

Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004



Organized by:



Sponsored by:



Ontario

Ontario Ministry of
Agriculture & Food



Agricultural
Adaptation
Council



Dairy Farmers
of Ontario

Speakers and Topics...

Managing for Newborn Calf Success - Solutions for the Real World



Speaker: Dr. Gerald Bertoldo

The first day in the life of a calf is critical in setting the pattern for health and growth to follow. The health of the newborn can be affected by the metabolic status of its dam, the difficulty of its birth and a host of stresses, areas that have not received much attention in the past. The conventional focus on calving area cleanliness, colostrum, disease exposure and nutrition has widened in recent years as well. This presentation will focus on best management practices dealing with the chain of events from pre-natal care to feeding programs that affect the health of young calves.

Dr. Bertoldo is a 1977 graduate of the College of Veterinary Medicine at Cornell University. After 22 years of private practice primarily focused on dairy cattle in western New York State with a multi-person, diversified, veterinary clinic in Attica, New York, Dr. Bertoldo joined Agway Feed and Nutrition as a member of the technical services team. Presently, Dr. Bertoldo is a dairy specialist with the 10-county, NWN Dairy, Livestock and Field Crops Team of Cornell Cooperative Extension/Pro-Dairy Program.

Creating a Healthy Environment for Happy Calves



Speaker: Harold House, P.Eng.

Housing and the calf's environment are critical components to producing healthy calves. A discussion of cold versus warm housing and natural versus fan ventilation will help producers better understand the needs of the calf. Harold will also discuss various housing options including hutches, modified hutch buildings, greenhouse calf shelters, cold barns and warm barns. Practical advice from producers will also be shared through results from a recent study.

Harold was raised on a dairy and swine farm in Elgin County. He received his BSc and MSc degrees in Agricultural Engineering from the University of Guelph in 1978 and 1990. Prior to joining OMAF in 1981, Harold worked in various positions in both the agricultural industry and research. Harold is currently OMAF's provincial Dairy & Beef Housing and Equipment engineer, working out of the Clinton field office. He has a special interest in cow comfort, ventilation, manure handling, and more recently robotic milking systems.

Profit Boosting Strategies for Newborn and Neonatal Calf Care



Speaker: Dr. Sam Leadley

How is your management of calves at birth up to two weeks of age? Dr. Leadley will guide us through a Neonatal Calf Care Management Checklist. Do we know the criteria for "best management practices?" Are we avoiding the most common pitfalls in caring for these newborn calves? Do our current procedures put our calves at excessive risk?

Dr. Sam Leadley is the calf/heifer management specialist for the Attica Veterinary Associates in Attica, New York, a practice devoted solely to dairy cattle. He consults with dairy farmers and heifer growers with the economic goal of raising healthier, faster-growing animals through better management practices. He is also the editor and publisher of "Calving Ease," a free monthly newsletter that is distributed internationally, and the "Calf Connection" column.



Dairy and Veal **Healthy Calf** Conference 2004

What Can You Expect to Get From Vaccinating Calves?

Speaker: Dr. Rob Tremblay (Nov. 29)
Dr. Paul Baillargeon (Dec. 1)

Building immunity in calves is a critical component in laying the foundation for a healthy calf. Topics such as the level of protection calves have when they are born, how the immune system develops, and vaccinating cows to protect calves will be reviewed. Discussion will also focus on whether vaccines can protect young calves and how to use this knowledge to make good health and business decisions in veal and dairy calves.

Dr. Tremblay is a Technical Services veterinarian with Boehringer Ingelheim, Canada. He graduated from the Ontario Veterinary College in 1982 then practiced in New Brunswick. He obtained a Doctor of Veterinary Science degree from the University of Guelph and remained as a faculty member in the large animal clinic until 1992. He was employed with the OMAF as a cattle health specialist. He is a diplomat of the American College of Veterinary Internal Medicine and specializes in large animal internal medicine, particularly infectious diseases of cattle.

Nutritional Management Strategies to Optimize Neonatal Calf Performance

Speaker: Dr. Vern Osborne (Nov. 29) &
Dennis McKnight (Dec. 1)

Getting calves off to a good start depends on good nutrition. This presentation will look at the management factors associated with high calf mortality, evaluate accelerated feeding programs, look at automated feeding technology, and discuss how to feed scouring calves. A discussion of introducing hay, calf starter and water will lead into an overview of the requirements for proper rumen development as a foundation for strong, healthy calves.

Dr. Vern Osborne is an Assistant Professor in Ruminant Nutrition with Animal and Poultry Science – University of Guelph. Dr. Osborne has held teaching positions with Ridgetown College and his research has concentrated on nutritional management strategies that enhance early heifer growth and the delivery of extra nutrients using drinking water.

Dennis McKnight has spent almost 30 years in the field of calf research, primarily in the area of calf housing, especially hutches, and nutrition. He is currently the Research Coordinator and a Professor with Kemptville College. He is currently researching the influence of calf starter and water on the incidence levels of scours.

Practical Protocols for Practical People!

Speakers: Dr. Nancy Charlton (Nov. 29) and
Dr. Reny Lothrop (Dec. 1)

Whether you are raising calves on contract, for your dairy operation, or for veal, to get a quality calf you need to start with a quality calf. It takes a lot of dedication to raise healthy calves but there are some simple protocols you can follow to take some of the stress from this important phase of production. When selling or buying calves learn what to look for in a quality calf. Starting with a good foundation will help bring better economic returns to your operation.

Dr. Reny Lothrop is one of six practicing veterinarians working for Main Street Animal Hospital, located in Cambridge, Ontario. Dr. Lothrop graduated from the Ontario Veterinary College in 1966 and has been a veterinarian for over 35 years. Dr. Lothrop's main areas of interest are in dairy cattle and veal calves.

Dr. Nancy Charlton graduated from the Ontario Veterinary College in 1993. Dr. Charlton joined Linwood Veterinary Services, located in Linwood, Ontario in 1996 and in 2000 became a partner. Dr. Charlton has interests in swine, dairy and calves.

Final agenda will be sent with registration confirmation. Agenda subject to change.

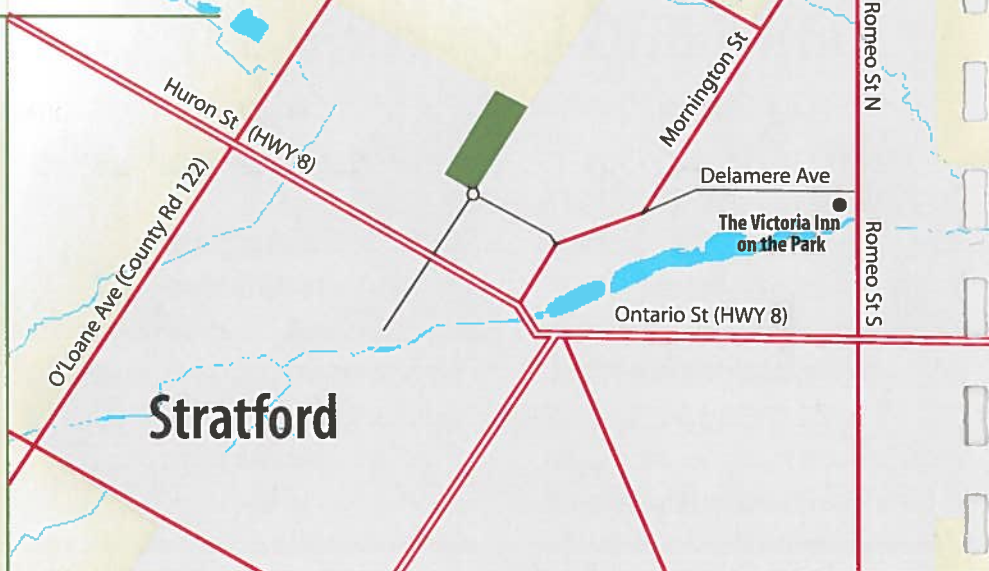
For more information on the conference, please call the OVA office at

(519) 824-2942 or info@ontarioveal.on.ca



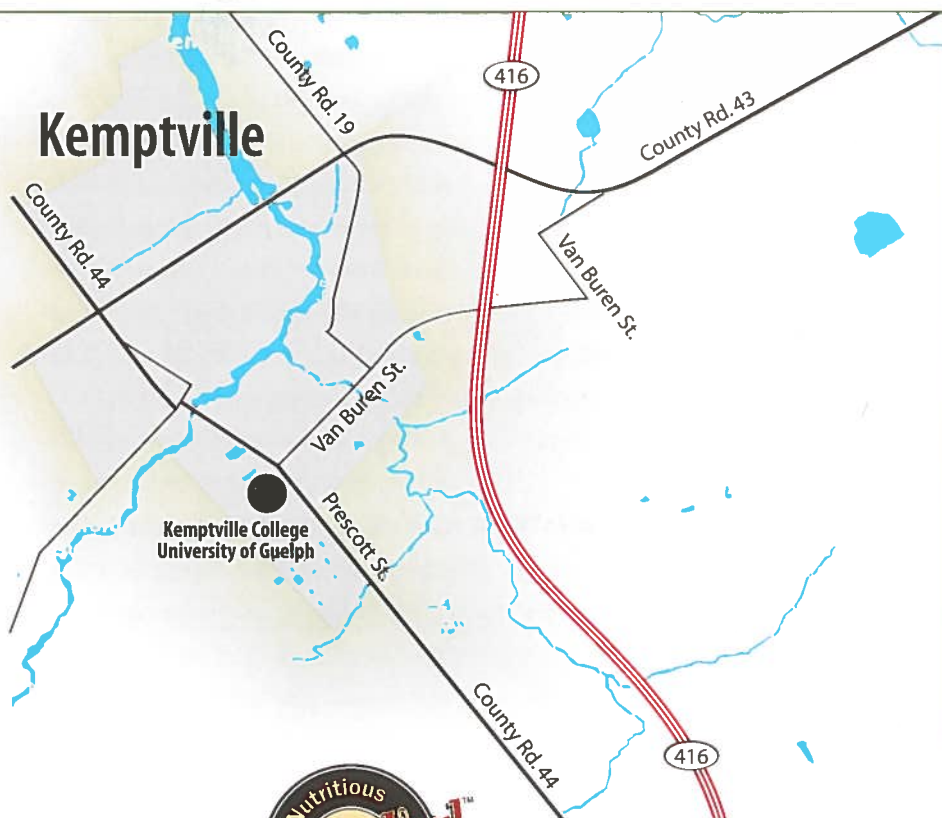
Locations

The Dairy and Veal **Healthy Calf**
Conference is in Stratford at:
The Victoria Inn on the Park
10 Romeo Street North
(519) 271-4650



Stratford – Monday November 29th

Kemptville – Wednesday December 1st



The Dairy and Veal **Healthy Calf**
Conference is in Kemptville at:
**Kemptville College – University
of Guelph**
830 Prescott Street
(613) 258-8336

Please note that space is limited and registrations
will be accepted on a first-come, first-serve basis.
Payment must be received by the Ontario Veal
Association prior to the conference to guarantee
your spot.

*For further information, please call the
OVA office at 519-824-2942 or email
info@ontarioveal.on.ca*

Organized by:



Sponsored by:



Ontario

Ontario Ministry of
Agriculture & Food



Agricultural
Adaptation
Council



Dairy Farmers
of Ontario

Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

Agenda Details

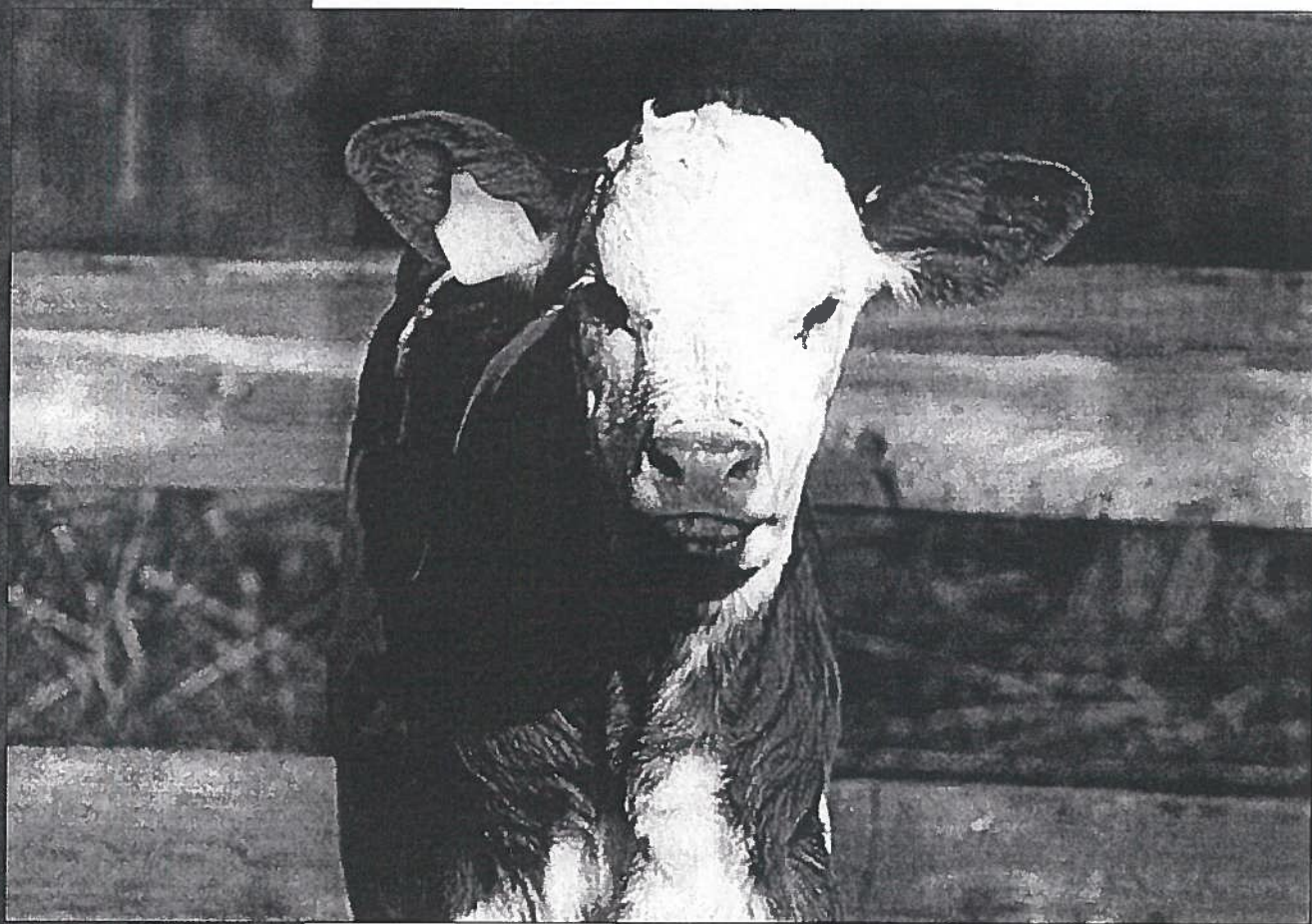
- | | |
|---------|--|
| 9:00am | Registration and Tradeshow |
| 9:30am | Successfully Managing the Newborn Calf - Solutions for the Real World
Dr. Gerald Bertoldo, Dairy Specialist - Cornell Cooperative Extension/Pro-Dairy Program |
| 10:30am | Creating a Healthy Environment for Happy Calves
Harold House, P.Eng., Ontario Ministry of Agriculture and Food |
| 11:15am | What Can You Expect to Get From Vaccinating Calves?
Dr. Rob Tremblay, Boehringer-Ingelheim (Stratford)
Dr. Paul Baillargeon, Pfizer Animal Health (Kemptville) |
| 12:00pm | Tradeshow and Lunch |
| 1:30pm | Profit Boosting Strategies for Newborn and Neonatal Calf Care
Dr. Sam Leadley, Attica Veterinary Associated, New York |
| 2:30pm | Milk Replacer: A Bag Full of Common Sense
André Roy, Director of Nutrition, Grober Nutrition |
| 3:00pm | Nutritional Management Strategies to Optimize Neonatal Calf Performance
Dr. Vern Osborne, University of Guelph (Stratford)
Dennis McKnight, Kemptville College (Kemptville) |
| 3:30pm | Practical Protocols for Practical People!
Dr. Nancy Charlton, Linwood Veterinary Services (Stratford)
Dr. Reny Lothrop, Main Street Animal Hospital (Kemptville) |
| 4:00pm | Conclusions |

LELY

HIGH - TECH
IN AGRICULTURE

CALM

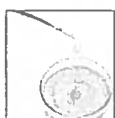
AUTOMATIC CALF FEEDER



- The best start for your calves
- Individual calf management for the healthiest herd
- Economically very beneficial

Lely Canada Inc.
218 Silvercreek Pkwy. N.
Guelph, ON. N1H 8E8
Tel: (877) 535-9269
Fax: (519) 836-6850
email: sales@lely.ca

www.lely.com



We offer you the best, naturally



Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

Managing for Newborn Calf Success- Solutions for the Real World



Dr. Gerald Bertoldo

Dr. Bertoldo is a 1977 graduate of the College of Veterinary Medicine at Cornell University. After 22 years of private practice primarily focused on dairy cattle in western New York State with a multi-person, diversified, veterinary clinic in Attica, New York, Dr. Bertoldo joined Agway Feed and Nutrition as a member of the technical services team. Presently, Dr. Bertoldo is a dairy specialist with the 10-county, NWNYS Dairy, Livestock and Field Crops Team of Cornell Cooperative Extension/Pro-Dairy Program.

Managing for Newborn Calf Success

Solutions for the Real World

Jerry Bertoldo, DVM
Extension Dairy Specialist – NWNV Team
Cornell Cooperative Extension/ PRO-DAIRY

Introduction

The well being of the day old calf has many contributing causes. We have focused on calving survival, the getting up and about and drinking colostrum out of a bottle as prime indicators of success for a long time. There is now a broader focus on the factors leading up to the viability of this neonate in its first day of life. The metabolic and immune status of the dam, the conditions of her environment as a close-up cow, the stresses associated with birth and the pathogen load of the calving environment are now part of the formula for success or failure.

“Pre-natal care”

This commonly heard phrase rings loud with expectant mothers as a way to insure the birth of a healthy baby. In the dairy business, we have spoken of dry cow nutrition and management as a part of a health program for the cow herself. Considering the impact of what happens to the calf as a result of whatever conditions come to exist for the dam has not been great.

Luckily, the cow puts a high value on fetal well being. Only her maintenance requirements rate higher. The fetus in the last two months of gestation requires as much energy and protein as the cow needs to produce 3-6 kg of milk (Bauman and Currie, 1980). Cows will sacrifice fat stores and muscle mass to meet this demand. Unless the dam is in a near starvation situation the development and birthing of the calf is not affected. Colostrum quality does not appear to suffer as a result either (Grumm et al., 1996). On the other hand, the health status and degree of stress on the dam during the dry and close-up period may have an impact on colostrum quality and quantity (Nardone, 1996). Vitamin and mineral supplementation is considered important to the immune status of the transitioning cow as well.

Cows that suffer from subacute rumen acidosis (SARA), chronic lameness and low level peritonitis from hardware disease or stomach ulcers would be suspect in delivering less colostrum immunity than healthy herdmates. These animals are under stress by definition and will be the first ones to experience immune system failures when further challenged by other stressful scenarios. Heat, overcrowding, uncomfortable resting areas, fly annoyance, poor water availability, bad ventilation, mycotoxins and socialization pressures will result in increased cortisol release as a stress reaction. Cortisol depresses disease resistance as well as response to vaccination.

Healthy, adult cattle harbor many pathogens without any clinical effects. Under stress, clinical disease can emerge. Tremendous numbers of viruses and bacteria are shed from weakened animals with compromised immune systems. *Mycoplasma* and *Salmonella* are two well known examples, both concentrating rather well in colostrum. Coccidia and *Cryptosporidia* rarely affect older cattle, but are often present in the intestines and shed in higher numbers around calving. The area where calves are to be born can be polluted with organisms from normal build up or from massive contributions by weakened or clinically ill mothers-to-be. A dedicated, frequently cleaned and bedded calving area avoids this problem to a great extent.

Pathogens accumulate on the bellies, udders and tails of cattle. These are areas that calves will “investigate” after getting on their feet and in search of their first meal. Reducing shed and build-up on the bedded surfaces where late gestation cows lay down is one control measure. Keeping the surfaces dry and clean is another.

Vaccination programs for dry cows and springing heifers have three benefits. The immunoglobulin or antibody production increases for the vaccinated animal thereby reducing the disease risk for pregnant and fresh cows, boosting the antibody concentration in colostrum and indirectly keeping close-up cows from becoming pathogen factories. The timing and frequency of these vaccinations is important. If given too far in advance of calving, the serum antibody levels will fade before peak demand for dam protection and colostrum accumulation. If given too close to calving (less than 2-3 weeks), cortisol interference may dampen response, the vaccines might act as an appetite suppressant and colostrum production may be past the point of being able to incorporate the extra immunoglobulins.

There is a wide array of vaccines available for immunizing cattle. All cattle should be started with the first or primary immunization at an early age after maternal antibodies have reached low numbers (12-14 weeks of age). Failure to do this leaves the immune system unable to respond properly to subsequent booster shots. It is recognized that modified live viral products are valuable in the degree and longevity of protection. The number and uses of bacteria based vaccines or bacterins are best described as a matter of individual herd need. The custom heifer raiser and open herd will have use for more variety and frequency of vaccination than a closed herd.

Although vaccines are useful tools, excessive use must be avoided in dry cows. The ones derived from Gram-negative bacteria such as *Leptospira*, *Hemophilus*, *Salmonella* and *E.coli* contain compounds known as endotoxins. These poisons cause fever, depression and decreased appetite. No more than 2 of these Gram-negative bacteria should be involved in any one episode of vaccinating a dry cow. Abortion or early calving can result.

Dry cow treatment is a valuable practice to insure less fresh cow mastitis and better availability of quality colostrum. Flaming or clipping udders reduces the amount of filth that the calf might encounter and the risk of contaminating the colostrum harvest.

A listing of dry cow and springer recommendations:

- Feed for maintenance of body condition avoiding moldy and poorly fermented feeds, using appropriate vitamin and mineral supplements and providing adequate metabolizable protein.
- Allow 2.5 feet per cow of bunk space.
- Avoid overcrowding (<one cow per stall), frequent grouping changes and additions, hot and stuffy conditions.
- Provide adequate fresh water (one drinking spot per 15 cows), comfortable and dry areas to rest with 100 square feet per cow.
- Do not vaccinate dry cows and heifers less than 2-3 weeks prior to calving
- Do not vaccinate when the temperature is over 85° F (30° C).
- Do not use more than 2 Gram-negative bacterins at one time. Separate them by one week if necessary.
- Consider pregnancy re-checks before drying off to verify date and presence of calf.
- Trim all late pregnancy cows to assure good foot balance.
- Control and treat cases of foot rot and heel warts.

Preparation for Calving

Cows should be provided with a comfortable place before labor begins in earnest. A clean, well bedded and dry box stall of at least 80 sq. ft., a dedicated pack with 125 sq. ft. per animal or a conventional barn stall with gutter grate in place and lots of bedding will work. Calving areas should be cleaned out weekly and bedded daily. These should pass the "knee drop test" where your pants remain clean and dry after kneeling on these surfaces.

Cows should have access to feed and water although they will not eat or drink much at this time. Making sure the teats are clean is important if newborns might suckle unassisted. If teat dip is used, it should be wiped off after contact for a few minutes.

The Calving Process

Cows that are close to calving must be observed frequently for the first stage of labor. Signs include increased vaginal discharge, restlessness, lying down and standing up frequently, nervousness, kicking at the belly and contractions. Individual animals will vary in the intensity of signs. It is important to exam vaginally ones that do not progress as expected. The onset of milk fever, abnormal presentations and uterine torsions alter the characteristics and the timeline. Stage 1 ends when the cervix is fully dilated. This process should take 2-4 hours in heifers and 2-3 hours in older cows.

Stage 2 of labor involves the appearance of the water bag or feet, strong uterine contractions and the delivery of the calf into the birth canal. It ends with the delivery of

the calf. This period should last less than an hour in heifers and about 30 minutes in older cows.

Calving assistance requires cleanliness, good judgment and consistency. Vaginal exams and manipulations of the calf must be performed only after the tail has been held or tied out of the way, the vulva has been scrubbed with soap and a plastic sleeve has been put on the operators arm. Sterile lubricant, not soap, should be used on sleeves and inside the cow. Soaps are irritating and lead to metritis later on. Dirty techniques will contaminant the uterus and present bacteria to the mouth and nose of the calf. Pulling calves before complete dilation, with too much force or too quickly often leads to increased calf loss and vaginal trauma.

