial to a calf during this time is a direct-fed microbial (beneficial bacteria). Populating the gut with live beneficial bacteria competitively excludes pathogens and prevents them from establishing in the gut. Most beneficial bacteria enhance the metabolism of key nutrients as well. These classes of feed additives, alone or in combination, at proven inclusion rates have demonstrated the following:

- **Improved digestive system development**
- **Increased immunity**
- **Lower disease incidence**
- **Improved growth**
- **Less antibiotic use**



STRATEGIC LIQUID FEEDING

Milk replacer or waste milk

Calves are born monogastric (i.e., pre-ruminant) and have a high capacity to digest milk for the first few weeks of life. Their liquid diet is the major source of nutrition (until grain intake becomes appreciable). During this phase, whether feeding milk replacer or pasteurized waste milk, it is critical the feeding strategy optimizes growth rates, calf health and rumen development for successful weaning and beyond.

STRATEGIC FEEDING OF MILK REPLACER

Choosing the proper milk replacer will help keep calves healthy and assist you in reaching your business objectives. Milk replacers have varying specifications including: protein and fat levels, protein source, medication and feeding rate. To achieve your calf performance goals, an optimal milk replacer feeding program can be developed combining the appropriate quality milk replacer formulation and feeding rate, calf expertise and consulting, and available research proven prediction resources.

STRATEGIC FEEDING OF PASTEURIZED WASTE MILK (PWM)

Nearly half of all dairy calves raised in the United States are fed a diet of PWM in the pre-weaned stage. While milk has been deemed “nature’s most perfect food” and calves have been shown to perform well on it, there are ways to optimize the consistency and nutritional value of PWM fed to calves. To create a consistent liquid ration containing the ideal level of nutrients for efficient calf growth, PWM may require supplementation with the following:

BALANCE

The standard protein-to-fat ratio in PWM is approximately 25-28 percent protein (DM basis) and 28-30 percent fat. A high-fat diet like this can result in short, fat heifers that do not meet target breeding performance criteria. Also, a high-fat diet results in decreased starter-grain intake. A good guideline is to strive for a protein-to-fat ratio of greater than 1.0 (more protein than fat). An ideal target is generally around 1.4 (example: 24:18), which is especially important for intensive nutrition programs that feed pre-weaned calves on an elevated nutrition plane. It has been demonstrated that a higher protein percentage in the milk diet promotes lean tissue growth and greater stature in calves.

EXTEND

Occasionally the supply of pasteurized waste milk (PWM) available is not enough. Dairies typically have only 30 to 60 percent of the waste milk supply they will need to feed all of their heifer calves. Some remedy the situation by using salable milk; however, this can be a costly option. Others feed milk replacer; however, switching calves between liquid sources creates an inconsistent diet and management challenges. Extending the supply with a balancer product is economical and offers calves the least variation in diet, therefore, the lowest risk of health challenges.

FORTIFY

PWM is deficient in a number of vitamins and trace minerals when comparing standard values for whole milk to the National Research Council (NRC 2001) recommendations for dairy calf nutrition. Among the elements with deficiencies are iron, manganese, copper, iodine, cobalt, selenium, vitamin D and vitamin E. Starter-grain formulations often are fortified with these vitamins and minerals; however, starter-grain intake is minimal in the first few weeks of life. Adding a whole milk fortifier is ideal to bring the calf diet to recommended NRC levels. Fortifiers can also offer the option to offer a coccidiostat or feed-through larvacide to the liquid diet.

¹ NAHMS, Wells, 1996; ² Fowler, 1999; Faber et al., 2005; Nocek et al., 1984; Robison et al., 1988; Faber, 2005; ³ Faber et al., 2005; ⁴ DeNise, 1989; Faber, 2005; ⁵ Lago, C. Blanc, M. Socha, A. Geiger, D. Cook, N. Silvia-del-Rio, R. Quesnell, and C. Leonardi. 2017. Efficacy of colostrum replacer versus maternal colostrum on immunological status, health, and growth of pre-weaned dairy calves. J Dairy Sci. 2018 Feb; 101(2): 1344-1354.

⁶™First Defense Technology is a trademark of ImmuCell Corporation. ⁷First Defense Technology is a unique, un-denatured whey protein concentrate and refers to ImmuCell Corporation's trademarked whey protein concentrate processing method. It is not intended to imply claims of ImmuCell's USDA licensed product, First Defense®. ¹ Anim. Sci. Vol. 93, Suppl. s3/J. Dairy Sci. Vol. 98.

MANAGEMENT AND ENVIRONMENTAL EVENTS

Raising healthy calves will ensure quality herd replacements.

In the young calf, multiple energy dependent processes such as development of the absorptive surface of the gut and immune system, skeletal and muscular growth, early rumen development, and management practices that cause calf stress leading up to weaning are occurring simultaneously.

The last thing you want during this time is for pathogens to establish themselves in the gut. Disease causing pathogens are dually dangerous as pathogens can attach and cause damage at the absorptive surface of the gut making it hard for the calf to absorb energy from its diet. They also make it necessary for the calf to mount an immune response further taxing vital energy reserves.

To keep pathogens from interrupting these essential processes, bio-active feed additives have been proven to reduce their impact.

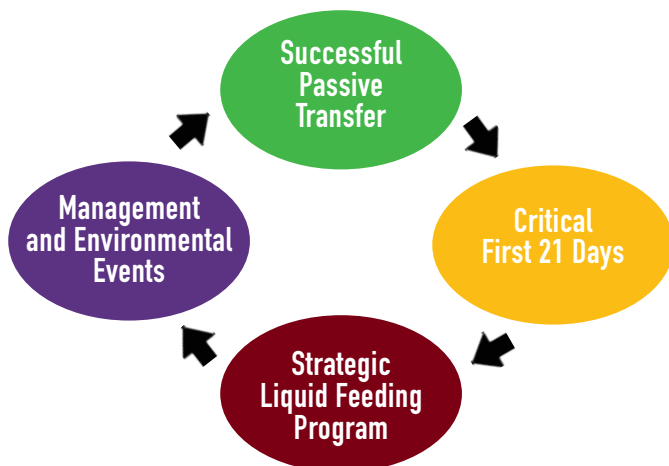
Direct-Fed Microbials (DFMs probiotics, beneficial bacteria) – when fed in adequate inclusion rates inhibit pathogens in the gut by competitive exclusion and altering the enteric environment (small intestine in the young calf – rumen in the older calves) to favor beneficial microflora. Providing an optimal level of live beneficial bacteria can jump-start a calf's stalled digestive system. In addition, a healthy microbial population promotes increased feed intake, weight gain, and feed efficiency.

Essential Oils (botanical, plant extracts) – offer a strong anti-bacterial effect cleansing pathogens and enhancing the environment for good bacteria to thrive.

Regardless of the cause, diarrhea results in increased loss of electrolytes and water in the feces of calves and decreases milk intake. Ultimately, this process causes dehydration, metabolic acidosis (the blood is more acidic than it should be), electrolyte abnormalities including a critical sodium deficiency, and a negative energy balance from the lost nutrients and lack of milk. Oral electrolyte solutions have typically been used to restore fluids, correct the pH and electrolyte levels in the blood, and provide nutritional support with the added benefit of being relatively inexpensive and easy to administer.

Calf Housing – Healthy calves are a direct result of comfort and climate. Adequate space, clean, dry bedding, and proper ventilation are key. These factors, combined with proper management practices, have resulted in lower mortality, morbidity, and overall treatment costs leading to enhanced growth.

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