Calving difficulty or dystocia is commonly scored on a 1 to 5 scale. "1" represents no problem whereas "5" represents extreme difficulty. 30% of calvings involve some difficulty. There is a range of effects as a result of this physical trauma. Calves can be stillborn in the worst case scenario. This ranges in prevalence from 5% in older cows to 10% in heifers. Calves will experience metabolic acidosis, low blood oxygen, hypoglycemia and hypothermia with dystocia. Passive transfer failure is common despite proper colostrum management in calves with difficult births. Quantifying the indicators of these metabolic effects such as blood oxygen, CO₂, acid-base balance and cortisol is impractical in the field. Even moderate assistance will cause higher illness and death rates in comparison to normal deliveries. Dystocia calves as a whole will experience 3.8 times more sickness and 4.5 times higher death rates than normal ones. 25% of these die within 48 hours of birth.

It is important to give special attention to dystocia calves. Often their breathing reflexes are poor and the mouth and upper airways can be mucous filled. Vigorous rubbing, poking a piece of straw up a nostril, pouring water in an ear, hanging over a gate, mouth to nose resuscitation and using oxygen resuscitators are ways of stimulating these calves.

Post-calving Care

Post-calving management control points include naval dipping, environmental hygiene (dry and clean), stress avoidance (no rough handling, cold protection), colostrum (quality, quantity and quickness) and nutrient delivery (energy). It has become apparent that the environment of the dam is a difficult one at best to keep calf friendly. Adult cattle can be factories for viruses and bacteria that may cause little if any harm to themselves or pen mates, but could be potentially life threatening to newborns. This includes respiratory pathogens as well as the critical enteric ones. Removing calves from even the cleanest, lowest density calving pen promptly is a sound best management practice.

The navel is a direct pathway for bacteria to invade the blood stream of the calf. Strong 7% tincture iodine should be applied to the navel stump as soon as possible and repeated within 24 hours. Any accumulated organic material should be removed before dipping. Iodine tincture cauterizes, dries and disinfects. Other disinfectants may kill bacteria, but have little drying effect.

Calves are born with temperatures around 103° F (39.5° C). This decreases during the first day of life. If the temperature drops below 101° F (38.5 C), metabolic changes occur which reduce survivability and the absorption of antibodies from colostrum. In cold weather, heat lamps and “hot boxes” are great aids in keeping calves warm. Placing calf jackets on calves after dry off will maintain body temperatures and reduce maintenance energy requirements. Gentle handling of newborns will keep the already elevated levels of cortisol from rising further.

Colostrum

Colostrum is a special secretion of the mammary gland which has attributes far exceeding that of regular milk. It contains high levels of immunoglobulins (antibodies), macro and micronutrients, leukocytes (white blood cells), enzymes, growth factors and hormones.

Table 1. The average Holstein “first milking” colostrum compares to normal milk as follows:	
Colostrum contains	2 times the solids
	4 times the protein
	2 times the fat
	65 times the IgG
	2 times the calcium
	10 times the Vitamin A
	3 times the Vitamin D
	10 times the iron

The placenta of the ruminant does not allow for the transfer of immunoglobulins from the maternal blood to the fetus. If the fetus is challenged directly in utero by pathogens within its own system, it will be born with antibodies of its own. Bovine colostrum contains particularly high levels of IgG1, accounting for greater than 80% of all antibodies present (Barrington, 2001). IgG1 is a commonly used indicator to evaluate overall immunoglobulin status in colostrum and calf blood.

The status of the immune system is a critical component of the early health and growth of calves. Calves are born with a competent, but naïve ability to respond to disease challenges. This means that the newborn, compared to the adult, will respond to the entry of pathogens into the body in a less vigorous and speedy manner. Reliance on maternal antibodies (passive immunity) provided by colostrum during this time has been a benchmark of management practices.

The late gestation cow will produce levels of immunoglobulins or antibodies in her colostrum based on her own response to infectious agent challenge. This is usually a combined result of natural exposure and vaccination administration. Logically, older

cattle tend to produce higher levels of antibodies in their colostrum as opposed to first calf heifers. It has been reported that as many as 25% of primiparous dams will have adequate concentrations at calving.

The calving process initiates a change in the profile of the secretion of the udder. Newly produced transition milk is added to the already existing core of colostrum produced over the preceding three weeks. Since this production is less concentrated in antibodies and white cells, delaying the milk out of the dam to collect colostrum leads to poorer Ig concentrations. Harvest of colostrum at 6 hours post-calving has been shown to reduce antibody levels up to 40% as opposed to removal within 2 hours of parturition (Davis and Drackley, 1998).

Colostrum has a somatic cell count of over 1 million leukocytes and epithelial cells. Along with the immunoglobulins, this provides the bulk of the passive immunity derived from colostrum. Both immunoglobulins (Ig) and leukocytes are actively transferred across the gut wall to enter the blood within the first 24 hours of life

The volume of colostrum obtained from the first milking has been used as a barometer for quality. The "18 pound rule" says that amounts greater than this tend to be inadequate in immunoglobulins. This ties in with the lost quality noted when the first milking is delayed and transition milk has been produced. Precalving milking and leaking of milk will reduce colostrum value as well. Color and consistency have been qualitative measures used to judge antibody content, the thought being the thicker and deeper the yellow color, the better it is. The correlation here is not all that reliable.

At the present time, two methods of testing colostrum for immunoglobulin quality are prevalent. The colostrometer, an instrument which determines specific gravity, is an easy and inexpensive method of evaluation. One important ground rule for its use is often overlooked, however. The colostrum to be tested must be near "room temperature" (68-72° F) to get a reliable reading. The colostrometer is calibrated in this range and is marked with the correlated level of IgG. Colder product is thicker and will give a falsely elevated reading. Warmer temperatures thin out the liquid and underestimate the immunoglobulin content. Colostrum is classified as poor if it contains <22 mg/ml of IgG (red zone), moderate if between 22 and 50 mg/ml (yellow zone) and excellent if the level is >50 mg/ml (green zone) of IgG. Variations in fat and non-Ig protein content will change the viscosity of colostrum and affect the reliability of this method.

The other more accurate means of evaluating colostrum is through the Colostrum Bovine IgG Midland Quik Test™ (Midland BioProducts) which directly measures IgG levels in 20 minutes. It is not subject to temperature or component based error. This test indicates whether colostrum is above or below 50 mg IgG/ml. This test has been used in different ways. Some have tested all colostrum deemed appropriate to consider for feeding. Others use it as a spot check to monitor variations based on a season, parity and performance.

Colostrum supplements and replacements have gained popularity as a result of quality and biosecurity concerns. These products are derived from bovine serum, colostrum or

whey. Total replacement preparations must contain greater than 100 grams of IgG. The recommended timing of administration does not differ from that of natural colostrum with regard to antibody absorption characteristics. The efficiency of absorption of natural or supplemented antibodies is determined by elapsed time since birth as well as the Ig mass presented to the gut. Supplemental sources added to adequate or superior colostrum will not change blood Ig concentrations significantly. Addition to poor colostrum raises Ig levels notably. There appears to be a rate limiting factor regulating immunoglobulin uptake (Arthington et al., 2000).

The integrity of colostrum from the bacterial contamination point of view is vital to the newborn calf. It is recommended that routine culturing of colostrum be used to monitor the success of harvesting, handling, storage and sanitation. It may be necessary to culture various articles of feeding, water and the environment to determine the source(s) of the contamination.

Ideally, colostrum should be administered within four hours of birth. Large calves should be fed 4 quarts, small calves 3 quarts. A second feeding of 2 quarts is recommended within 8 hours. Surveys show that less than 40% of dairy calves receive 4 quarts of colostrum or more in total (McGuirk, 2004)

Unlike beef calves, the dairy calf experiences very high rates of failure of passive transfer if left to nurse the dam (Besser and Gay, 1991). 40 % of dairies leave calves with their dams to nurse colostrum. Hand feeding with a nipple bottle is the recommended first means of administration. Large volumes may not be consumed readily by some calves. Completing the feeding by use of an esophageal feeder is recommended. Proper positioning of the calf and care in preventing residual colostrum in the tube from being inhaled eliminates any risk associated with "tubing". Esophageal feeding delivers the liquid into the rumen rather than in a path to the abomasum. There is a 3 hour delay in emptying the colostrum from the rumen into the abomasum. The trade off between the early and high volume delivery of antibodies versus this delay favors the use of the esophageal feeder (Hopkins and Quigley, 1997).

Colostrum should be close to body temperature at feeding. Refrigerated or frozen colostrum must be warmed using water baths no hotter than 120° F to avoid destruction of antibodies. Microwave thawing is time consuming (15-20 minutes) if performed in a non-destructive manner. Care must be taken to administer warmed or recently harvested colostrum quickly to prevent bacterial growth.

It becomes apparent that the real measure of success of passive transfer lies with the testing of the calf. Calves should be at least 24-36 hours old and no more than 7 days for testing. Direct measurement of circulating IgG levels is the ideal method. Commercial tests are available for use on whole blood or serum (Midland BioProducts). These rapid tests indicate whether the blood concentration of IgG is above or below 10 mg/ml. Indirect methods such as the zinc sulfate turbidity test and total blood protein determination with a refractometer are cheaper, but less accurate at evaluating IgG status. The calf's hydration status will alter refractometer results. Dehydration can move the

total protein reading higher while anemia from naval stump blood loss will depress it. It is important that calves are always sampled at the same time related to liquid feeding to minimize this error. Refractometer readings can also be elevated by the presence of fibrinogen, a blood protein transferred to the calf through colostrum. Fibrinogen is produced in greater quantity by the cow experiencing chronic infection.

Other Management Practices

The use of vitamin and mineral supplementation by injection is a common practice in newborn calf care. Colostrum has concentrations of these micronutrients at levels many times that of milk or milk replacer. Since prolonged feeding of colostrum or transition milk is not as common today as it was, the availability of these trace nutrients may be lacking.

The supplemental use of vitamins A, D, E and B-complex and minerals iron and selenium is commonly adopted for newborns while use of products with manganese, copper and zinc are less utilized.

Intranasal vaccines can be used during the first day of life. These IBR-PI3 live virus vaccines provide quick, broad spectrum, surface antibody protection against common pathogens of the respiratory tract with some spill over into the digestive tract. These are not subject to the cortisol interference that blocks injectable vaccine efficacy.

Immune stimulating products (Immuboo®) and endotoxin vaccines (ENDO-VAC Bovi®) are commonly used beginning on the first day of age on calf ranches and veal operations. These by pass the regular route of immune response and will not be blocked by calving-induced cortisol release. Both types are injectable. The early use of these agents is aimed primarily at enteric disease caused by coliform bacteria although protection against respiratory pathogens is additionally achieved.

Summary

Achieving high rates of survivability and health in newborn calves involves a comprehensive management program that starts with the dam and continues through the first day of age. The day of calving is the most critical point in the life of the bovine as well as one of the greatest opportunity areas presented to the industry as a whole.

REFERENCES

- Arthington, J. D., M. B. Cattell, and J. D. Quigley. 2000. Effect of dietary IgG source (colostrum, serum, or milk-derived supplement) on the efficiency of IgG absorption in newborn Holstein calves. *J. Dairy Sci.* 83:1463-1467
- Barrington, G. M. and S. M. Parish. 2001. Bovine neonatal immunology. *Veterinary Clinics of North America*. Vol. 17. No. 3, Nov. 2001. W.B. Saunders Company.
- Besser, T. E. and C. C. Gay. 1991. Comparison of three methods of feeding colostrum to dairy calves. *JAVMA* 198(3):419-422.
- Davis, C. L. and J. K. Drackley. 1998. *The Development, Nutrition, and Management of the Young Calf*. Iowa State University Press.
- Grum, D. E., J. K. Drackley, R. S. Younker, D. W. Lacount, and J. J. Veenhuizen. 1996. Production, digestion, and hepatic lipid metabolism of dairy cows fed increased energy from fat or concentrate. *J. Dairy Sci.* 79:1836.
- Hopkins, B. A. and J. D. Quigley. 1997. Effects of method of colostrum feeding and colostrum supplementation on concentrations of immunoglobulin G in serum of neonatal calves. *J. Dairy Sci.* 80:979-983.
- LeJan, C. 1996. Cellular components of mammary secretions and neonatal immunity: a review. *Vet. Res.* 27:403-417.
- McGuirk, S. M., M. Collins. 2004. Managing the production, storage, and delivery of colostrum. *Veterinary Clinics of North America*. Vol. 20, No. 3

Managing for Newborn Success

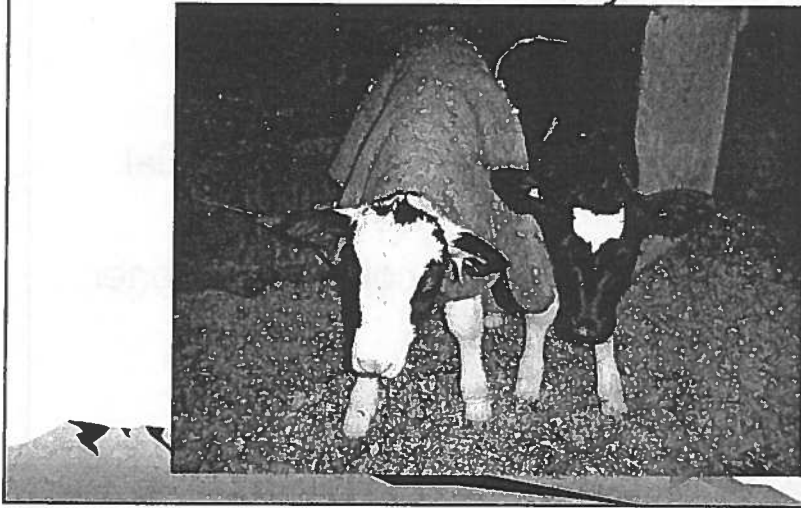
Jerry Bertoldo, DVM
Extension Dairy Specialist
NWNV Team
Cornell Cooperative
Extension/ PRO-DAIRY



Presentation Objective

- Outline and discuss the importance of three time frames of management that determine the well being of the newborn:
 - Dry period
 - Calving
 - The 24 hours after calving

*** The Baby Calf ***
*the toughest challenge
on the dairy*



Historically, success was.....

- Born alive
- Got up
- Drank something
- Survived the first day
- Lost < 1 out of 10



So in modern times.....

- We group dry cows and springers
- We give vaccines in the last part of pregnancy to boost colostrum
- We try to put calving animals in a special place
- We give more and better colostrum sooner than ever

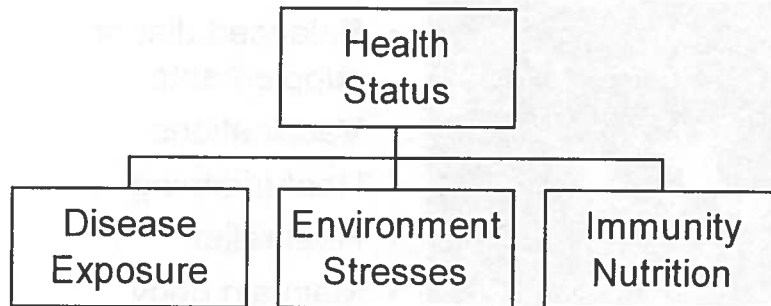


Unfortunately.....

- Calves can be born fine and have high rates of illness
- Dystocia calves can surprisingly perk up, drink and then die
- Quick feeding of plenty of great quality colostrum can be followed by severe diarrhea and death in some calves
- Managing and monitoring colostrum alone does not insure health and happiness

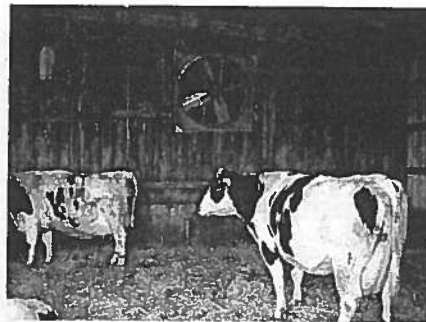


The Big Picture

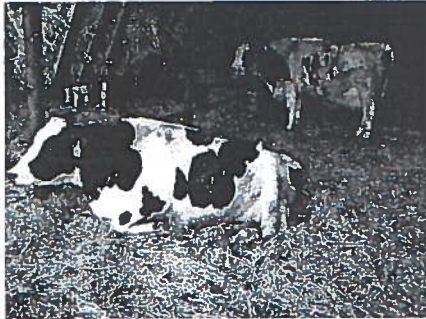


What about the role of the dam and the environment?

- Does the status of the dam have any bearing on calf viability and health?
- What impact does calving and the environment have on the newborn itself?



Prenatal care for cows



- Dry bedding or good pasture
- Balanced diet or supplements
- Vaccinations
- Hoof trimming
- Heat relief
- Maintain body condition

Immunity

Does it come out of a bottle or has nature provided a method?



Building the Dry Cow's Immune System

- Dry period vaccination program
- Paying attention to energy and protein past 190 days pregnant
- Micronutrients - Se, Cu, Zn, vit E
- Stress avoidance!!

Critical to making high quality colostrum!



Vaccinations

- Within reasonable period precalving
- Do not vaccinate less than 3 weeks before expected calving date
- Do not use more than 2 Gram (-) bacterins at once
- Avoid doubling on Gram (-) with *Pasturella* and *Clostridium spp. vaccines*



Endotoxins

- By product of Gram (-) bacterin production
- Increases immune response
- Depresses appetite, induces fever, may cause early calving or abortion
- Big stressor!



Stress

- Heat
- Lameness
- Overcrowding
- Poor water access
- Flies
- Uncomfortable resting area
- Bad ventilation
- Mycotoxins
- Over vaccinating

Cortisol !
The common thread



Nutrition

- Not directly correlated to calf health, size or colostrum quality!
- Immune status of dam is, however



In Utero Diseases

- BVD (PI or persistently infected)
- Leptospira hardjo-bovis
- Neosporosis
- Brucellosis
- Johnes
- Leucosis

Diseases from adults around calving

- BRSV - nasal discharge
- Mycoplasma - nasal and vaginal discharge, colostrum
- Leukosis – colostrum, in utero
- Johnes - colostrum, manure, in utero
- Salmonella - manure, colostrum, saliva
- E. coli, Rotavirus, Coronavirus, Coccidia, Cryptosporidia - manure



Other environmental threats

- Mastitis affecting colostrum safety
- Environmental pathogen load on dam and in calving area
- Dirty teats
- Bacteria in wet bedding



The adult cow world is not a friendly one to calves

Cattle routinely harbor, multiply and shed viruses and bacteria that often have little effect on themselves, but can cause serious illness to calves.



The calving process



- *Comfort* for dam to prevent nervousness
- *Recognition* of stages of labor
- Area to *monitor* and *assist*
- *Cleanliness*

Stages of Labor

- Stage I – nervous, restless, up and down, increased vaginal discharge and contractions
 - 2-3 hours for cows; 2-4 hours for heifers
- Stage II - appearance of the water bag or feet, strong uterine contractions and the delivery of the calf into the birth canal
 - 30 minutes for cows; 30-60 minutes for heifers



Calving = Stress

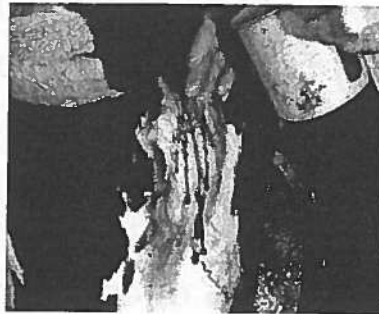
The goal is to minimize this

- Provide assistance without rushing and causing trauma
- Use calf jacks and chains
- Use lots of lubricant
- Pull with contractions only after cervical dilation



Be clean!!

- Get the tail out of the way – it is impossible to clean properly
- Use *soap* on skin and disinfecting *solution* in clean warm water
- Use sterile lubricant *not soap*



There is an open mouth and nasal passageway inside!

Inside the cow

- Always a *clean* sleeve
- Always gentle
- Always lubrication
- Work with cow
- Keep her up if possible
- Use pail for sanitizing not washing off manure

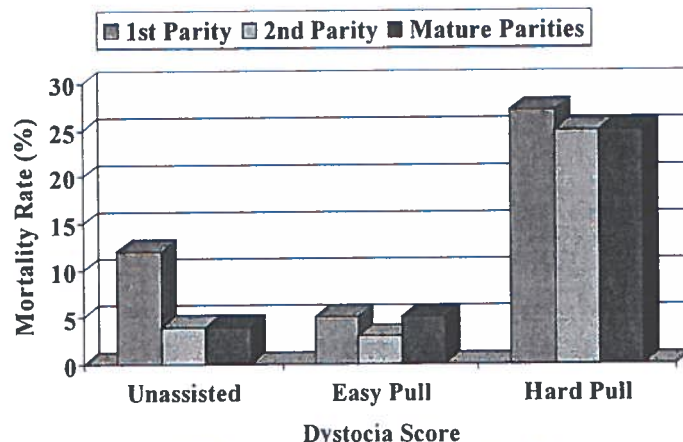


Dystocia

- 30% of all calvings have some difficulty
- Scored on a scale of 1-5
1 = easy unassisted; 5 = very difficult assisted
- All scores over 1 result in metabolic changes in the calf to some degree
- Over 7% of calves are stillborn
- 25% of dystocia calves die within 48 hours



**Average mortality rates of calves
24 hours postpartum for
different dystocia scores by parity**



Metabolic impact of dystocia

- Physical trauma, inactivity, congestion
- Low blood oxygen
- Hypothermia
- Lactic acidosis
- Hypoglycemia (transient)



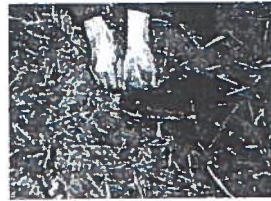
Aftermath of dystocia

- Inability to stand
- Poor sucking reflex
- "Dummy" calves
- Loss of thermoregulation
- Poor efficiency of antibody absorption
leading to failure of passive transfer (FPT)



Handling a dystocia calf

- Stimulate breathing if necessary
- Vigorous rubbing to encourage movement, circulation and respirations



Resuscitation

- Mouth to nose
- Cone over the nose with oxygen
- Intubation with oxygen



Managing a dystocia calf

- Roll from side to side to avoid lung congestion
- Keep in sternal recumbency
- In cold weather, use a “hot box” or heat lamp
- Use a calf jacket only after dry



Handling a dystocia calf

- Be careful of swallowing reflex if bottle feeding
- Do not tube feed and leave lying out flat
- Reflux and poor throat function can allow milk into lungs
- Good preventative antibiotic candidate
- Immune stimulants?



Routine Practices

- 7% tincture of iodine navel dip
- Make sure no crud is covering navel first
- Check sex of calf
- ID the calf and note dam
- Feed colostrum
- Remove from calving pen



Importance of Colostrum

- Ruminants do not transfer passive protection (antibodies or Ig) across the placenta to the fetus
- Calves have functional, but naïve immune systems that take weeks to mature
- Colostrum supplies antibodies as well as superior nutrition and stimulants to the calf



Table 1. The average Holstein "first milking" colostrum compares to normal milk as follows:

Colostrum contains	2	times the solids
	4	times the protein
	2	times the fat
	65	times the IgG
	2	times the calcium
	10	times the Vitamin A
	3	times the Vitamin D
	10	times the iron

For newborns its passive immunity and colostrum!

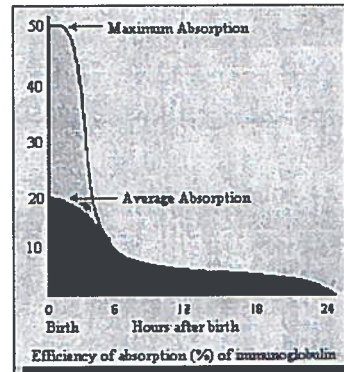
- Quality
- Quantity
- Quickly

If you cannot deliver quality, wholesome colostrum in a timely fashion consider a substitute.



Antibody absorption factors

- Age (in hours) of calf
- Volume of feeding
- Concentration of Ig
- Metabolic status
- Presence of bacteria
- Administration means
- Temperature of colostrum?

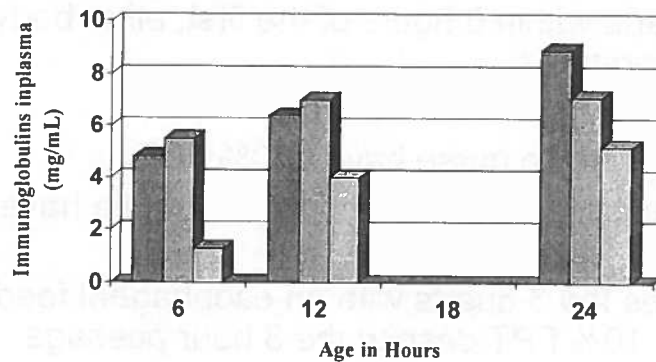


Colostrum Facts

- Main source of disease protection for the first couple of weeks
- Produced in udder 3 weeks precalving
- Older cows have better quality (18 lbs./10 kg rule)
- Dry cow vaccination helps
- Difficult to substituted for (serum and colostrum derived products)
- First milking has most antibodies

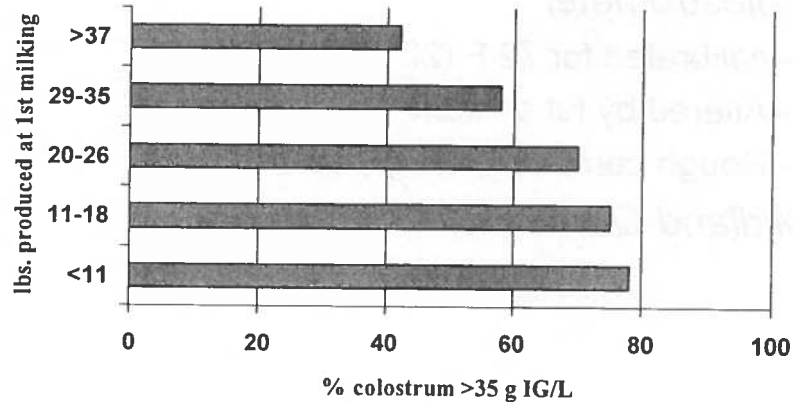
Dystocia Affects Absorption of IgG

■ Births without dystocia ■ Moderate dystocia births
 ■ Severe dystocia births



Source: M. Vermorel et al. "Energy Metabolism and Thermoregulation in the newborn Calf: Effective of Calving Conditions," 1989 Canadian Journal of Animal Science, Volume 69.

Effect of Milk Output at 1st Milking on IG Concentration



Recommendations?

- Feed a full 4 quarts of colostrum ASAP and 2 quarts within 6 hours of the first, all at body temperatures

WHY?

- Calves left to nurse have >60% FPT
- Calves fed 2 quarts with a nipple bottle have 20% FPT
- Calves fed 3 quarts with an esophageal feeder have 10% FPT despite the 3 hour passage delay.



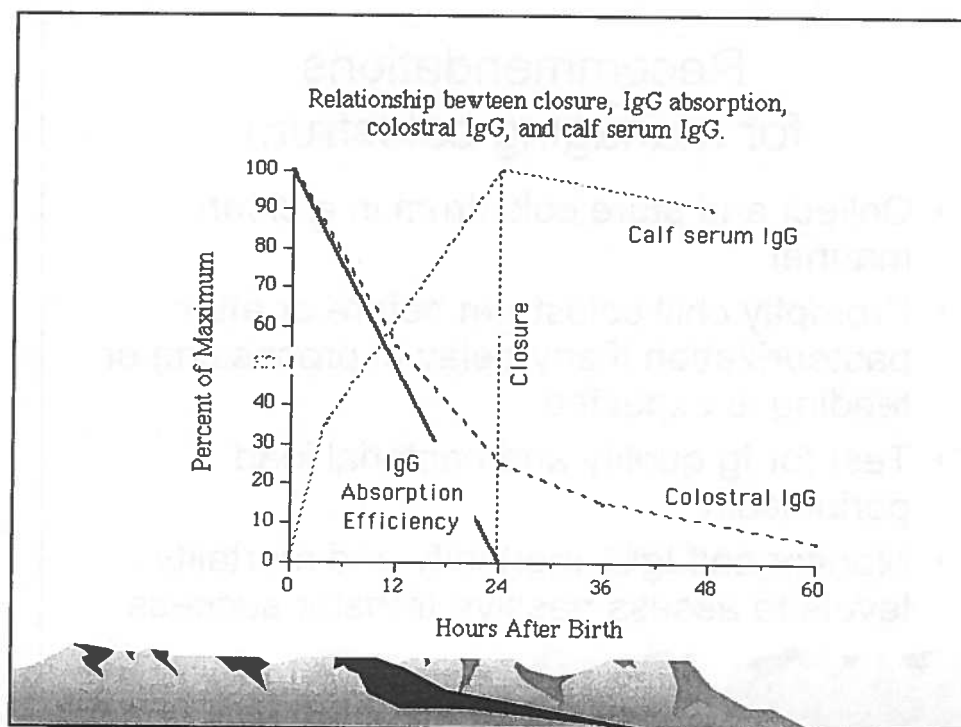
Monitoring Ig of colostrum

- *Colostrometer*
 - calibrated for 72 F (22 C)
 - Altered by fat content
 - Rough correlation to Ig levels
- *Midland Quik Test*



Monitoring Ig of the calf

- Start after 24-36 hours of age
- Refractometer to measure total protein of serum
- Midland Quik Test to measure IgG directly



1st day nutrition

- Calves are only 3% fat by body weight compared to 18% for human infants
- Only 180 grams of glycogen stores
- Only 18 hours of energy reserve in thermo-neutral environment ($>10^{\circ}\text{C}$ and dry)
- Be careful of colostrum supplements



Recommendations for managing colostrum

- Collect and store colostrum in a clean manner
- Promptly chill colostrum before or after pasteurization if any delay in processing or feeding is expected
- Test for Ig quality and bacterial load periodically
- Monitor calf IgG, morbidity and mortality levels to assess passive transfer success

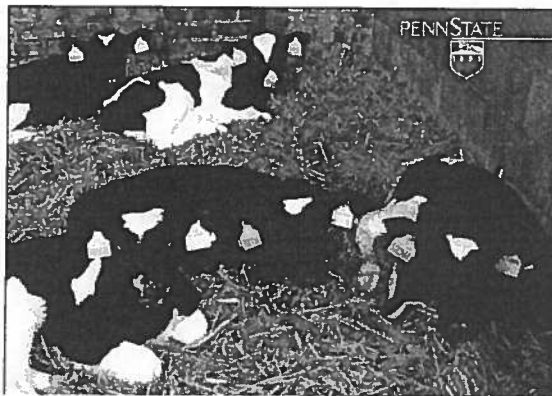


Remember.....

- Colostrum is not antibacterial !!
- Colostrum grows "bugs" better than anything on the farm
- Coliform numbers can double every 20 minutes
- Colostrum is often gathered and stored in places and by means totally unacceptable to public health regulations



Thank you!



Any questions?



Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

Creating a Healthy Environment for Happy Calves



Harold House, P.Eng

Harold was raised on a dairy and swine farm in Elgin County. He received his BSc and MSc degrees in Agricultural Engineering from the University of Guelph in 1978 and 1990. Prior to joining OMAF in 1981, Harold worked in various positions in both the agricultural industry and research. Harold is currently OMAF's provincial Dairy & Beef Housing and Equipment engineer, working out of the Clinton field office. He has a special interest in cow comfort, ventilation, manure handling, and more recently robotic milking systems.

Creating a Healthy Environment for Happy Calves

Harold K. House, P.Eng.,
Dairy and Beef Structures and Equipment Engineer

Ontario Ministry of Agriculture and Food
Clinton, Ontario

November 13, 2004

Why house calves?

The question may seem obvious at first, but like so many obvious questions, do we stop and think what is behind them? Maybe the question we should ask is why do we house calves separate from the rest of the dairy herd? Calves like other babies are at a delicate stage of their life cycle. They can not withstand the disease, environment, or challenges that they will face at a later stage of development. They need to develop their immune system and body structure gradually so that they can face the challenges when they are able.

Calves need to be isolated from older animals to minimize their exposure to disease organisms. They need to be isolated from direct contact with each other to minimize the spread of disease. They need to be protected from the extremes of the elements of cold, heat, snow, rain and wind (Figure 1).

The best way to provide this protection is by adequate housing. Then the question becomes: What is adequate housing?

Housing Considerations

There are a number of different factors to be considered when housing calves. Here is my "top 10 + 1" list. The order is not critical, as they all work together to make it a housing system.

1. Isolation

Calves must be isolated from the rest of the dairy herd and from each other. Calves must be kept away from the rest of the dairy herd to minimize their exposure to disease organisms that their body is not ready to handle. This is best accomplished by a separate facility.

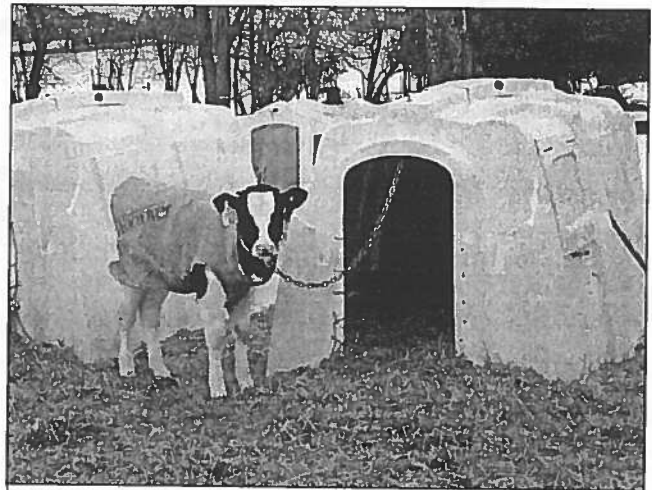


Figure 1 Calves need to be isolated from larger animals

Calves need to be isolated from each other until weaning. This prevents the spread of disease from nose to nose contact and the risk of infection from navel sucking. This means calves need separate pens that are placed a distance away from each other, or penning dividers that prevent contact between calves, or tethers that don't allow them to reach each other.

2. Protection from the Elements

Calves need to be protected from the elements. They can handle heat and cold, but not in extremes. They need to be protected from rain and snow, and strong winds.

3. Ventilation

Calves need fresh air, but they can't handle drafts. What is a draft? A draft occurs when the calf experiences discomfort based on the speed, temperature, and humidity of air moving around them. Drafts put a stress on the calf that makes them susceptible to other diseases such as pneumonia.

4. Environment

What environment is most comfortable for the calf? What environment is most comfortable for the operator? What environment is most practical to maintain? The answer is a cold environment within reason. If the environment is so cold that calf performance suffers, and operators, can't manage calves properly then other alternatives or modifications need to be considered.

5. Adequate Space

Calves need adequate space. They need space to exercise and grow. Calves up to two months of age need at least 25-30 ft². Pens from 3½' x 6' to 4' x 8' work best.

6. Observation

Does the housing allow for convenient observation of the calf? Early detection of disease means early treatment and early cure.

7. Drainage

Does the housing allow for good drainage? Calves need to be kept clean and dry. This starts with a well-drained base. This may mean a gravel base covered by sand for a hutch or greenhouse. Or it may mean a concrete floor with a slight slope to a gutter. This becomes even more critical when pens are pressure washed.

8. Bedding

What kind of bedding is best? How much should be used? How convenient is it to apply? These are important questions. One producer told me that "bedding is the cheapest drug you can buy." Bedding especially long straw can be used to keep the calf warm when it is cold. Long straw does not blow around as much. Other bedding options are more absorbent and better for fly control at other times of the year.

9. Feeding

Proper nutrition plays a key role in calf performance and health. How easy is it to feed the calves? How far must the feed be transferred? Is it necessary to have a feed/hospital room in the calf facility?

10. Cleaning

How convenient is it to maintain a clean calf bed, and consequently clean calves? Is there a need for bedding storage?

11. Sanitation

How can the calf facilities be sanitized between calves? Sometimes it is best to leave a calf space empty for 10 to 14 days, or more.

Housing Study

In preparation for the conference a survey of a number of different calf facilities on larger dairies (milking over 100 cows) was undertaken. This included an evaluation of the calf facilities and an interview with the owner or calf manager. This was far from an extensive study but was very useful in understanding why producers used what they did, and how they made their facilities work.

Information was collected about:

1. Type of Housing
 - size, age, cost, design features
2. Ventilation
 - Cold weather
 - Changeable weather
 - Hot weather
3. Calf Management
 - Colostrum feeding
 - Regular feeding
 - Length of time in facility
4. Disease Treatment
 - Treatment at birth
 - Diseases
 - Treatment records
 - Mortality rates
5. Housing Management
 - Bedding
 - Cleaning
 - Sanitation
6. Other Comments
 - What works, what doesn't
 - What is necessary to make it work

Criteria for Evaluating Calf Housing

After about the third interview it became clear that the three most important criteria to producers were: 1. Calf Performance; 2. Operator Comfort; and 3. Cost.

On a scale of 1 to 10 with 10 being the most important, calf performance rated a 10, operator comfort rated a 6 or 8 depending on who you were talking to, and cost was about a 4.

1. Performance of Calf

In terms of calf performance producers were concerned with calf health, growth rate, and mortality rate.

2. Operator Comfort

The need for operator comfort was quite controversial. Some argued that calves could be managed properly under any circumstances, while others said the operator could do a far better job of management if they were in a comfortable environment.

3. Cost

Everybody agreed that cost was a factor, but it paled next to calf performance.

Most Important Housing Factors

In terms of housing, producers thought the most important factors were to keep the calves clean, and dry, and in a well-ventilated environment free from drafts and to provide them with adequate space.

Housing Options

Four housing options were studied:

1. Hutches
2. Modified Hutches
3. Greenhouse Calf Shelters
4. Cold Calf Barns
5. Warm Calf Barns

Hutches \$350 - \$400

Hutches work, there is no doubt about it. They are economical, and it is easy to add several more hutches as the herd expands. Many different styles of hutches are available commercially. Hutches can also be constructed from plywood (www.cps.gov.on.ca/english/dc2000/dc2832.htm). If you build your own hutches, be sure to put a slight crown on the top to shed water.

The hutch provides the calf with an opportunity to select the most comfortable of three micro-environments (Figure 2). The first is deep in the shelter where the calf can escape wind, rain and snow. The second micro-environment is outside the hutch where the calf can be warmed by the sun and get exercise. The third is a combination. In the doorway, the calf can be partially protected from wind and moisture, yet can still absorb the sun's warmth.

Hutches should be located facing south. They should be protected as much as possible from the wind, and they should

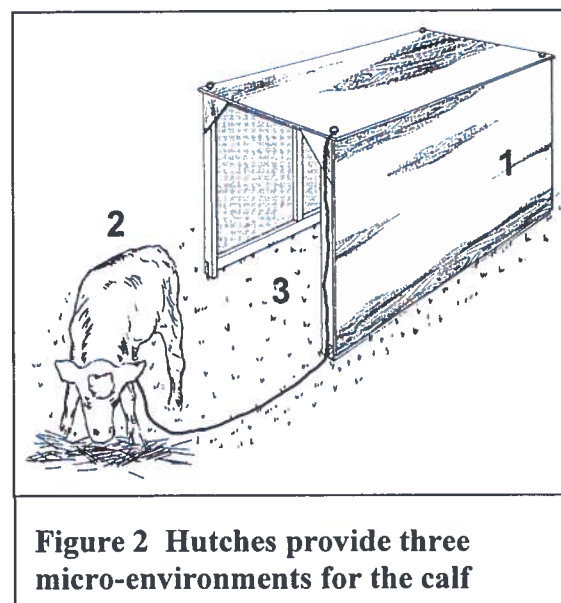


Figure 2 Hutches provide three micro-environments for the calf

be placed on a well-drained base.

Calves should be started in a clean hutch with a fresh bale of straw. When the navel is dry, the bedding can be switched to sawdust or shavings. Straw is better when it is cold, but may breed more flies in hot weather.

Calves can either be restrained in a wire-enclosed run, or tethered with a neck strap and chain. The wire enclosed run gives the calf total freedom of movement, and it allows the calf hutches to be placed closer together without touching than with tethers. However, it makes it more difficult to remove snow from around the hutch, and more difficult for the operator to have access to the calf. The tether, on the other hand, allows easy access to the hutch and calf for snow removal, feeding and checking. One producer lowered the tether pipe to the bottom of the hutch to avoid tangling. Whatever the system used, hutches should be spaced far enough apart to avoid calf to calf contact.

Between calves hutches should be cleaned and then allowed to sit empty. Some producers disinfected and tipped hutches so that the sun could dry them between calves. Ideally hutches should be moved to a new location for the next calf.

Calves are very healthy in hutches. Mortality rates were reported in the 1 to 2% range. It is rare to have pneumonia in hutches. Calves must be dry when introduced into the hutch, and extra bedding may be necessary to keep the calf warm in cold weather, or dry in wet weather. Woolovers are useful in extreme cold. If more than one person is feeding the calves, it is important to have a treatment board or communication board somewhere for all the calf feeders to see.

The complaints most people have about hutches are weather related. It takes a committed manager to take the time to observe calf health under all weather conditions. It may also be more difficult to see the whole calf, depending on the hutch style.

Modified Hutch Buildings \$1000 - \$1500

In an effort to make it more comfortable for the operator a number of different modified hutch arrangements have been used over the years. These may be as simple as placing hutches in a machinery shed (Figure 3), or may be more permanent by building a structure and placing the hutches inside.

Done properly, modified hutch housing still provides an environment similar to a hutch while offering more protection for the calf and operator. This option can also save labour and bedding.



Figure 3 Hutches in storage shed

The structure in Figure 4 is ventilated similar to any cold housing livestock barn. A minimum amount of ventilation is allowed at the eaves when the curtain is closed. The top curtain is adjusted up and down as needed depending on the weather, and the bottom curtain is rolled up during hot weather. An open ridge, ridge vents or chimneys can be used. It is important with calf housing to have a protected ridge opening to prevent down drafts.

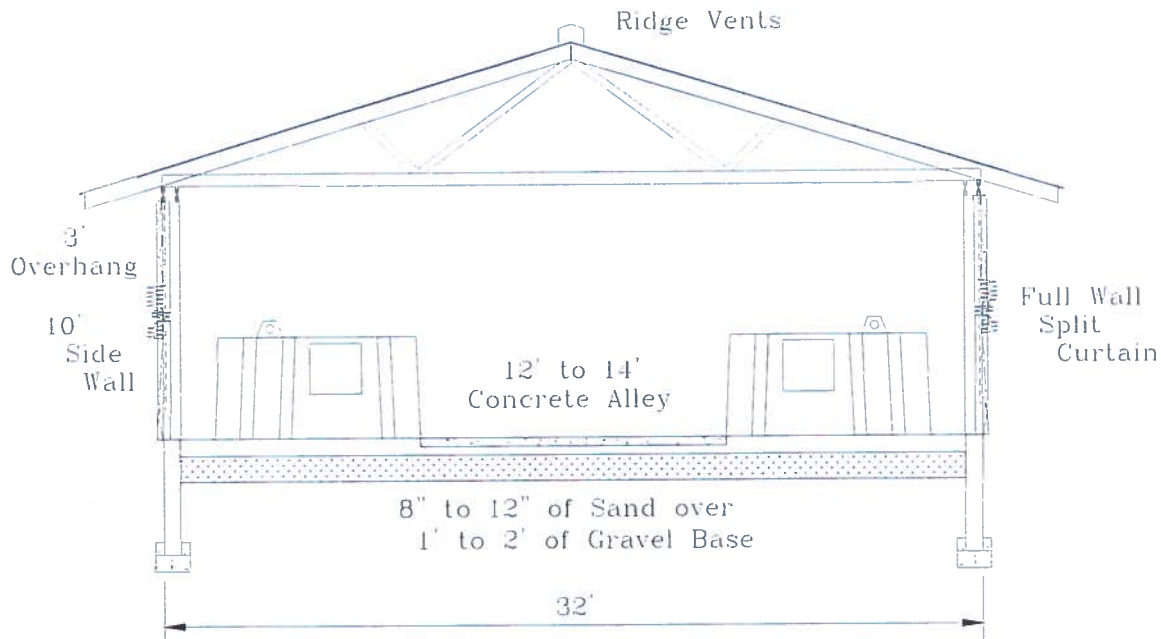


Figure 4. Modified hutch building

It is important especially when using existing buildings, not to compromise on the hutch environment. The calves still need plenty of fresh air, and sunshine similar to hutches. A machinery shed with doors facing the south makes a nice option. The hutches can be placed in the doorway in the sun, and the doors can be shut in a snow storm. When using existing buildings and comparing costs, it is important to keep in mind that the building can no longer be used for its initial purpose.

Greenhouse Calf Shelters \$400 - \$800

In March of 1996 the Large Herd Operators took a tour to Vermont to study greenhouses for calves and cows. This generated a lot of interest in using greenhouses for calf shelters. Several were built shortly after this tour and many others have been built since.

Several different styles of greenhouses have been used over the years from the traditional double walled clear plastic structures to Cover-All type structures. The greenhouse structure is again a cold housing environment, but offers the protection of a greenhouse. Calves are usually confined in pens made of hog wire similar to hutch runs.

Clear plastic greenhouses have to be covered with shade cloth in warm weather to keep the calves cooler (Figure 5). Shade cloth is usually put on in late April and removed in late October. Greenhouses with an outer white plastic layer or a single woven polyethylene white layer do not require shade cloth.



Figure 5 Greenhouse covered with shade cloth

Shade cloth with a 20% opening also makes an excellent windbreak material for ventilation. Many installations use the shade cloth on the ends of the structure to provide a minimum air exchange during cold weather. A section of adjustable curtain is installed along the lower walls for ventilation as well. Care must be taken when opening the sidewall curtains to prevent drafts at floor level. Some producers have used plywood or other deflectors and blocks to minimize floor drafts.

Some of the greenhouse structures had adjustable ridge vents, and others had chimneys. Both of these options are beneficial for ventilation during cold weather when the sidewalls are completely closed.

Because of their shape greenhouses do not have an eave (Figure 6). This allows rain to come in when the curtains are up. Pens should be kept a foot or more away from the walls to avoid getting wet. Some of the fabric-covered buildings do have eaves that can be added on.

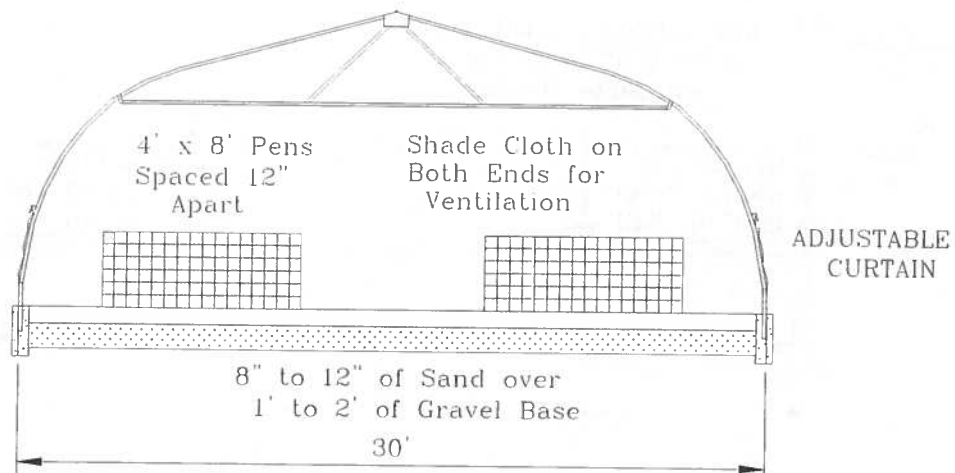


Figure 6. Greenhouse calf shelter

Once again pens need to be constructed on a well-drained base. Many greenhouses have used a layer of coarse gravel covered by sand as the base.

Many producers don't like the thought of using plastic as a building covering. It was surprising to note that one of the greenhouses built in 1996 still has the original plastic covering. Others because of ice damage had to be replaced in three to five years.

Some producers also feel that the pens can't be kept as organized and as neat in a greenhouse because they can't fasten the pens to a wall. To others this is not an issue.

Producers using the greenhouses were quite pleased by calf performance in them. Mortality rates were also generally less than 2%. Precautions need to be taken in extreme cold conditions.

Cold Barns \$1400 - \$2500

Other producers chose to go with a cold barn using a more conventional building. These buildings still provide a cold environment, but use a more traditional form of pens and ventilation (Figure 7). Concrete floors were used. It was still important to provide good drainage in the pens. Most barns had a gutter running under the pens for drainage. This was especially important if the pens are pressure-washed.

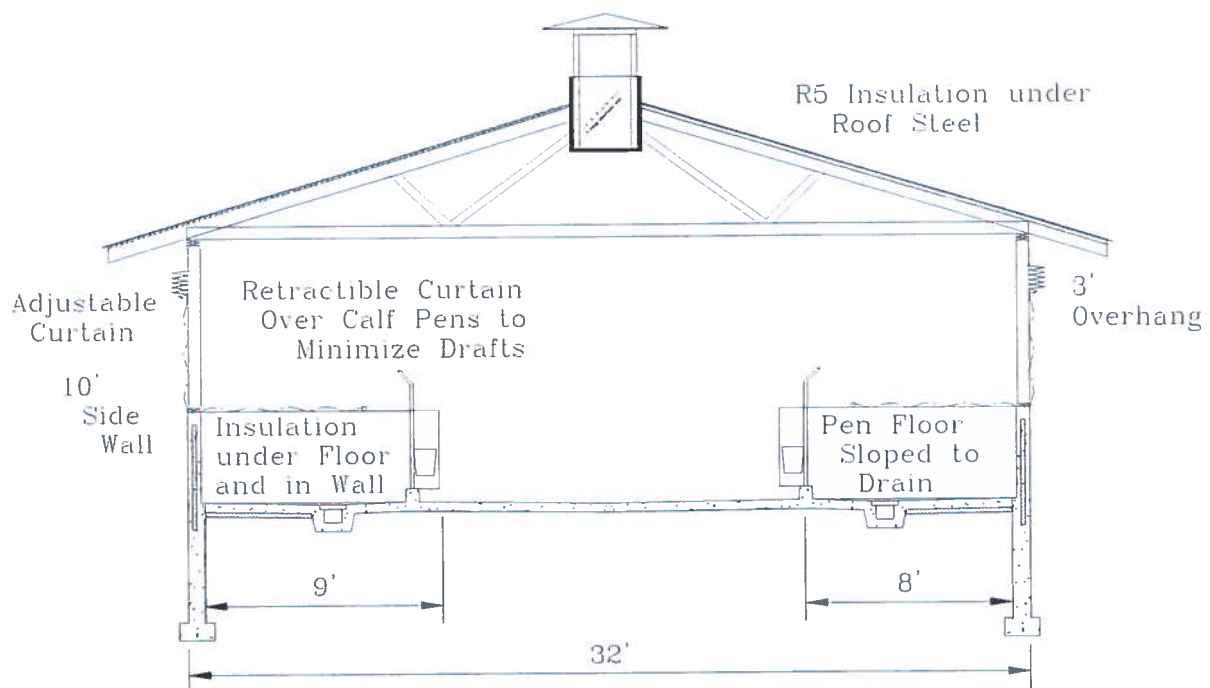


Figure 7. Cold naturally ventilated calf barn

Adjustable curtains were used for sidewall ventilation, some curtains were automatically controlled. Automation is still useful even in a cold barn to close the curtains when the winds change. Some of the barns that have been built recently have extended the curtains right to the ground, while others have a solid wall to the top of the calf pens.

Chimneys were used for ridge ventilation. It is important to have dampers installed in the chimneys to prevent down drafts. Dampers can be manually controlled. Another important ventilation feature was to have curtain material that could be rolled over top of the pens to protect the calves from downdrafts. This provided a protected area similar to a hutch.

Solid panels were used as pen dividers (Figure 8). The divider should extend beyond the pens at least 12" for a single opening gate and 16" for a double opening gate to minimize nose to nose contact between calves. These dividers can be removed once a calf is weaned to allow for grouping. The centre alley needs to be wide enough to allow these panels to be removed from the pens.



Figure 8 Calf pens with solid dividers

These barns can be more mechanized in terms of ventilation, feeding, and cleaning. But just because they are more mechanized doesn't mean they are more fool proof. Raising calves still requires careful management. As expected these facilities cost more than the previous simpler options. Having a feeding/hospital room will vary the cost of any of the facilities. Mortality rates varied between 1% to 3%.

Warm Barns \$1750 - \$2500

A warm calf barn uses a conventional room or building with insulated walls (R20) and an insulated ceiling (R30) (Figure 9). The goal is to maintain a room temperature of between 10 to 13 °C (50 to 55 °F). Although these buildings can be naturally ventilated it is more common to fan ventilate a warm calf nursery. Heat is needed because baby calves do not produce enough body heat to maintain adequate ventilation rates.

The ventilation system must provide fresh air without drafts and temperature fluctuations to every pen in the nursery. This will require a well controlled air inlet, an internal air circulation system, a supplementary heating system, and properly sized and staged exhaust fans.

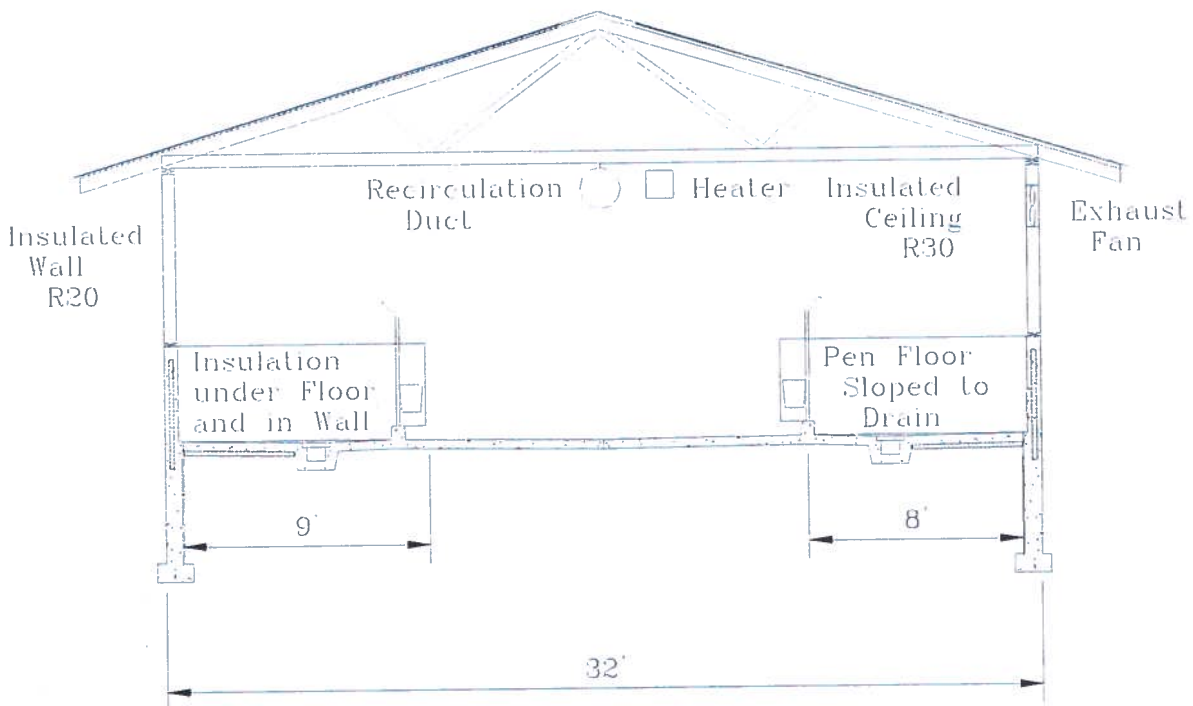


Figure 9. Warm fan ventilated calf barn

An internal air circulation system is recommended to guarantee a uniform air flow pattern as well as eliminate dead spots and temperature stratification. It also provides an excellent way to distribute the supplemental heat. This circulation system should be located in such a way to assist the flow of cooler, incoming fresh air and help mix and warm it prior to reaching the pen area. The circulation fan is designed to operate continuously and circulate approximately 1 cfm of room air per square foot of floor area.

Additional heat is required to both maintain the desired room temperature, and allow adequate air exchange to control the respired moisture and odours. The recommended room temperature for a calf nursery is 10-13°C (50-55°F).

Exhaust fans are required to control the rate of air exchange in the room, and need to be balanced with the fresh air inlet system. The ventilation required varies from a minimum, continuous winter rate of 10 cfm per calf to 1 summer level of 150 cfm or more per head. In fact, the minimum rate may need to be increased to about 4 air changes per hour to adequately control the barn odours.

The rest of a warm calf nursery is very similar to a cold one.

Recommendations

I received a number of good tips and recommendations from the dairy producers I interviewed.

- Avoid keeping older calves in the same housing as baby calves. Once calves are weaned they start to produce more and different manure. More ventilation is required to keep the facility fresh. This is often too much ventilation for young calves.
- All pens and hutches require good drainage to stay dry. Nothing beats a 1' to 2' gravel base covered with 8" to 12" of sand.
- Hutches do work, but they are not for everyone. Hutches require committed managers willing to take the time to manage in all kinds of weather. Expect to get a tan, but also frostbite.
- Oversize your facility to break the disease cycle. Pens or hutches need to sit empty between calves to allow disease organisms time to die off. Several of the producers interviewed would like to have two housing facilities that they could alternate between. Others have used hutches to give their regular facilities a break.
- Get calves off to a good start with proper colostrum feeding, and make sure they go into the hutch or pen dry.
- Keep good treatment records, especially if more than one person feeds the calves. Keep a calf card or record at the pen. If this is not possible keep a treatment/message board where the milk is prepared. Make sure all calf feeders communicate.
- Housing is a management tool. Calves can survive in cold minimal housing, but if calf managers cannot survive the cold consider another alternative.
- Early detection of disease leads to early treatment and an early cure. Make sure you observe the whole calf at every feeding.
- Consider a feed preparation/hospital room if the milking centre is a long way from the calf facility. Or, consider easy transportation of milk and feed. A used golf cart makes for happy employees.
- Calves do not produce enough heat to warm up a barn. Barns must be operated as cold barns no matter how much insulation is used, unless heat is added.

Summary

What started out to be a study in housing ended up as a study in management techniques. It was evident that producers could make a variety of housing systems work, and work well. Hutches were still a favourite choice in terms of calf performance and cost. But sometimes in order to maintain family and employee relations a more sheltered alternative was chosen.

Producers agreed that the key housing factors for raising healthy, fast-growing calves were to keep the calves in a clean, dry, well-ventilated environment, free from drafts and to provide the calves with adequate space.

Creating a Healthy Environment for Happy Calves



Harold K. House, M.Sc., P.Eng
OMAF



Why House Calves?

- ISOLATION FROM OLDER ANIMALS
- ISOLATION FROM EACH OTHER
- PROTECTION FROM ELEMENTS
- MANAGEMENT PURPOSES



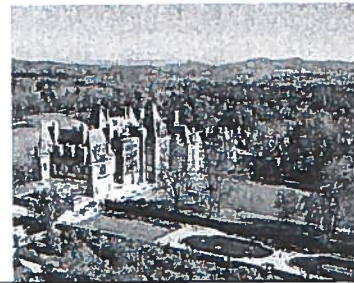
How do we Provide Isolation and Protection?



Adequate Housing

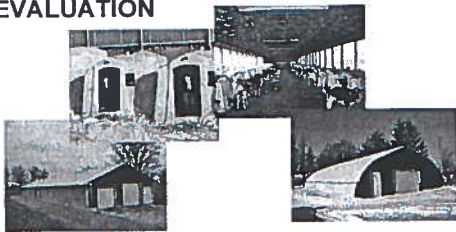


What is Adequate Housing?



Housing Study

- COMPARISON
- EVALUATION



Housing Study

1. TYPE OF HOUSING

- Design Features
- Size
- Age
- Cost



Housing Study

2. VENTILATION

- Cold Weather
- Changeable Weather
- Hot Weather



Housing Study

3. CALF MANAGEMENT

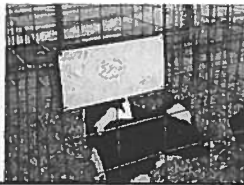
- Colostrum Feeding
- Regular Feeding
- Time in Facility



Housing Study

4. DISEASE TREATMENT

- Treatment at Birth
- Diseases
- Treatment Records
- Mortality rates



Housing Study

5. HOUSING MANAGEMENT

- Bedding
- Cleaning
- Sanitation



Housing Study

6. OTHER COMMENTS

- What Works - What Doesn't
- What is Necessary to Make it Work

HOUSING CONSIDERATIONS

- ADEQUATE HOUSING



1. Isolation

- FROM THE REST OF THE HERD



1. Isolation

- FROM EACH OTHER



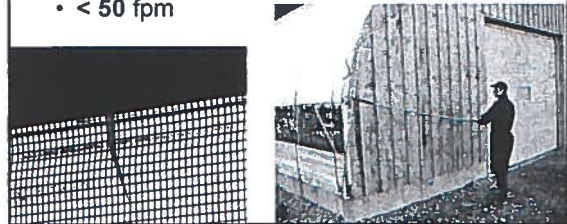
2. Protection from the Elements

- COLD, HEAT, SNOW, RAIN, & WIND

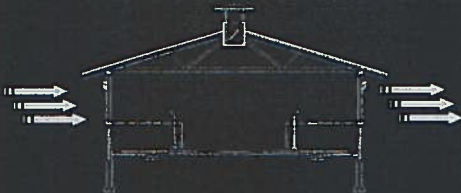


3. Ventilation

- FRESH AIR WITHOUT DRAFTS
- < 50 fpm

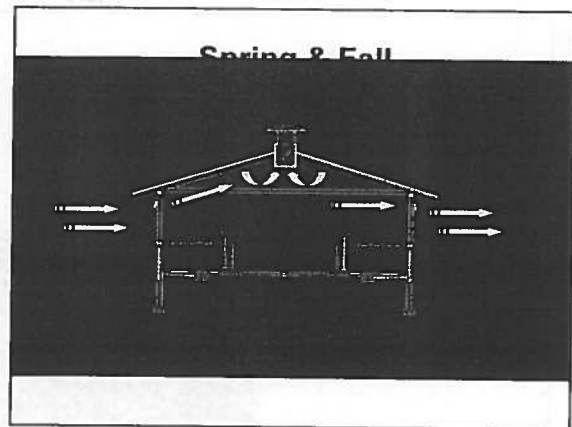
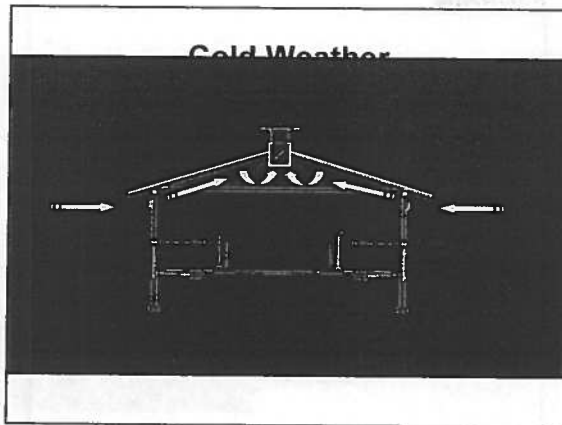


Hot Weather



NATURAL VENTILATION

- WIND EFFECT
- TEMPERATURE EFFECT



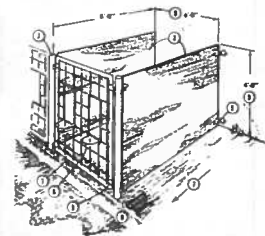
4. Environment

- COLD HOUSING VS. WARM HOUSING



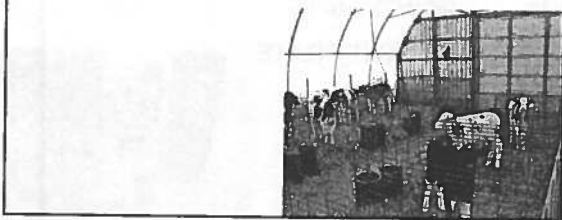
5. Adequate Space

- EXERCISE AND GROW
- 25 to 30 FT²
- 3½' x 6' to 4' x 8'



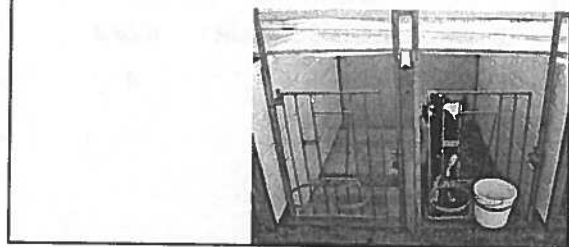
6. Observation

- CONVENIENT OBSERVATION OF THE WHOLE CALF



7. Drainage

- MAINTAIN CLEAN AND DRY



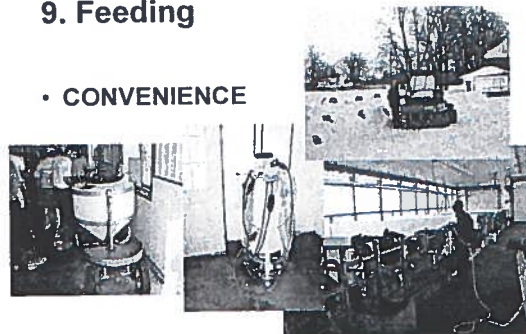
8. Bedding

- "bedding is the cheapest drug you can buy"
- LONG STRAW FOR COLD
- SHAVINGS TO REDUCE FLIES



9. Feeding

- CONVENIENCE



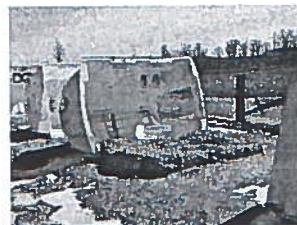
10. Cleaning

- CONVENIENCE



11. Sanitation

- BREAK DISEASE CYCLE



SCALE FROM 1 TO 10

- | | |
|---------------------|--------|
| 1. CALF PERFORMANCE | 10 |
| 2. OPERATOR COMFORT | 6 or 8 |
| 3. COST | 4 |

1. CALF PERFORMANCE

- CALF HEALTH
- GROWTH RATE
- MORTALITY RATE

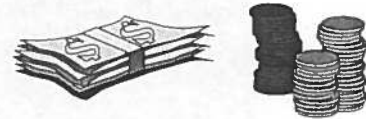


2. OPERATOR COMFORT

- CALVES CAN BE WELL MANAGED UNDER ANY CIRCUMSTANCE
- OPERATORS DO A BETTER JOB IF THEY ARE COMFORTABLE

3. COST

- COST IS A FACTOR
- COST LESS IMPORTANT THAN PERFORMANCE



KEY HOUSING FACTORS

- CLEAN AND DRY
- WELL VENTILATED WITHOUT DRAFTS
- ADEQUATE SPACE
- ISOLATION

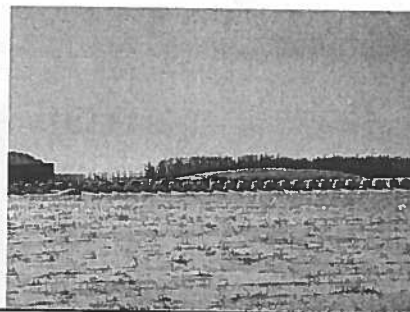
HOUSING OPTIONS

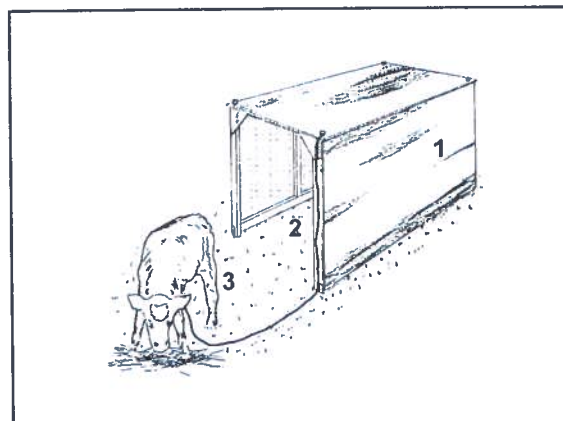
1. HUTCHES
2. MODIFIED HUTCHES
3. GREENHOUSE SHELTERS
4. COLD CALF BARNs
5. WARM CALF BARNs

1. HUTCH HOUSING



"hutches do work"





LOCATION

- WELL DRAINED
- SOUTHERN EXPOSURE
- PROTECTED FROM WIND

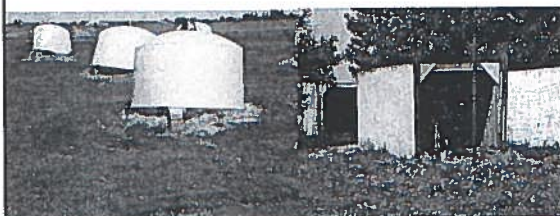


RESTRAINT



HOT WEATHER

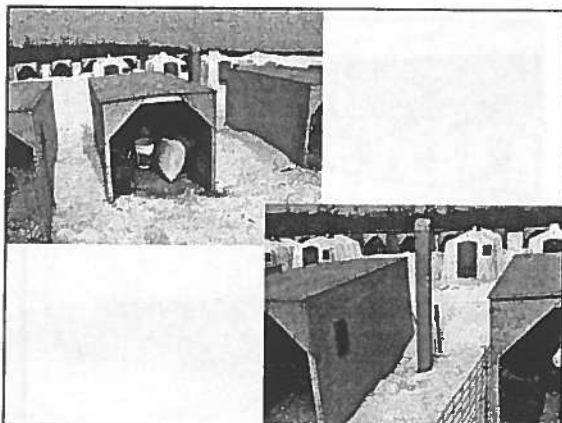
- SHADE IF POSSIBLE



COLD WEATHER

- FEED FOR TEMPERATURE





MANAGEMENT



MANAGEMENT

- COLOSTRUM FEEDING
- START IN SEPARATE CLEAN HUTCH OR PEN
- DRY CALF / DRY BEDDING
- OBSERVE THE WHOLE CALF AT EACH FEEDING

MANAGEMENT

- FEED FOR WEATHER
- ADJUST VENTILATION FOR TEMPERATURE AND WIND
- CLEAN AND SANITIZE
- LET SIT EMPTY FOR 7-14 DAYS

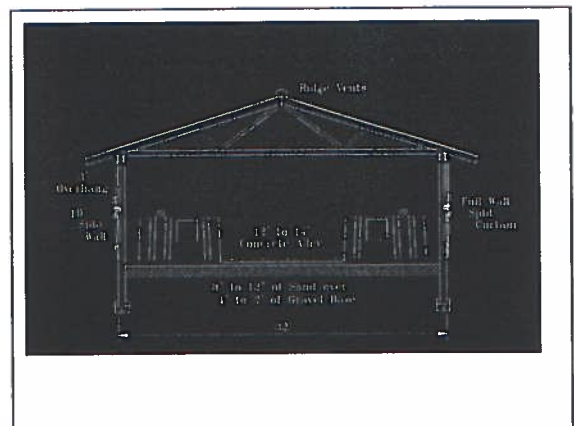
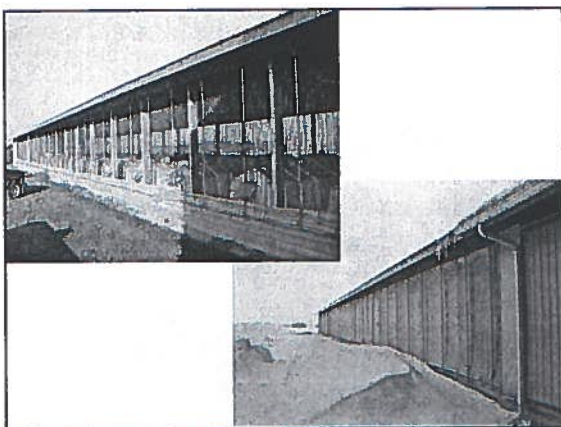
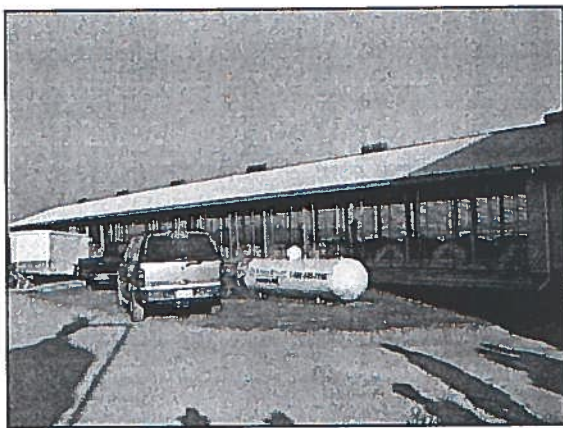
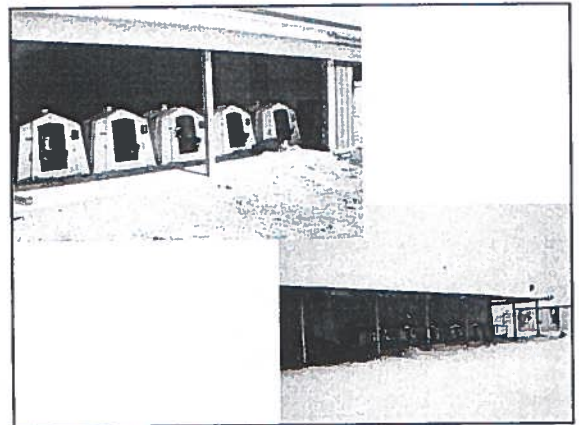
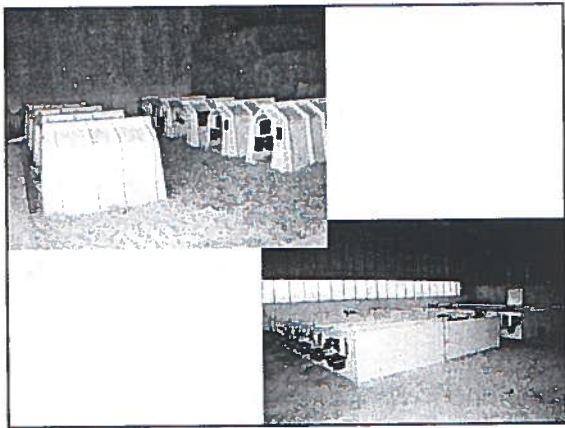
HUTCHES

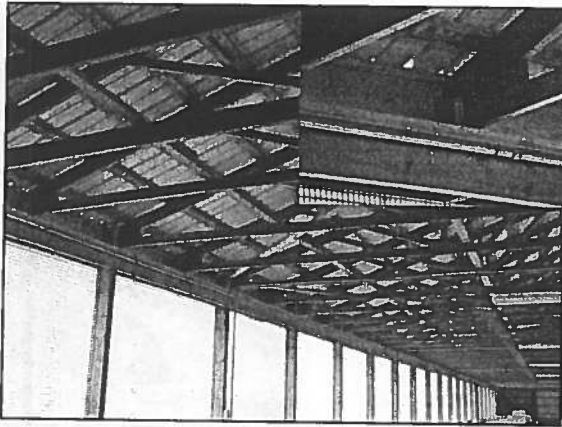
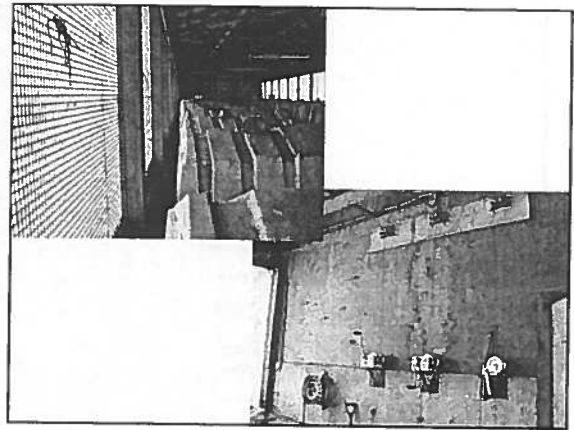
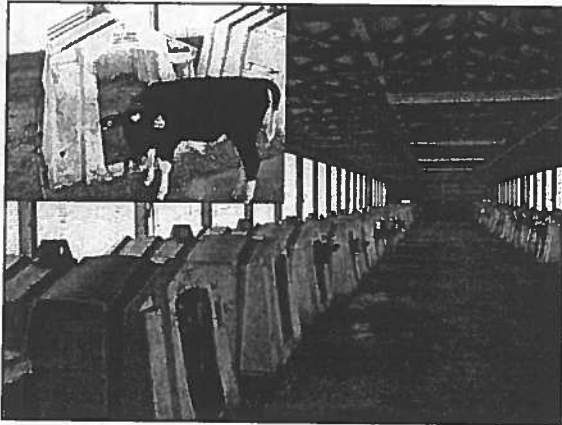
SCALE FROM 1 TO 5

- | | |
|---------------------|-------|
| 1. CALF PERFORMANCE | ***** |
| 2. OPERATOR COMFORT | ***** |
| 3. COST | ***** |

2. MODIFIED HUTCHES







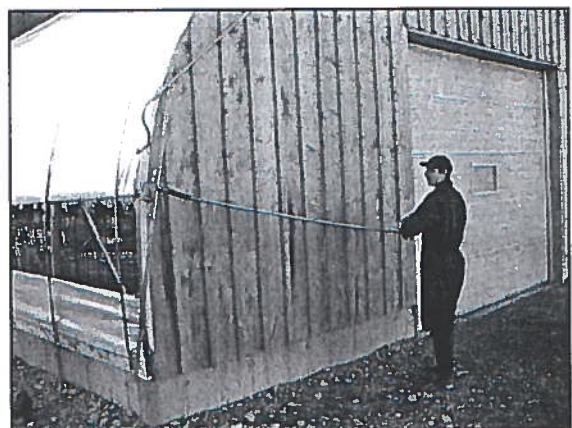
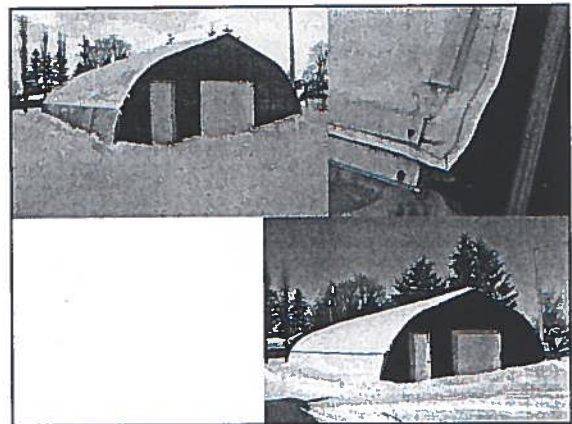
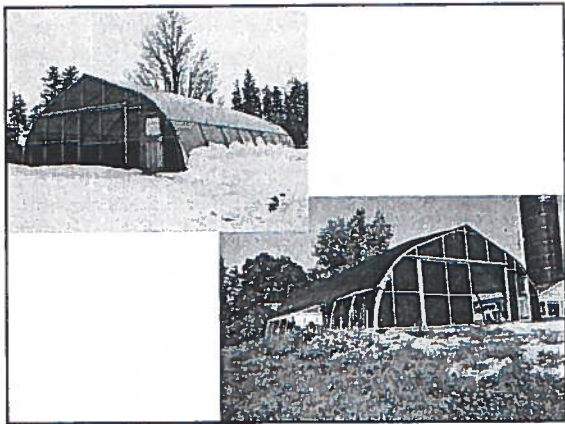
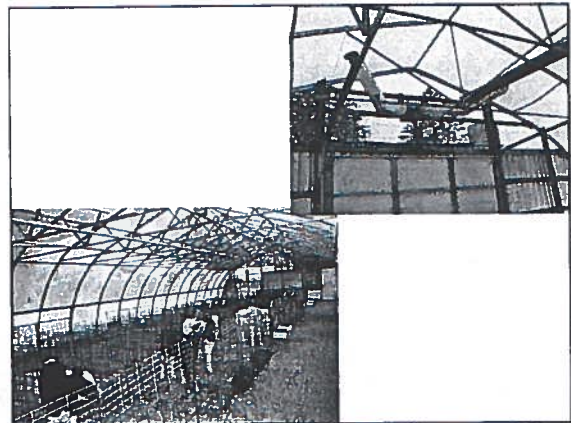
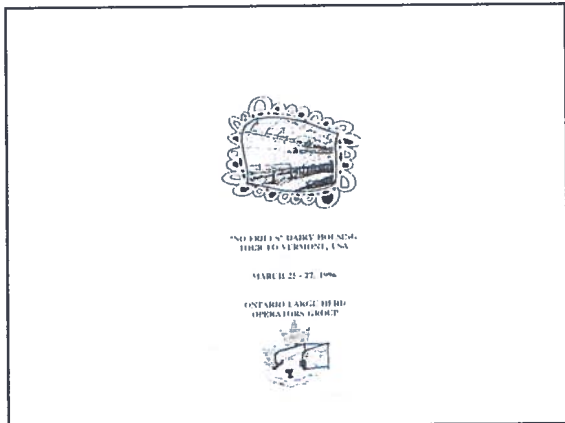
MODIFIED HUTCHES

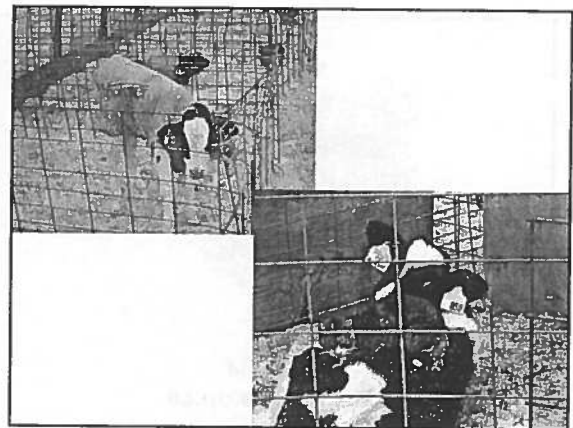
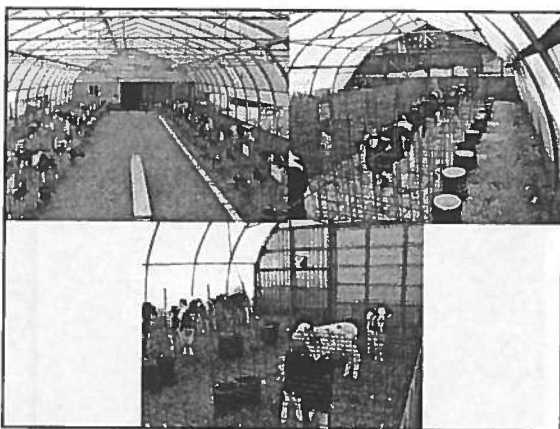
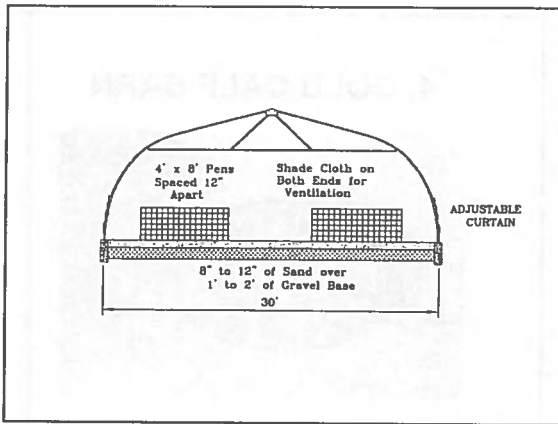
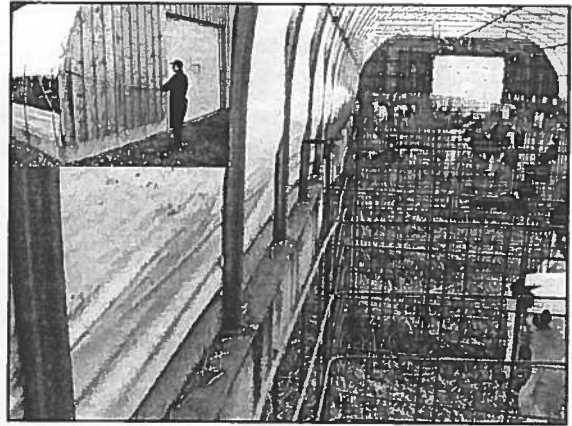
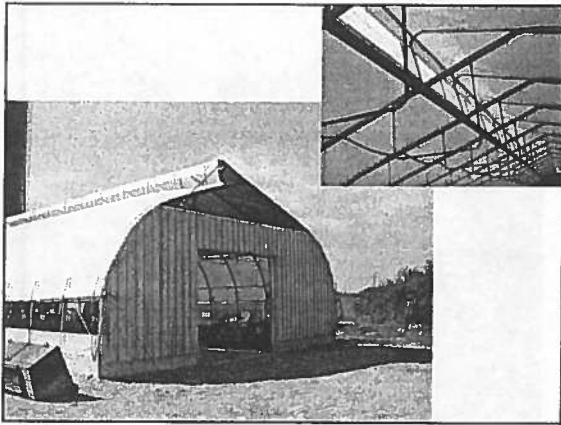
SCALE FROM 1 TO 5

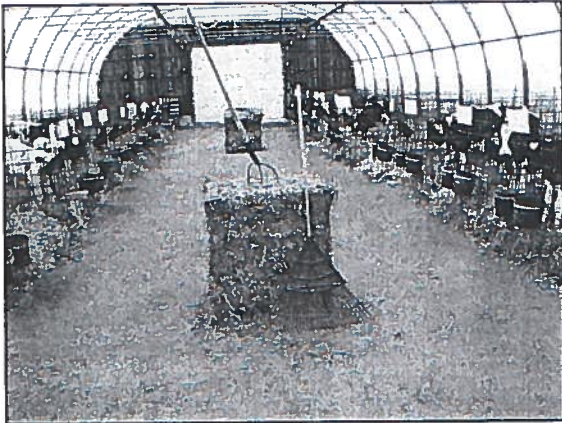
- | | |
|---------------------|-------|
| 1. CALF PERFORMANCE | ***** |
| 2. OPERATOR COMFORT | ***** |
| 3. COST | ***** |

3. GREENHOUSES





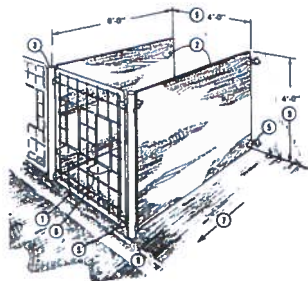
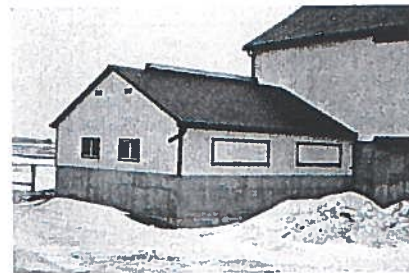




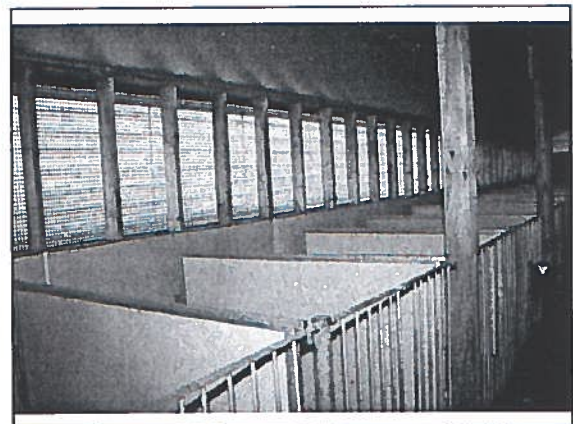
GREENHOUSE SHELTERS SCALE FROM 1 TO 5

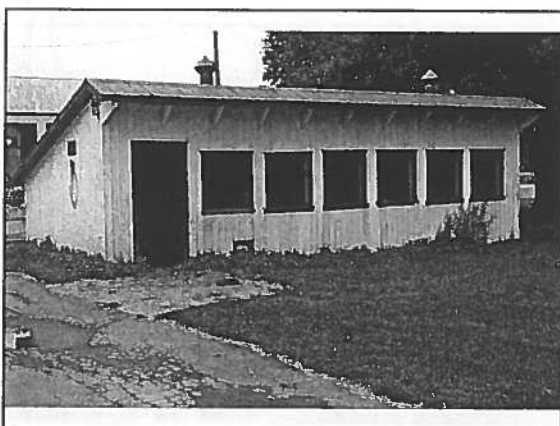
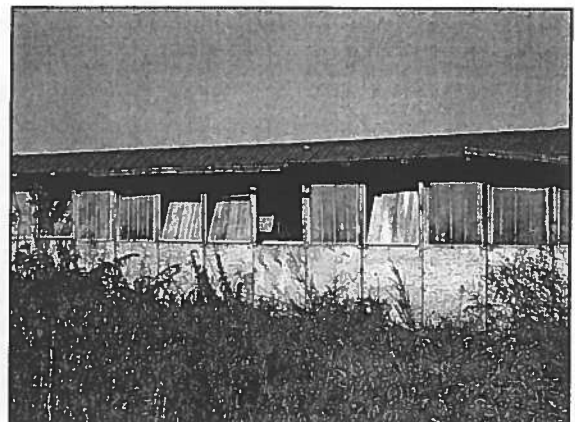
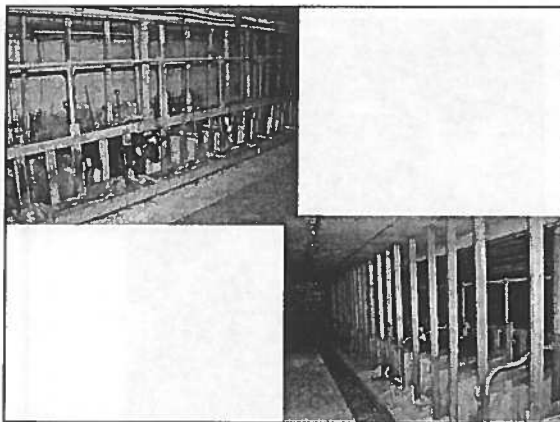
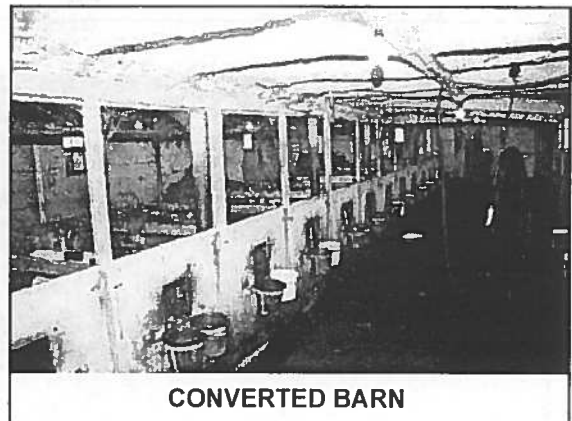
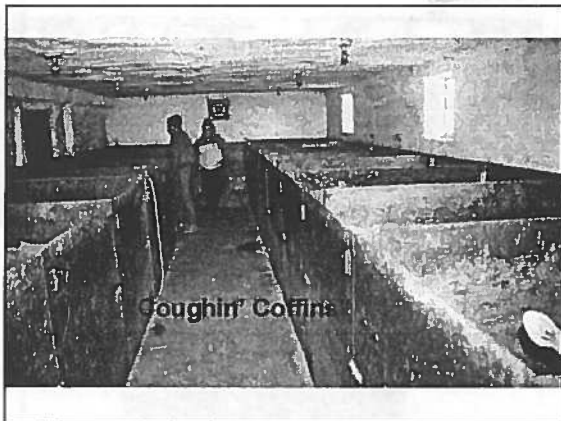
- | | |
|---------------------|-------|
| 1. CALF PERFORMANCE | ***** |
| 2. OPERATOR COMFORT | ***** |
| 3. COST | ***** |

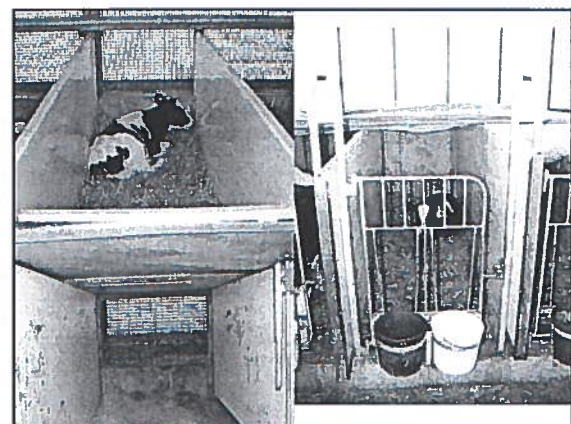
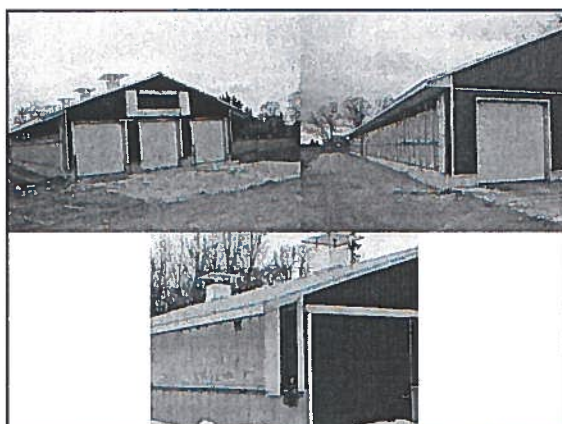
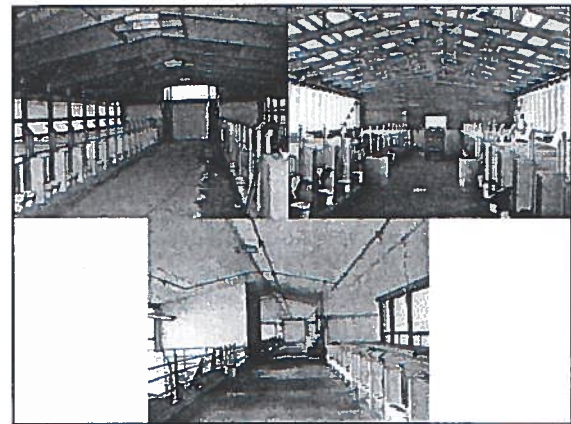
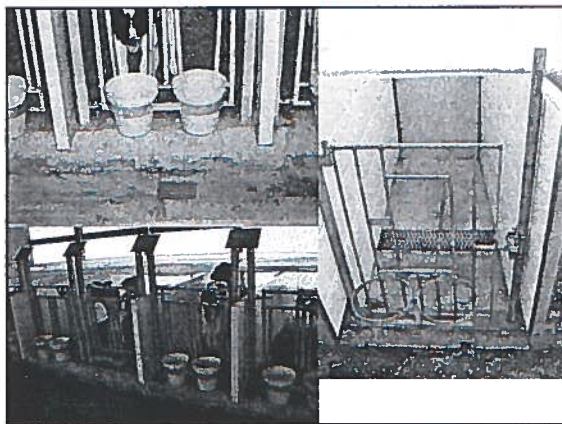
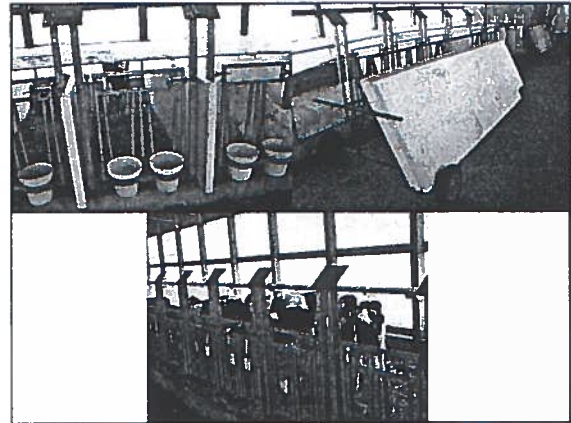
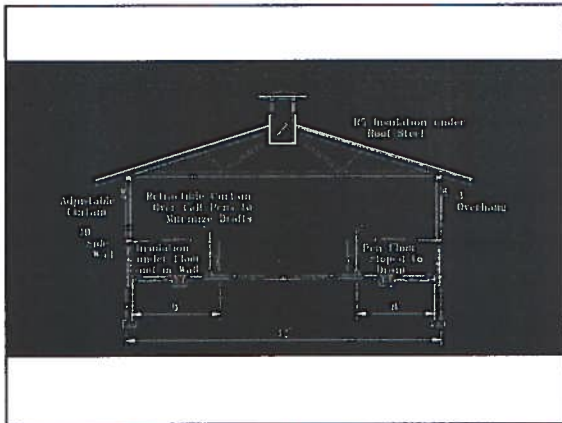
4. COLD CALF BARN

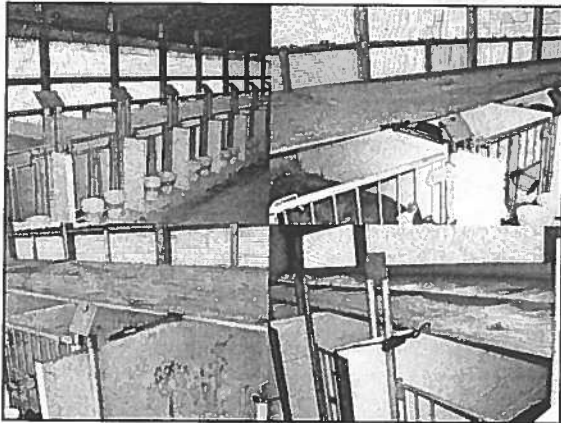


CPS 2834
www.cps.gov.on.ca









COLD CALF BARN

SCALE FROM 1 TO 5

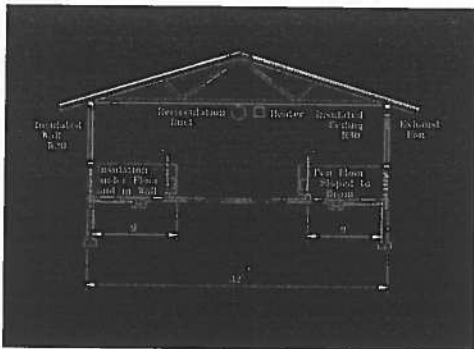
- | | |
|---------------------|-------|
| 1. CALF PERFORMANCE | ***** |
| 2. OPERATOR COMFORT | ***** |
| 3. COST | ***** |

5. WARM CALF BARN



WARM HOUSING

- 10 - 13 °C (50 - 55 °F)
- INSULATION
 - WALLS: R20
 - CEILING: R30
- RECIRCULATION
- HEAT



VENTILATION RATE



ANIMAL TYPE, SIZE, AND NUMBER

VENTILATION RATES

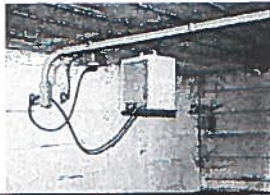
WARM HOUSING

- RECIRCULATION
- $1 - 1\frac{1}{4}$ CFM/FT²



WARM HOUSING

- HEAT



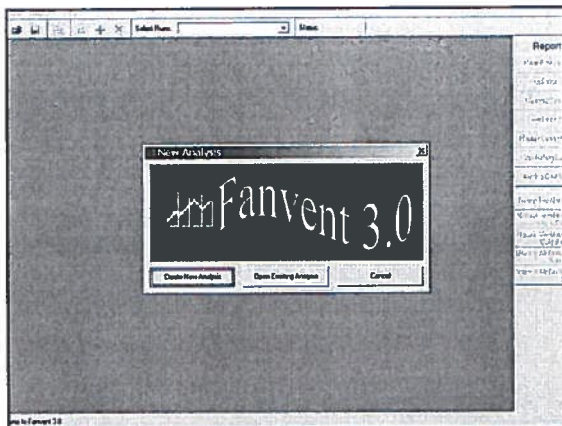
WARM HOUSING

HEAT (BTU/HR) =

WINTER VENTILATION RATE (CFM) X

$1.35 \times (\text{TEMP}_{\text{ROOM}} - \text{TEMP}_{\text{OUTSIDE}}) ^\circ\text{F}$

HEAT (kW) = HEAT (BTU/HR) / 3415



WINTER MINIMUM

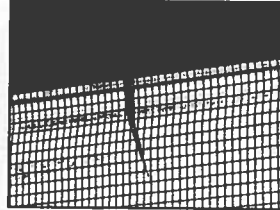
- 4 AIR CHANGES PER HOUR

DOUBLING RULE

- EACH SUCCESSIVE STEP IN VENTILATION, NO MORE THAN DOUBLES THE CURRENT VENTILATION RATE
- EX 500 CFM
 1000 CFM
 2000 CFM

Ventilation

- FRESH AIR WITHOUT DRAFTS
- < 50 fpm



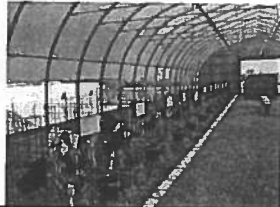
WARM CALF BARN SCALE FROM 1 TO 5

1. CALF PERFORMANCE *****
2. OPERATOR COMFORT *****
3. COST *****

TIPS & COMMENTS

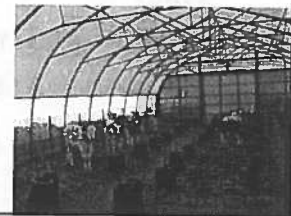
TIPS & COMMENTS

- AVOID KEEPING OLDER CALVES WITH BABY CALVES



TIPS & COMMENTS

- OVERSIZE FACILITY TO BREAK DISEASE CYCLE



TIPS & COMMENTS

- PENS AND HUTCHES NEED GOOD DRAINAGE



TIPS & COMMENTS

- HUTCHES DO WORK
- HUTCHES REQUIRE COMMITTED MANAGERS



TIPS & COMMENTS

- CALVES CAN SURVIVE IN COLD MINIMAL HOUSING



TIPS & COMMENTS

- CALVES CAN SURVIVE IN COLD MINIMAL HOUSING
- MANAGERS MAY NOT !



TIPS & COMMENTS

- GET CALVES OFF TO A GOOD START
- PROPER COLOSTRUM FEEDING
- DRY CALF / DRY BED

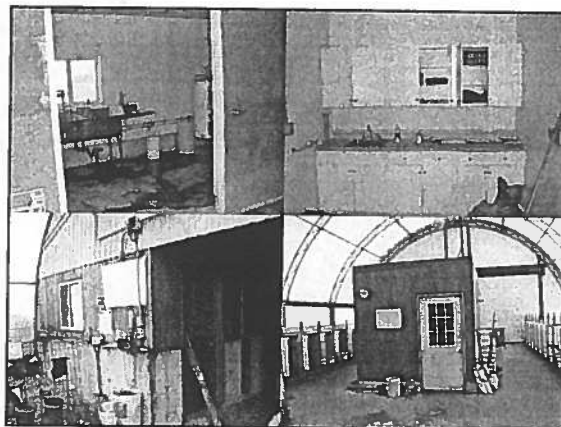
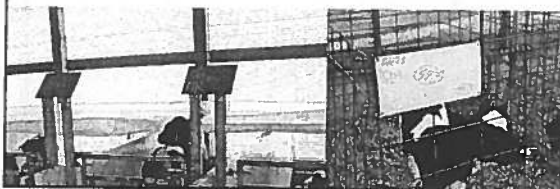
TIPS & COMMENTS

- OBSERVE WHOLE CALF AT EACH FEEDING
 - EARLY DETECTION OF DISEASE
 - EARLY TREATMENT
 - EARLY CURE



TIPS & COMMENTS

- KEEP GOOD TREATMENT RECORDS
- COMMUNICATE WITH OTHER CALF MANAGERS



TIPS & COMMENTS

- CALVES DO NOT PRODUCE ENOUGH HEAT TO WARM A BARN



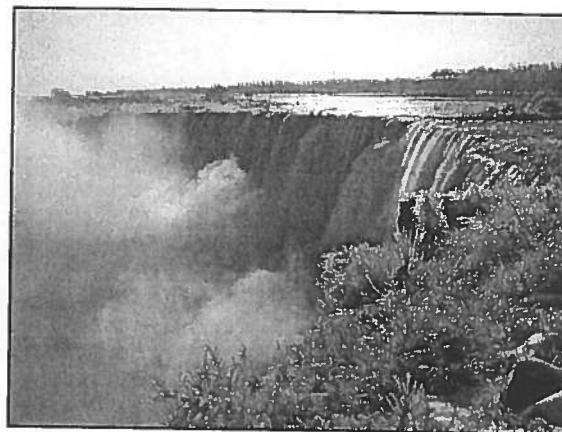
EVALUATING HOUSING

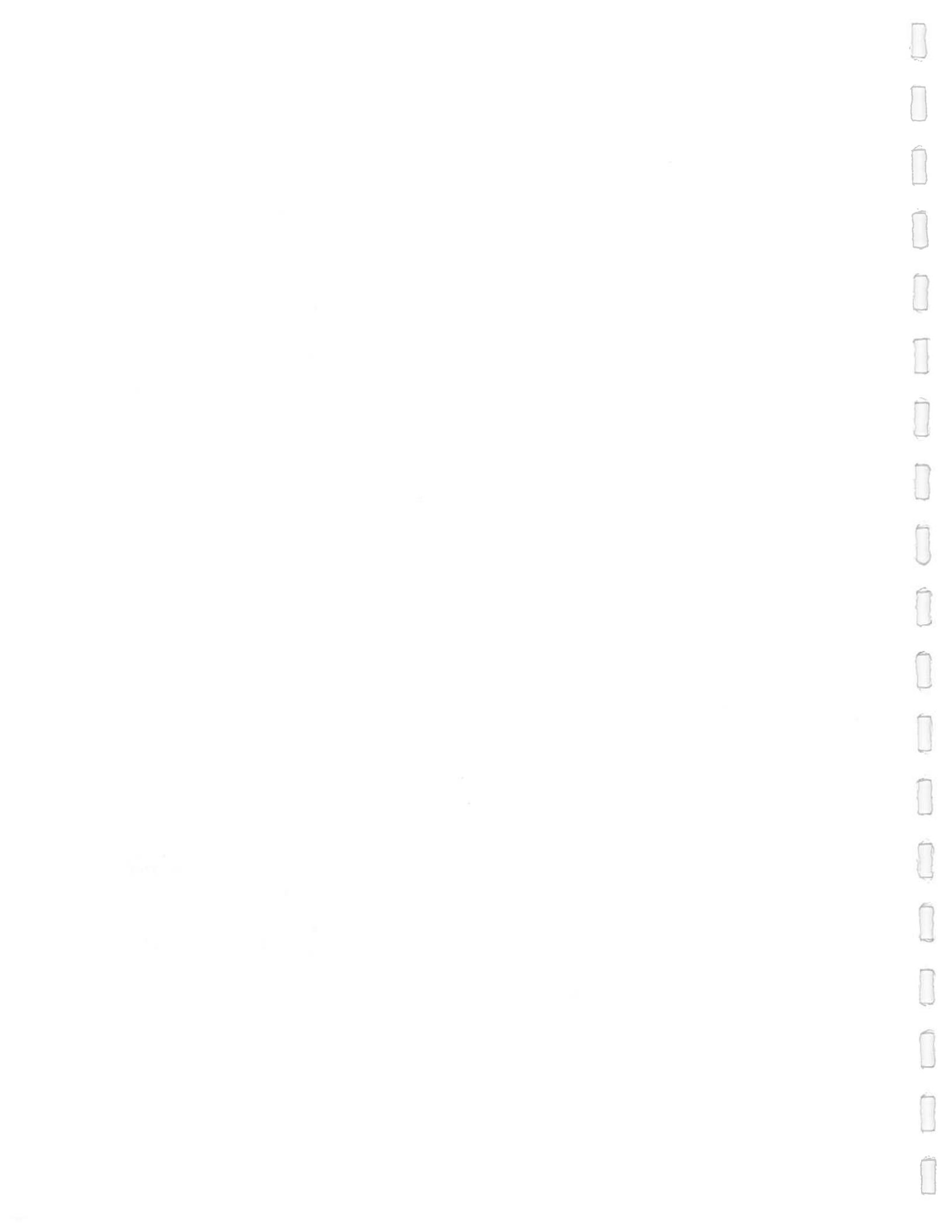
1. CALF PERFORMANCE
2. OPERATOR COMFORT
3. COST



KEY HOUSING FACTORS

- CLEAN AND DRY
- WELL VENTILATED WITHOUT DRAFTS
- ADEQUATE SPACE
- ISOLATION





Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

What Can You Expect to Get From Vaccinating Calves?



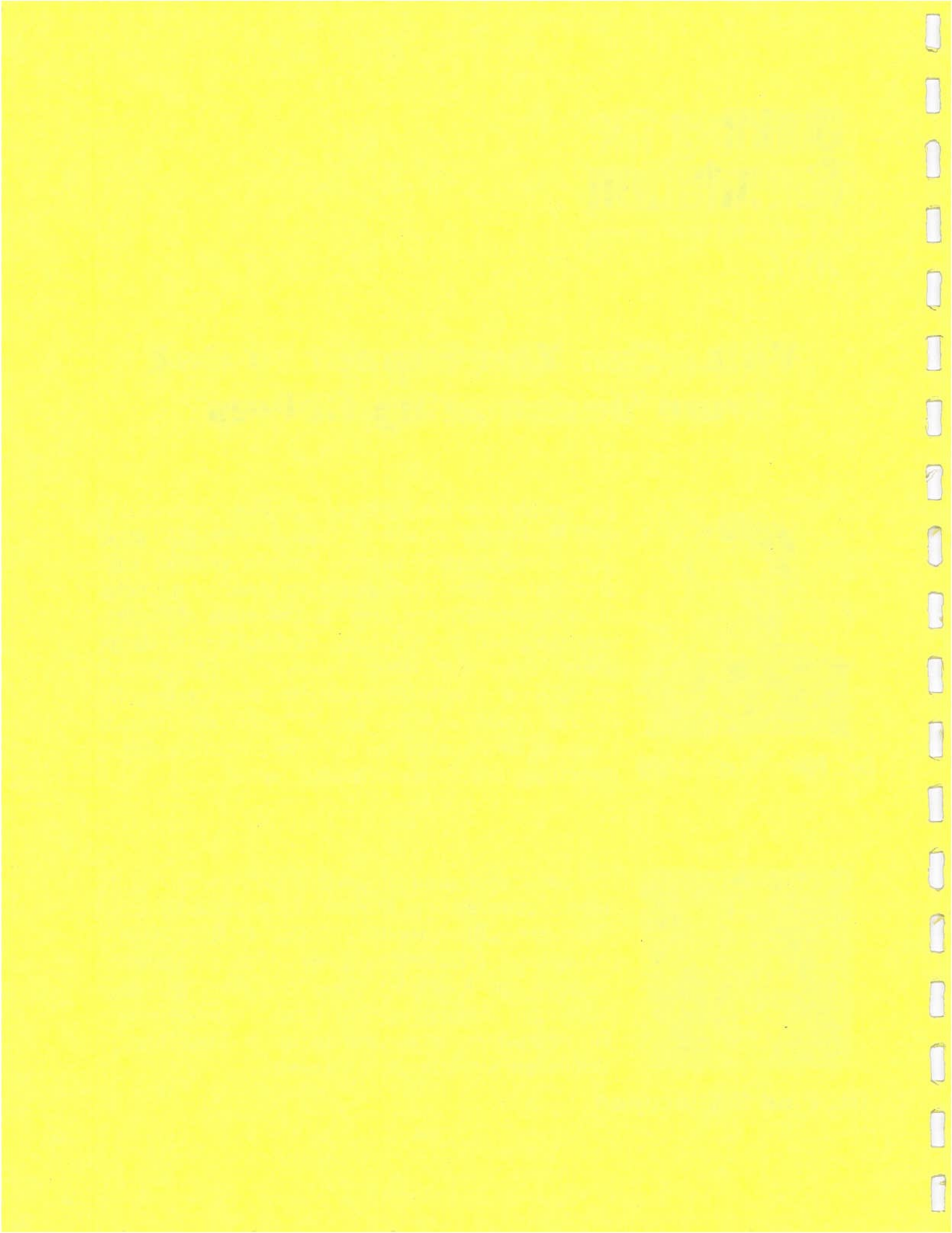
Dr. Rob Tremblay

Dr. Tremblay is the Technical Services veterinarian with Boehringer Ingelheim, Canada. He graduated from the Ontario Veterinary College in 1982 then practiced in New Brunswick. He obtained a Doctor of Veterinary Science from the University of Guelph and remained as a faculty member in the large animal clinic until 1992. He was employed with OMAF as a cattle health specialist. He is a diplomat of the American College of Veterinary Internal Medicine and specializes in large animal medicine, particularly infectious diseases of cattle.



Dr. Paul Baillargeon

Dr. Baillargeon graduated with a DVM in 1974 and then completed a Masters Degree in Clinical Sciences in St-Hyacinthe in 2000. Until 2003, Dr. Baillargeon practiced privately in south western Quebec and Eastern Ontario in a dairy practice with main interest in herd health management. Dr. Baillargeon is now working as a Dairy Health Consultant for Pfizer Animal Health.



What can you expect to get from vaccinating calves

Robert Tremblay, DVM, DVSc, Dipl ACVIM

Boehringer-Ingelheim (Canada) Ltd

Paul Baillargeon, DMV, MSc

Pfizer Canada Inc

Dairy and Veal Healthy Calf Conference, 2004



- **Outline:**

- What protection do calves have when they are born
- How does the immune system develop in calves
- Vaccinating cows to protect calves
- Can vaccines protect young calves
- How could you use this knowledge

Dairy and Veal Healthy Calf Conference, 2004



- How do calves respond immunologically:
 - calves in late gestation (>190 days) can respond if exposed to some antigens but not to all;
 - new-born calves have lower numbers of the cells responsible for antibody (B lymphocytes) than adults;
 - these cells reach numbers similar to adult cattle by 20 days of age.



Dairy and Veal Healthy Calf Conference, 2004

- How do calves respond immunologically:
 - the “cell mediated” side of the immune system (T lymphocytes) in calves is similar to adult’s by 2 weeks of age;
 - local immune responses (e.g. GALT, BALT) reach levels observed in adults when calves are 3 to 5 weeks old. These local immune responses help protect the intestines and the lungs;
 - calves can respond as adults by 3-5 weeks.



Dairy and Veal Healthy Calf Conference, 2004

- How do calves respond immunologically:
 - the first time a calf is infected, its immune responses is different:
 - each first exposure is a priming response;
 - priming responses usually develop more slowly than a secondary response;
 - the priming response develops to a lower level than a secondary response;
 - *even though their immune system is developed, it doesn't work as efficiently as an adult's*

Dairy and Veal Healthy Calf Conference, 2004



Vaccinating cows to protect calves

Dairy and Veal Healthy Calf Conference, 2004



- Should you vaccinate young calves?

- Current vaccine labels recommend vaccination of calves on either the basis of age (3 to 6 months) or stage of life (“weaning”). The labels do not say that calves can’t be vaccinated earlier, they just suggest that calves vaccinated earlier should be re-vaccinated with a primary series later in life.



Dairy and Veal Healthy Calf Conference, 2004

- Objectives in vaccinating calves:

- 1. To provide protection against infectious disease in the calves themselves;
- 2. To provide a foundation for subsequent vaccination when calves later enter the herd;
- 3. To provide a detectable antibody response



Dairy and Veal Healthy Calf Conference, 2004

- Should you vaccinate young calves?

- most studies evaluating the results of vaccinating young calves have used indirect measures of protection (e.g. antibody responses).
- most of these studies have concluded that calves do not respond to vaccination the same way as adults;
- few studies evaluate the effect of vaccination on actual treatment rates or death losses.

Dairy and Veal Healthy Calf Conference, 2004



- Should you vaccinate young calves?

- recent studies have proven that calves vaccinated when they are a few days old produce cell-mediated immunity even though they don't produce antibody;
- the response to vaccination in calves depends on the individual disease-causing microbe;
- the studies of successful vaccination in young calves tend to use MLV vaccines.

Dairy and Veal Healthy Calf Conference, 2004



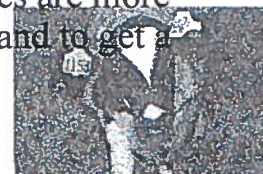
- Should you vaccinate young calves?
 - the relative importance of passive and active immunity differs depending on the risk of disease and when disease occurs.
 - low passive or active immunity has greater consequences in herds with a relatively high incidence (or risk) of disease.
 - passive immunity is not likely to be effective in disease that occurs when calves are >6 weeks old.

Dairy and Veal Healthy Calf Conference, 2004



- Should you vaccinate young calves?
 - vaccines can only protect if they induce immunity to the microbes causing the disease;
 - not all farms will have the microbes that cause disease (for example, BVD, IBR and *Mycoplasma*) although many of the microbes are present on most farms (PI3, BRSV, *Mannheimia*);
 - farms with calves from many sources are more likely to have numerous microbes (and to get a benefit from vaccination).

Dairy and Veal Healthy Calf Conference, 2004



- Selected infectious causes of calf scours:

adenovirus

Clostridium spp.

astrovirus

Bacteroides spp

bredavirus

*E. coli**

BVD virus

Campylobacter spp

coronavirus*

Cryptosporidium spp

rotavirus*

Eimeria spp

Salmonella spp

A combination!

- * microbes in commercial scours vaccines
- underlined diseases can be passed to humans!



Dairy and Veal Healthy Calf Conference, 2004

- Selected non-infectious causes of diarrhea in calves:

under-feeding;

over-feeding;

selenium deficiency;

antibiotic treatment;

other oral treatments;

unknown causes!!



Dairy and Veal Healthy Calf Conference, 2004

- Should you vaccinate young calves?

- all vaccination decisions should be based on expected outcome or need (what do you want to do?)
- having a clear idea of what you want to do will make it more likely that the vaccination program will be effective;
- ideally vaccination should be timed for 10-14 days before disease is usually seen.

Dairy and Veal Healthy Calf Conference, 2004



- Should you vaccinate young calves?

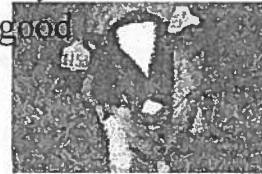
- example:
 - calves develop pneumonia after they leave hutches and are moved to group housing;
 - plan to vaccinate when calves are still in the hutches aiming to vaccinate about 10 days before moving calves;
 - vaccinated with a 3, 4 or 5-way MLV vaccine with or without “Pasteurella” (now called *Mannheimia*).

Dairy and Veal Healthy Calf Conference, 2004



- Should you vaccinate young calves?
 - vaccine labels recommend vaccinating healthy calves;
 - stressed calves may not respond well to vaccination;
 - for example, calves that have been through an auction mart then transported are likely to be dehydrated and starved and are not good candidates for vaccination.

Dairy and Veal Healthy Calf Conference, 2004



- Should you vaccinate young calves?
 - all MLV vaccines set up a mild infection that may cause fever and mild illness in calves;
 - MLV vaccines should be avoided until the calf is at least 5 days old because the IBR part of the vaccine has been shown to cause serious illness in some calves;

Dairy and Veal Healthy Calf Conference, 2004



- Conclusions:

- good colostral immunity is essential for calf health;
- to get good colostral immunity, you need to make sure calves get enough good quality colostrum shortly after birth;
- colostral immunity may not provide good protection for some diseases (pneumonia, diarrhea in older calves);

Dairy and Veal Healthy Calf Conference, 2004



- Conclusions:

- there are large gaps in knowledge about the clinical efficacy (or efficiency) of vaccinating young calves;
- current research suggests that vaccination of calves against BVD, *M hemolytica*, *H somnus* and leptospirosis may be justified especially in high risk situations;

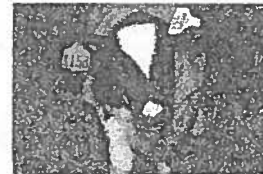
Dairy and Veal Healthy Calf Conference, 2004



- **Conclusions:**

- evidence suggests that vaccination of young calves against IBR, BVD, PI3, BRSV (?), *M hemolytica* and leptospirosis will result in induction of a memory cell response;
- in instances of suspected or proven failure of passive transfer, the response to vaccination may be greater.

Dairy and Veal Healthy Calf Conference, 2004



- **Conclusions:**

- available research suggests that only MLV vaccines be used in calves;
- MLV vaccines should be avoided until the calf is at least 5 days old;
- there is only limited data on how long protection lasts following vaccination of calves. Protection may not last as long as in adults.

Dairy and Veal Healthy Calf Conference, 2004



Thank you

Questions??



Dairy and Veal Healthy Calf Conference, 2004

Building the Foundation

Dairy and Veal Healthy Calf Conference

2004

Profit Boosting Strategies for Newborn and Neonatal Calf Care



Dr. Sam Leadley

Dr. Sam Leadley is the calf/heifer management specialist for the Attica Veterinary Associates in Attica, New York, a practice devoted solely to dairy cattle. He consults with dairy farmers and heifer growers with the economic goal of raising healthier, faster-growing animals through better management practices. He is also the editor and publisher of "*Calving Ease*," a free monthly newsletter that is distributed internationally, and the "*Calf Connection*" column.

Profit Boosting Strategies for Newborn and Neonatal Calf Care

Sam Leadley, Ph.D., P.A.S.
Attica Veterinary Associates, P.C.
116 Prospect Street, Attica NY 14011
www.atticacows.com and sleadley@frontiernet.net
585-591-2660 Fax 585-591-2898

Growing heifers that calve and make milk is essential for a positive bottomline in dairy. Most of the risk in achieving that goal is concentrated in the first two months of a replacement dairy heifer's life.

The two checklists that accompany this summary cover the period from birth to about two months old.

The first checklist is on just-born calf care. All calves need a clean place for their birth. All calves need plenty of high quality, clean colostrum as soon as possible after birth.

It is estimated that assisted deliveries account for about 25 to 30 percent of calvings for heifers and 8 to 10 percent of calvings for second and greater lactation animals. For each 100 cows, this projects to approximately 15 to 18 assisted births annually. Thus, it is important to have procedures for dealing effectively with these dystocia calves. While not every dairy will include oxygen supplementation and injectable respiratory drugs as part of their "just-born" calf care tool kit, there are other inexpensive yet effective methods to promote survival and good health.

Most calves are raised in cold housing. Therefore, it is essential for low mortality, good health and efficient growth to follow best cold weather management practices. The second checklist, "Cold Weather Calf Care," focuses on practices proven on farms to these three goals: low mortality, good calf health, and efficient calf growth.

An economic analysis of navel dipping and colostrum feeding (attached) show how profitable these two practices can be when done properly.

Finally, there is a protocol for maintaining clean equipment for handling both colostrum and milk/milk replacer. These protocols are in English, French and Spanish.

Just-born Calf Care Checklist

Have you selected the appropriate procedures? Do they provide the opportunity for your employees to work to their full potential in providing quality calf care at calving?

Let's consider your procedures for calf care at calving time. Compare your actions with the standards in this checklist. When making this evaluation I like to use these scores:

1=never, 2=seldom, 3=often, 4=usually, and 5=almost always.

- _____ 1. I provide a clean place for the calf at birth and see that her navel is dipped.
- _____ 2. I feed four quarts of clean, high quality colostrum as soon as possible after birth, certainly within the first six hours.
- _____ 3. For assisted births, I make certain the calf can breath by clearing her airways. Normal behavior is the first breath within 30 seconds.
- _____ 4. For assisted births, I do NOT hold calves upside down more than 90 seconds. Most of the fluid draining after this length of time comes from the abomasum rather than the airways. An extended upside down position interferes with normal diaphragm action for breathing.
- _____ 5. For assisted births, if necessary I help the calf onto her chest and keep her there. This maintains normal pressure in the lungs. Normal behavior is to first lift the head and then to roll onto the chest within 2-6 minutes. Moderate pull calves may take from 5-8 minutes. Hard pull calves may take from 6-12 minutes. Over 20 minutes is an indicator of very high mortality.
- _____ 6. For assisted births, I use a towel to dry the calf and to rub her for stimulation. Rubbing in the neck and head areas is most effective for stimulating breathing.
- _____ 7. For assisted births, I am prepared to diagnose fractured ribs. Given that one in five assisted births results in fractured ribs, I know how to get a calf on her chest and feel for symmetry (not fractured) and folding (fractured).
- _____ 7. I identify high-risk calves as early as possible and immediately begin support measures. "High risk" calves include (a) premature delivery, (b) birth trauma, (c) premature placental separation, and (d) meconium staining.
- _____ 8. I give supplemental oxygen to high-risk calves. Shortage of oxygen in the blood (hypoxemia) is present in nearly all newborn calves. High-risk calves may be very hypoxemic and benefit greatly from oxygen supplementation. There is no evidence that oxygen supplementation has detrimental effects.
- _____ 9. Working with my veterinarian, I have injectable respiratory drugs on hand to treat high-risk calves.

Cold Weather Calf Care Checklist

Are you using effective cold weather calf care procedures? Do they provide the opportunity for your employees to provide quality calf care?

Let's consider your cold weather calf care procedures. Compare your actions with the standards in this checklist. When making this evaluation I like to use these scores:

1=never, 2=seldom, 3=often, 4=usually, and 5=almost always.

- _____ 1. I feed all calves at least 4 quart of high quality, clean colostrum no later than 6 hours after birth. (At www.atticacows.com at Calf Facts, see "Feeding Preweaned Calves: Colostrum.")
- _____ 2. For calves consuming primarily a liquid ration, I feed enough milk/milk replacer appropriate to the environmental temperature to provide enough energy for both maintenance and at least one pound per day growth. (At www.atticacows.com , see Jan'01 Calving Ease "Cold Weather and Energy for Calves.")
- _____ 3. For calves on a combination liquid and calf starter ration, I feed free-choice calf starter grain. (At www.atticacows.com , at Calf Facts, see "Feeding Preweaned Calves: Starter Grain.")
- _____ 4. I provide free-choice water to all calves in both non-freezing and freezing weather. (At www.atticacows.com , at Calf Facts, see "Feeding Preweaned Calves: Water.")
- _____ 5. During cold weather, I dry calf hair coats at birth enough to fluff in order to reduce evaporation heat losses.
- _____ 6. During cold weather in calf barns, I provide adequate air exchange (15 cfm/min/calf) without creating drafts on individual calves. (At www.ansci.cornell.edu/prodairy/ choose in order, "Dairy Facilities," "Papers," "Articles," and "Calf & Heifer Facilities" to get to Curt Gooch's paper, "Existing Facilities for Replacement Heifers.")
- _____ 7. In all housing in cold weather, I keep an adequate layer of dry bedding underneath calves to insulate them from a cold base. Much of the insulation value of bedding is lost when it is wet. Wet bedding can have three times the heat loss as dry bedding.
- _____ 8. In all housing in cold weather, I control convection losses either by adequate soft bedding to allow "nesting" or by the use of calf blankets.

DIPPING NAVELS

DOLLARS AND SENSE

Benefits:

- Lower death loss – Calves without navel disinfection (navel dipping with 7% tincture of iodine solution) have a 10 percent higher death loss than those that are disinfected. For every 100 cows, that means an extra 4 deaths among heifer calves. At \$100 per calf, **that comes to \$400 per 100 cows in extra death losses avoided due to properly disinfecting navels at birth.**
- Lower rate of treatment for pneumonia – Calves without navel disinfection have a 14 percent higher rate of treatable pneumonia than those that are disinfected. For every 100 cows, that means an extra 6 calves. Including drug and labor costs, **that comes to \$44 per 100 cows in extra treatment costs avoided due to properly disinfecting navels at birth.**
- **Total savings per 100 cows = \$444.**

Costs:

- Navel dip. The recommended dip is 7 percent tincture of iodine solution. This is a brown, alcohol solution that both dries the tissue and kills germs. Assuming about 50 ml (1.7 ounces) of dip is used for each calf, then the cost per calf is about \$0.27. **That comes to about \$12 per 100 cows.**
- Labor for dipping – Assuming \$10/hour and 5 minutes to dip each calf, then the cost per calf is about \$0.83. **That comes to about \$34 per 100 cows.**
- **Total cost per 100 cows = \$46**

If a calf is worth \$100, then profit is \$398 per 100 cows
If a calf is worth \$200, then profit is \$798 per 100 cows
If a calf is worth \$300, then profit is \$1,198 per 100 cows

FEEDING COLOSTRUM

DOLLARS AND SENSE

Benefits:

- By four weeks of age, calves receiving proper colostrum feeding cost the producer less than did ones that have not received adequate colostrum. Death losses are 10-12 percent less. Health treatments average about \$4 less per calf. In addition, weight gains as well as feed conversion rates are better. If a calf is valued at \$100, then this advantage is about \$23 per calf. **At \$200 replacement value for calves, this difference comes to \$35 per calf.**
- **Per 100 cows, the benefits of good colostrum feeding by four weeks of age come to about \$1,500.**
- By the time heifers have calved and milked 100 days, heifers receiving proper colostrum feeding as calves were more profitable than ones that have not received adequate colostrum. Death losses are 1 percent less and culling losses are 21 percent less. Moreover, milk production is higher, too. **If a replacement heifer is valued at \$1,500 and milk at \$12 per cwt., then this advantage is about \$71 per heifer.**
- **Per 100 cows, the benefits of good colostrum feeding for fresh heifers come to \$3,053.**

If

A replacement calf is worth \$200,

A replacement heifer is worth \$1,500

Milk price is \$12/cwt,

Then profit is \$4,553 per 100 cows.

References: Fowler, Mike "What is it worth to know a calf's Ig Level?" in Proceedings of the Professional Dairy Heifer Grower Annual Conference, March 1999, pp. 31-36. S.K. DeNise, J.D. Robison, G.H. Stott and D.V. Armstrong, " Effects of Passive Immunity on Subsequent Production in Dairy Heifers." 1989 Journal of Dairy Science 72:552-554

WASHING MILK CONTAINERS

1. RINSE

USE LUKEWARM WATER. Do not rinse with hot water. Rinse off dirt and milk residue.

2.WASH

USE HOT WATER. Add soap and bleach. Brush all surfaces. Scrub off remaining milk residue. Keep water above 120° (49° C) at all times.

3.RINSE

Use warm water. Add acid. Rinse containers. Do not rinse off the acid. Leave it on the bottles and pails while they dry.

4.DRY

Allow the bottles and pails to drain and dry. Do not stack pails inside each other. Do not sit pails upside down on a concrete floor.



Nettoyage Des Chaudières À Lait Pour Les Jeunes Veaux

LE RINÇAGE

Il est important d'utiliser de L'EAU À LA TEMPÉRATURE DE LA PIÈCE. Ne jamais rincer une chaudière sale avec de l'eau chaude. Rincer les résidus de lait et la saleté.

LE LAVAGE

Il est important d'utiliser de L'EAU TRÈS CHAUDE. Ajouter du savon et du désinfectant. Brosser la surface et assurez-vous d'enlever toute saleté. La température de l'eau doit être plus élevée que 49° C.

LE RINÇAGE

Utiliser de l'eau tiède. Ajouter de l'acide. Ne pas enlever l'acide. Laisser sécher les chaudières et les instruments pendant qu'ils sèchent.

LE SECHAGE

Laisser les bouteilles et les chaudières sécher à l'air libre. Ne pas empiler les chaudières. Ne pas mettre les chaudières à l'envers sur une surface de ciment.

Traduction près Andree Bourgeois Le 17 décembre 2003



Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

Milk Replacer: A Bag Full of Common Sense



André Roy

André Roy is the Director of Nutrition for Grober Animal Nutrition and has been with the company since 1994. André obtained his bachelor's degree in animal production in 1990 and finished a Master's degree in animal nutrition in 1994. André looks after formulation and product development, oversees quality assurance programs and coordinates milk replacer research. André has been the Chair of the Veal Committee of CRAAQ, an extension committee in Québec, between 1999 and 2004. Andre is currently the Vice Chair of the Animal Nutrition Association of Canada (ANAC) Nutrition Council.

Milk Replacer: A Bag Full of Common Sense

André Roy, Grober Animal Nutrition

Milk replacers have been around for over 50 years. At the beginning, they mainly consisted of skim milk powder, which with time, had fats, then minerals and vitamins added. In December of 1962, Monsanto applied for a patent on "calf feed" and obtained it in 1966. A large extent of possibilities was covered by the patent but yet, milk replacers have evolved significantly since that time. Today's quality products are based on sound nutrition with animal performance and health in mind, not simply maintenance of life. Two major aspects will differentiate sound from less than appropriate products: the nutrient composition and the quality of the raw materials. This paper will provide details that will enable the reader to see the "common sense" that is behind today's "calf feed".

Milk replacer is better defined as "product that replaces milk". But how much milk do they contain? The Canadian label or tag that accompanies the bag will contain that information. For example, a product that contains 22% crude protein and 22% protein from milk sources means that 100% of the proteins are from milk ingredients. In very simple terms, if a milk replacer contains 17% fat and 22% protein, the formulation will contain approximately 17% added fats and oils (which will be discussed later), about 3-5% of minerals, vitamins, amino acids and other additives, and the rest will consist of a blend of milk ingredients.

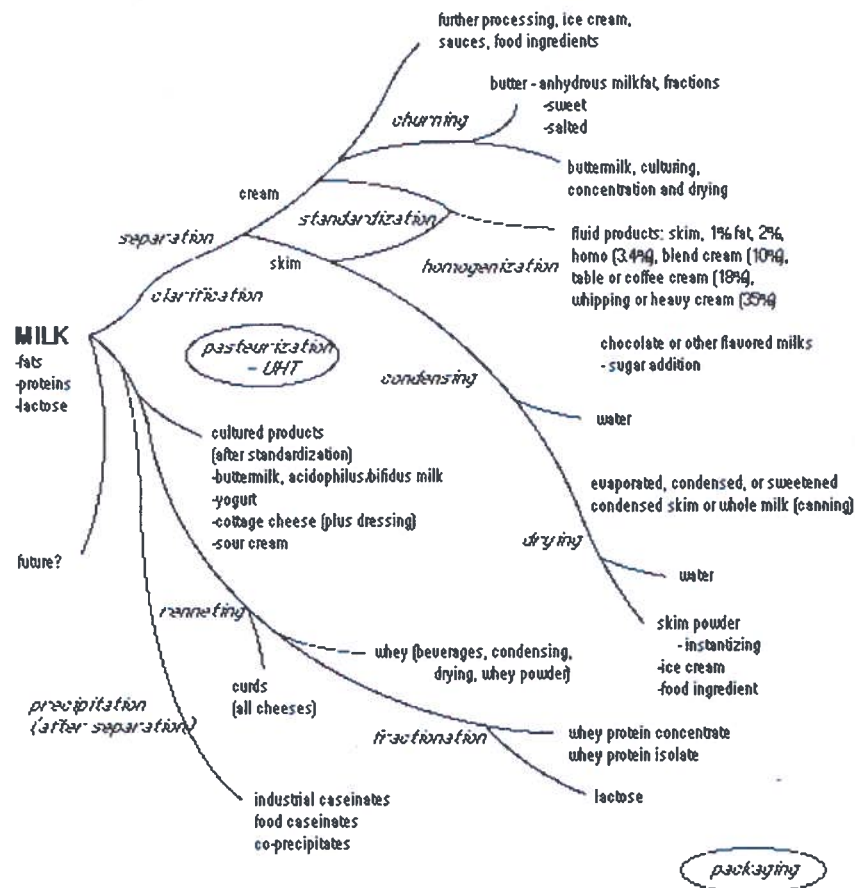
What are those so called milk ingredients? They can be skim milk powder, whey powder, whey protein concentrate, whey products and casein/caseinate (Figure 1). Skim milk powder comes from the simple process of removing the fat of fresh, pasteurised whole milk which is then dried. All of the whey products refer to the greenish translucent liquid that separates from the curd after the coagulation of milk during the manufacture of cheese. The liquid whey can either be evaporated and dried to provide 12% protein and 75% lactose or the lactose can be removed from ultrafiltration to increase the protein content to 34% or even 75—80%.

The above is the easy part of determining which ingredients are available as "milk ingredients". The key issue is which quality to use. First, since the "calf feed" is to be fed to newborn animals, in this case a calf, sanity and safety are key factors. For quality milk replacers, this means that only "food-edible grade" ingredients can be used. It also means that those ingredients could be used as well to manufacture ice-cream or chocolate bars. Several microbiological assays will be necessary to ensure low bacterial levels and no contaminations from *Salmonella* or *E. Coli*. Second, the complete control of key production processes from the manufacturer will ensure that all the nutrients are left in the milk ingredients, which will then ensure proper digestion and absorption by the calf. Key quality traits of milk ingredients will start from smell and taste to ensure complete intake by the calf. It will then move forward to things like solubility, scorch particles and pH, all signs of quality process and proper behaviour in milk replacer. Finally, nutrients like protein, amino acid profile and mineral assays can ensure optimum calf performance.

Since calf performance is closely associated to the nutrient profile, a combination of assays from accredited laboratories and certificates of analysis from the suppliers will ensure that the proper combinations of milk ingredients are formulated to provide that optimum profile. After proper quality assurance controls and appropriate formulations,

programs like Good Manufacturing Practices or HACCP will provide the last bit of assurance to the final user that the "calf feed" purchased is worth the money that was paid.

Figure 1. Range of dairy products from milk. (University of Guelph, Dairy Science and Technology)



Alternative proteins

Because food manufacturers and researchers are working hard at finding food uses for more and more milk ingredients, the milk replacer industry has had to look into other protein sources. Many protein sources have been researched with varying successes but some protein sources have shown promising results so far. Soya derivatives have been used since the 70's but because of the different processes available and the variable quality they can produce, some soy based milk replacers have received bad publicity over the years. Following are a few key points to watch for: NO soy flours are acceptable; soy protein concentrates (SPC) are acceptable at a certain level providing the fibre and antigen levels are controlled and low. Manufacturers of milk replacers have a few sources of very good quality SPC that can be used at up to 50% of protein replacement. The older the calf (4 weeks and up), the more it will be able to uptake the nutritional value of SPC.

Potato protein has also been around for a good 15 years but its availability is limited and its digestibility is less than milk ingredients but better than SPC. Two formulation-limiting factors are its poor suspendability (Kolar and Wagner, 1991) and its level of alkaloids.

Modified wheat proteins are younger but have received extensive research attention. They can be obtained from acid or enzymatic treatment. Their solubility is improved and

can show very good digestibility: 96-98% (Table 1) Tolman and Demeersman, 1991. Its amino acid profile complements whey protein's profile as long as it is supplemented with Lysine.

Without a more extended revision of protein sources, Davis and Drackley, 1998 summarized the section on alternative proteins by mentioning that high quality soy products, modified wheat proteins or animal plasma are suitable replacements for milk proteins. Other sources should be restricted to calves older than 3 weeks, Davis and Drackley, 1998.

Table 1. Summary of crude protein (CP) digestibility of milk replacers containing various protein sources¹

Protein source	Age of calf (d)	% CP replacement	CP digestibility (%)
Skim milk	7-56	-	90-95
Whey protein concentrate	11-48	100	88-91
Soy protein concentrate	14-21	75	59
	42-48	50	87
Soy flour	14-21	75	42
Potato protein concentrate	56-98	52	87
Soluble wheat protein	56-63	20	95
Animal plasma ²	>79kg	33	72

1. Modified from Davis and Drackley, 1999

2. Verdonk and Beelen, 1999

Carbohydrates

Newborn calves can only digest lactose since their intestine produces mostly lactase as carbohydrate enzymes. Lactose is very well digested and absorbed in young calves and as such, provides an important percentage of the digestible energy. Corn and wheat starches have been researched and found to be possible sources of carbohydrate replacement as long as they were pre-treated. Heat treatment is a must and pre-hydrolysis will offer increased availability of the starches. New partially hydrolysed products are making their way on the market and are showing high protein digestibility and around 50% for the carbohydrates (Internal research). We are also looking into the possible prebiotic potential of this new generation of hydrolysed starch, as some carbohydrates would be in such a form. Other sources of carbohydrates such as dextrose or fructose are not good sources to the young calf.

Lipids

Different sources of fats and oils are available to milk replacer manufacturers but the formulation of these sources has a major impact on the overall digestibility of these lipids. Two things are particularly important about lipid addition in milk replacers: fatty acid profile and emulsification of these lipids.

Milk fat has the highest digestibility at more than 95% but a combination of lard, tallow and coconut oil allows a very similar uptake. Some manufacturers made changes after the sole case of BSE in Canada, where tallow became suspicious and banned for export to the USA. A lot had to do with the definition of tallow where a content of impurities, sign of a potential protein contamination, brought confusion to users. Since then, there is recognition of a source of tallow called "protein-free tallow" of edible grade which is still allowed for use in the Canadian and American market. The key point in fats

and oils formulation is the mixing of proper quality ingredients, which can increase the individual digestibility from an average of 90% to as high as 95-96%. Some manufacturers still use choice white grease and one can expect a maximum digestibility of 75-80% at best. This partly explains why some milk replacers had a poor reputation as they contained a poor quality single source of lipids, which caused diarrhoea and/or emaciation from the lack of availability.

Secondly, a poorly emulsified blend will not allow proper absorption of these lipids. The use of lecithin and emulsifiers, in combination with appropriate incorporation process into the milk replacer powder will provide proper fat globule size that can be absorbed by the calf. Different tests are available to evaluate the emulsion capacity of lipids in milk replacers.

Nutritional content of actual and future milk replacers

The industry has been manufacturing 20-22% protein milk replacers and 20% fat (USA) or 14-18% (Canada) for years already. These milk replacers were and are still fed at low levels (450-500g or 4 litres per day), which only allows for minimum growth. VanAmburgh and Drackley were both in the country several times and presented results from trials on natural feeding or also known as "accelerated feeding" of young calves. These results corroborate what has been done in the veal industry for many years, which feeds larger quantity of milk to newborn calves in order to promote growth and health right from day one. What is added to the recent work is an increased protein and lower fat content in order to better promote muscle and skeletal growth from a proper protein/fat ratio. Some Canadian manufacturers have been marketing high protein/lower fat milk replacers for the last couple years. What people are seeing is that it does not work for every farm. Management has to be in control of the environment to properly benefit from this kind of program. At least, we are distancing ourselves from maintenance (or even starvation) diets for heifer calves and moving towards exploiting calves' potential.

Conclusion

Many changes have been proposed for the milk feeding of young heifer and milk replacers. Those changes are slowly being adopted and adapted according to the goals of the producers. Most of the recent research on higher feeding of a high protein milk replacer has been done on all-milk formulas, which obviously provides the best performance. But at the same time, some milk replacer manufacturers are looking ahead and getting ready to provide products using proven levels of alternative proteins and carbohydrates for when the days come where all of the good quality milk ingredients are being used for human consumption. As a company, we hope to provide feed companies and producers with alternatives that will allow using milk replacers, even when whey proteins of good quality are not so much available.

References

- Davis, C.L. and J.K. Drackley. 1998. In *The development, nutrition and management of the young calf*. Iowa State University Press. Ames, Iowa.
- Kolar, C.W. and T.J. Wagner. 1991. Alternative protein use in calf milk replacers. In *New trends in veal calf production*, Wageningen, NL: Pudoc.
- Tolman, G.H. and M. Demeersman. 1991. Digestibility and growth performance of soluble wheat protein for veal calves. In *New trends in veal calf production*, Wageningen, NL: Pudoc.
- Verdonk, J.M.A.J. and G.M. Beelen. 1999. Nutritional value of processed erythrocyte protein (PEP and plasma protein (NutraPro) in veal calves. Project No 20515. ILOB,

Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

Nutritional Management Strategies to Optimize Neonatal Calf Performance



Dr. Vern Osborne

Dr. Vern Osborne (MSc, PhD, University of Guelph) is an Assistant Professor in ruminant nutrition with the Animal and Poultry Science department at the University of Guelph. Dr. Osborne has also held teaching positions with Ridgetown College and his research has concentrated on nutritional management strategies that enhance early heifer growth, and the delivery of extra nutrients using drinking water, and water and feed combinations during times of physiological needs of the dairy cow.



Dennis McKnight

Dennis McKnight has spent almost 30 years in the field of calf research, primarily in the area of calf housing, especially hutches, and nutrition. Dennis is currently the Research Coordinator and a Professor with Kemptville College-University of Guelph. Dennis is currently researching the influence of calf starter and water on the incidence levels of scours.

**NUTRITIONAL AND ENVIRONMENTAL
MANAGEMENT FOR NEWBORN CALVES
D. R. MCKNIGHT
KEMPTVILLE COLLEGE, UNIVERSITY OF GUELPH**

- 1. MANAGEMENT PRACTICES ASSOCIATED WITH HIGH MORTALITY
- 2. NUTRITIONAL MANAGEMENT – WHAT’S HOT!
 - A. ACCELERATED FEEDING
 - B. AUTOMATED MILK/REPLACER FEEDING
 - C. MILK PASTEURIZATION
 - D. HAY, WATER, STARTER INTRODUCTION
 - E. FEEDING SCOURING CALVES
- 3. ENVIRONMENTAL MANAGEMENT – HUTCHES!
 - A. HUTCH TYPES
 - B. GREENHOUSE COVER/SHADE
 - C. PLAN “B”

**1. MANAGEMENT PRACTICES ASSOCIATED WITH
HIGH CALF MORTALITY**

A. LOSINGER AND HENRICKS, USDA, 1997
1685 HERDS WITH 47,057 HEIFERS, 9.4% MORTALITY

1. RHA < 7710 KG
2. PREWEANED HEIFERS IN GROUPS OF 7 >
3. MALE RESPONSIBLE FOR CARE
4. NO HAY OR ROUGHAGES UNTIL > 20 DAYS
OLD
5. MASTITIC OR ANTIBIOTIC MILK AFTER
COLOSTRUM
6. NO WHOLE MILK AFTER COLOSTRUM

B. PORTERFIELD , N. CAROLINA, 1979

189 HERDS WITH 6333 HEIFERS, 12. 4% MORTALITY

1. 28% OF MORTALITIES DUE TO SCOURS
22% DUE TO PNEUMONIA
2. 19% OF MORTALITIES IN DECEMBER
29% IN JANUARY
16.5 % IN FEBRUARY
3. 7% MORTALITIES IN HERDS < 50 COWS
11% > 150 COWS
4. PERSON RESPONSIBLE SINGLE MOST
IMPORTANT FACTOR

2. NUTRITIONAL MANAGEMENT – WHAT’S HOT!

A. ACCELERATED FEEDING (AF)

WHY? TO INCREASE GROWTH RATE WHEN THE
CALF IS MOST EFFICIENT AND LEAST LIKELY TO
NEGATIVELY IMPACT LACTATION

HOW?

MORE MILK OR REPLACER

HIGHER NUTRIENT REPLACERS AND STARTERS

PLUSES!

BIGGER CALVES

LOOKING GOOD!

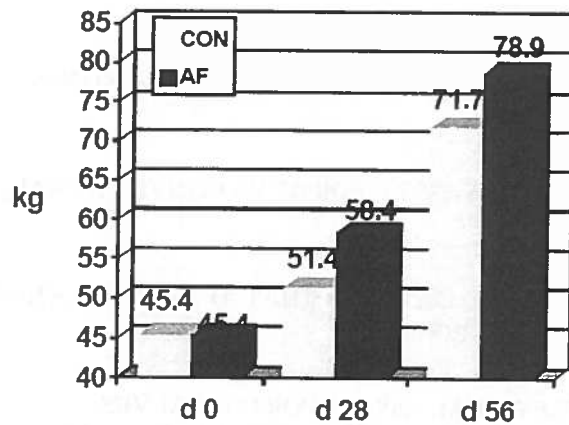


Figure 1. Body weight of calves fed a conventional CMR (0.5 kg/day) vs. an accelerated feeding program to weaning at 42 days. From: Quigley et al., 2003.

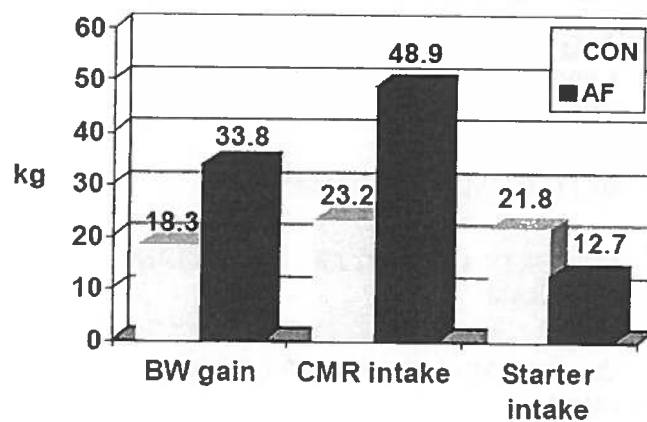


Figure 2. Body weight gain of calves fed a conventional CMR (0.5 kg/day) vs. an accelerated feeding program to weaning at 49 days. From: Commercial CMR company.

MINUSES!

NEED TO CONTINUE WITH HIGHER PLANE OF NUTRITION
AFTER WEANING

ECONOMICS (\$2.55 VS \$1.75/KG FOR AF VS CONVENTIONAL,
QUIGLEY ET AL., 2003)

NOT MUCH PUBLISHED DATA YET THAT AF CALVES CAN BE
BRED OR CALVE EARLIER

HEALTH? QUIGLEY ET AL., 2003 REPORTED CALVES
PURCHASED FROM SALES BARNS HAD POORER HEALTH IN AN
AF PROGRAM

NONNECKE ET AL., 2003 REPORTED NO DIFFERENCE

B. AUTOMATED MILK/REPLACER FEEDING

ADVANTAGES

LABOR SAVING BY HANDLING CALVES IN
GROUPS

BETTER CALF PERFORMANCE

SUPPORTS AN ACCELERATED FEEDING
PROGRAM

CAN USE MILK, REPLACER OR SOUR
COLOSTRUM

CALVES SUCK EACH OTHER LESS

ADAPT EARLY TO GROUPS

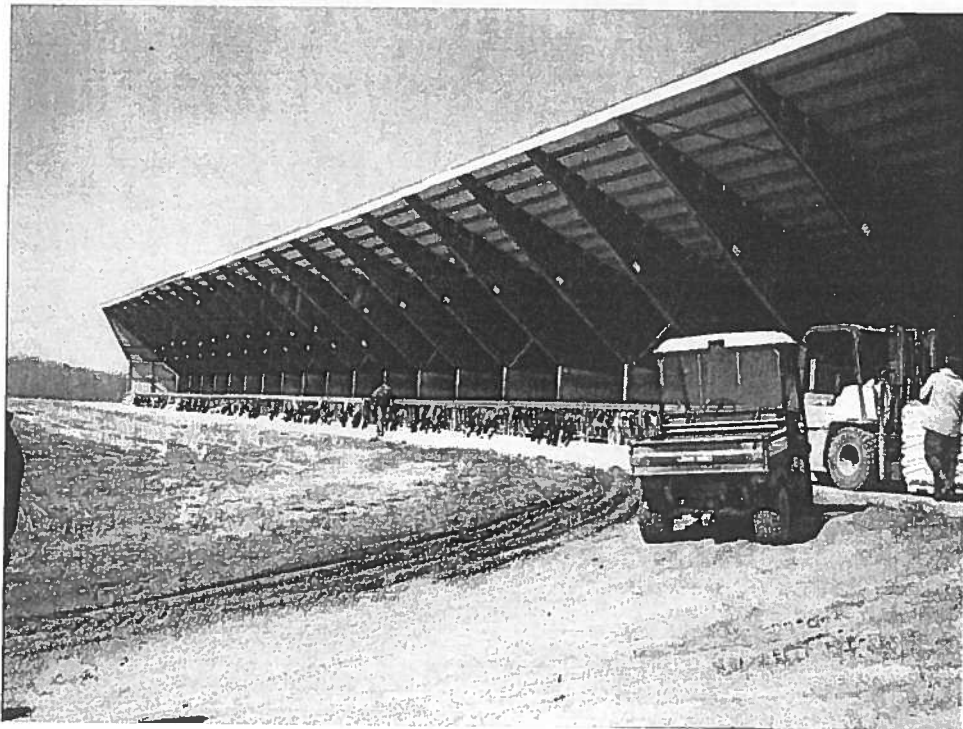
DISADVANTAGES

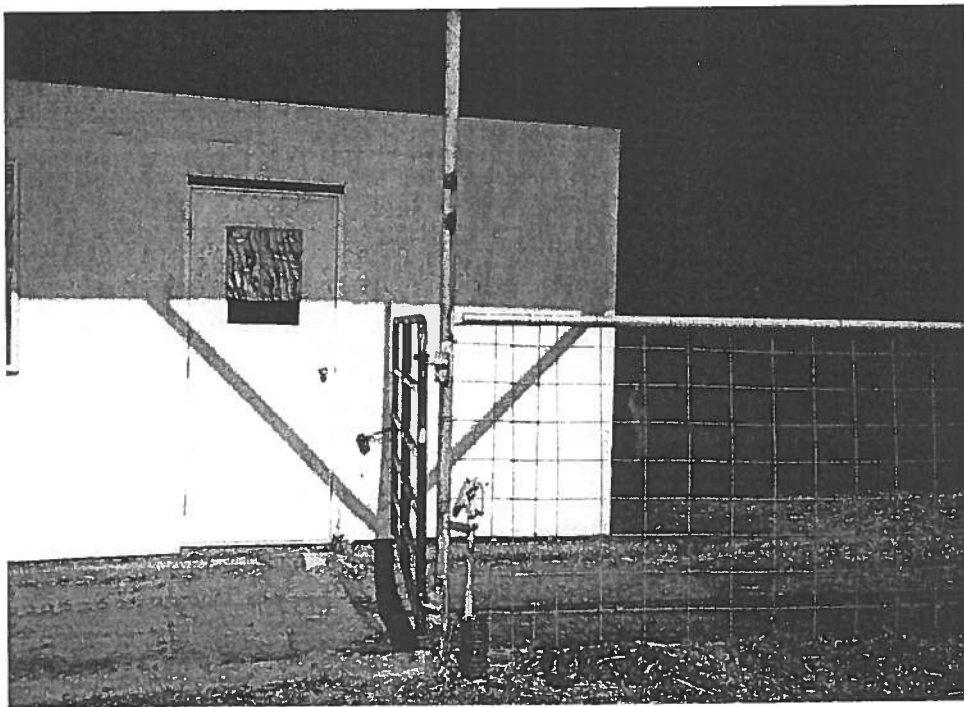
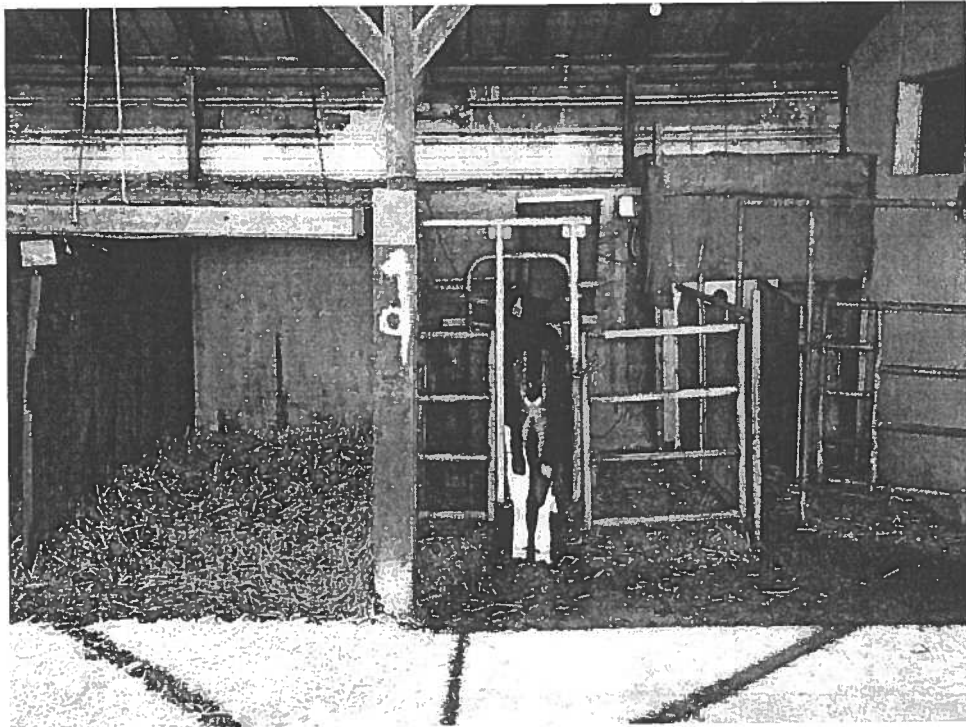
CALVES STILL NEED TO BE MONITORED
FOR HEALTH PROBLEMS

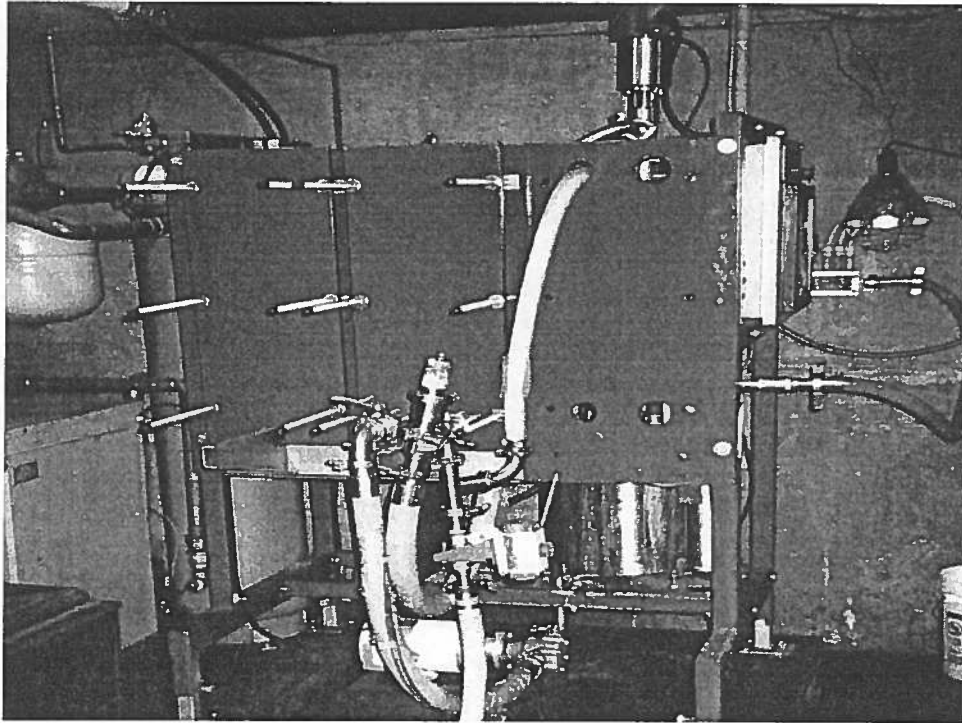
DISEASE MAY SPREAD FASTER

DIFFICULT TO KEEP EQUIPMENT CLEAN

EQUIPMENT COST







C. MILK PASTEURIZATION

INTEREST AS PART OF BIOSECURITY

CHOICE OF USING MILK REPLACER OR PASTEURIZED
COLOSTRUM OR MILK

A QUEBEC STUDY (FECTEAN ET AL., 2002) REPORTED
THAT 35.9% OF FIRST FEEDING MILK WAS CONSIDERED
CONTAMINATED

2.55 X'S AS LIKELY TO BE CONTAMINATED IN SUMMER
THAN WINTER AND 1.55 X'S AS LIKELY WITH MALE
CALVES

STAPH (57.7%), COLIFORMS (44.0%), STREP UBERUS
(20.5%) MOST COMMON

SOME LARGER FARMS NOW PASTEURIZE CALF MILK

JAMALUDDIN ET AL., 1996, REPORTED CALVES WORTH
AN EXTRA \$8.13 IN GROSS MARGIN/CALF

THIS WAS ONLY ECONOMICALLY FEASIBLE WITH > 315
CALVES/DAY (1,260 COW DAIRY FARM)

CONCERNS

ECONOMICS

ADDITIONAL TECHNOLOGY AND LABOR

SERUM IgG CONCENTRATIONS WERE SIGNIFICANTLY
HIGHER FOR CALVES FED UNPASTEURIZED (19.1
MG/ML) VS PASTEURIZED COLOSTRUM (9.7 MG/ML) FOR
CALVES FED 2 LITERS AT FIRST FEEDING

THESE DIFFERENCES WERE NOT AS GREAT WHEN
CALVES WERE FED 4 LITERS AT FIRST FEEDING (GODDEN
ET AL., 2003)

D. HAY, WATER AND STARTER INTRODUCTION

HAY

MOST CALVES RECEIVING MILK DO NOT EAT MUCH HAY, IF GRAIN IS ALSO OFFERED

IN FACT HAY FED TOO EARLY (< 4 WEEKS OF AGE) MAY LIMIT STARTER INTAKE, DECREASE PERFORMANCE AND RESULT IN GUTTY CALVES

AFTER ABOUT 6 WEEKS OF AGE, HAY DOES BECOME AN IMPORTANT COMPONENT

IN OUR RESEARCH WE COULD NOT DEMONSTRATE ANY BENEFIT OF HAY OFFERED BEFORE WEANING

WATER

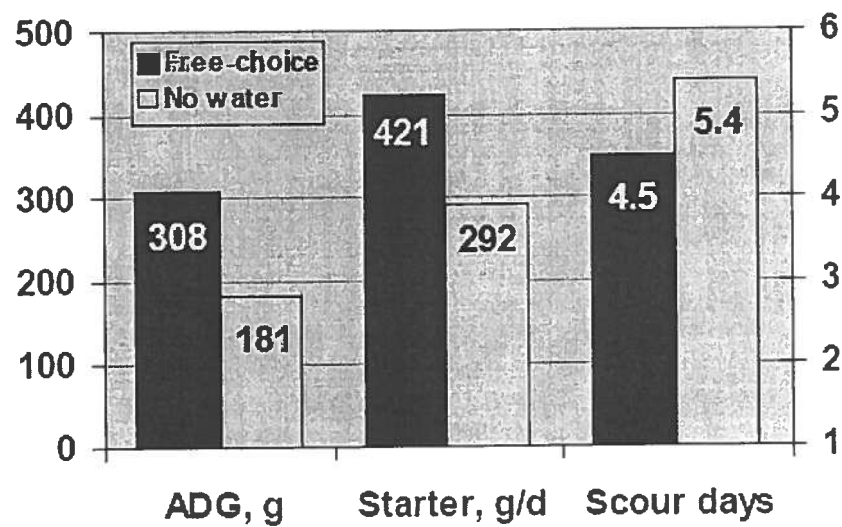
FREE WATER INTAKE HAS BEEN SHOWN TO INCREASE GAINS, STARTER INTAKE AND REDUCE SCOUR DAYS

WATER INTAKE INCREASES WITH STARTER INTAKE, INCREASES WITH MEAN DAILY TEMPERATURE AND DECREASES WITH INCREASING MILK INTAKE (QUIGLEY, 2001 CALF NOTES)

BUT THEY DRINK VERY LITTLE IN THE FIRST 2 WEEKS SO MANY PRODUCERS DO NOT OFFER IT

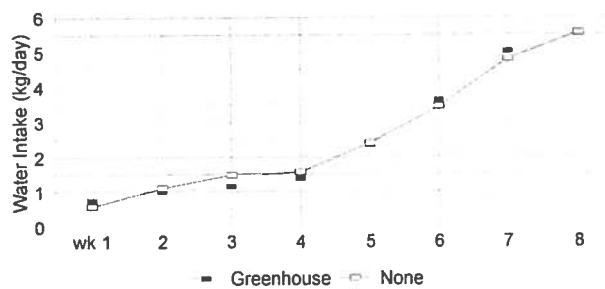
WE ARE CURRENTLY COMPLETING A 2x2 STUDY OF NO WATER OR STARTER FOR THE FIRST 2 WEEKS TO SEE IF IT AFFECTS SCOUR LEVELS

GENERALLY FREE CHOICE WATER IS RECOMMENDED AFTER 2-3 DAYS OF AGE



Source: Kertz, 1984.

Figure 1 Voluntary Water Intake
In Relationship to Housing



STARTER

CALVES CONSUME VERY LITTLE STARTER UNTIL 2 WEEKS OF AGE (< 100g/DAY)

IF WE USE THE "RULE OF THUMB" THAT CALVES CAN BE WEANED WHEN THEY CONSUME FROM 0.5 TO 1.0 KG OF STARTER FOR 2-3 CONSECUTIVE DAYS, THEN CALVES CAN BE READY TO WEAN AT 4-6 WEEKS OF AGE.

MOST STARTERS MEET NUTRIENT REQUIRMENTS

PALATABILITY MAY BE THE MOST IMPORTANT FACTOR

PALATABILITY IS GENERALLY HIGHER WITH TEXTURED FEEDS, FOLLOWED BY COMPLETE PELLETS

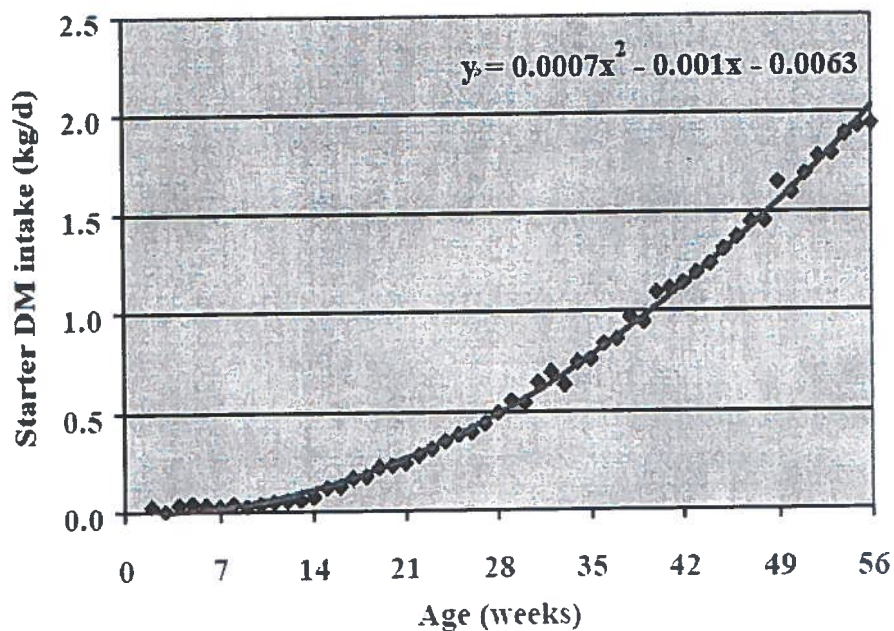
MANY STARTERS CONTAIN B VITAMINS, VITAMIN C AND A COCCIDIOSTAT

SOME PRODUCERS HAVE USED THEIR HIGH GROUP TMR , BUT THE HIGH MOISTURE CONTENT, ACIDITY AND HEATING MAY LIMIT INTAKE

PLACING SOME STARTER IN THE BOTTOM OF THE EMPTY MILK PAIL MAY ENCOURAGE EARLIER STARTER CONSUMPTION

A PRESTARTER WITH HIGHER NUTRIENT CONTENT, MILK BY-PRODUCTS MAY HELP AN AF PROGRAM

PROBIOTICS ADDED TO STARTERS MAY PROVE BENEFICIAL, BUT RESEARCHN RESULTS ARE VARIABLE AND COST MAY BE HIGH.



E. FEEDING SCOURING CALVES

MANY PRODUCERS LIKE TO REDUCE MILK LEVELS TO SCOURING CALVES

I HAVE BEEN TOLD "I CAN TELL BY LOOKING AT THE CALF IF THEY SHOULD HAVE THE MILK RESTRICTED"

RESEARCH HAS REPORTED A NUMBER OF TIMES (GARTHWAITE ET AL., 1994, MCKNIGHT ET AL., 1999) THAT WHOLE MILK AND ORAL HYDRATION SOLUTION FED TO CALVES DID NOT ADVERSELY AFFECT CALVES OR PROLONG OR WORSEN DIARRHEA, BUT PROMOTED GAIN IN BW

IT IS IMPORTANT TO NOTE THAT SCOURING CALVES IN THESE TRIALS WERE IMMEDIATELY (> FS 2.0) TREATED WITH ORAL ELECTROLYTES

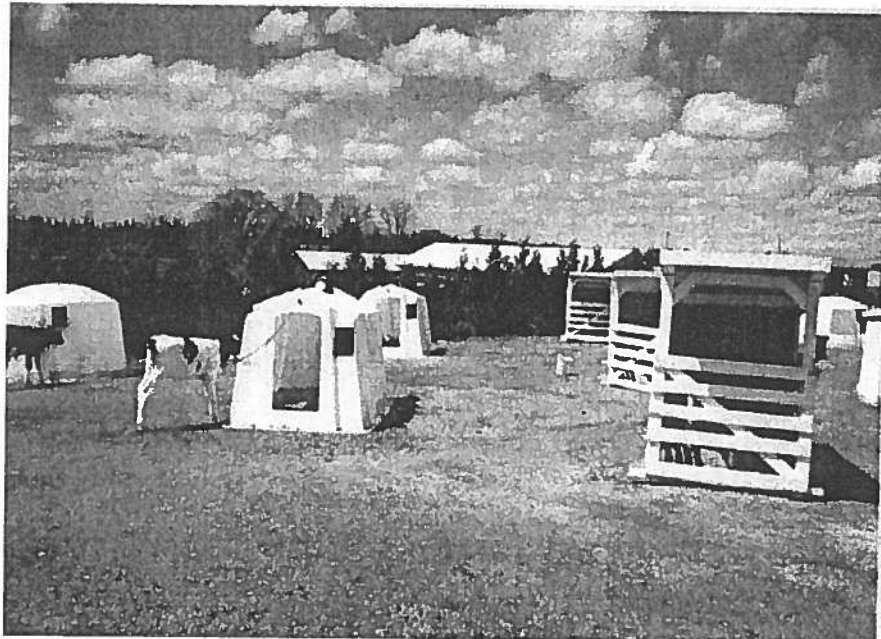
CONTINUED MILK IS EVEN MORE IMPORTANT WITH CALVES HOUSED IN HUTCHES IN WINTER

3. ENVIRONMENTAL MANAGEMENT – HUTCHES!

HUTCHES ARE ONE OF THE MOST EFFECTIVE WAYS TO
IMPROVE CALF HEALTH

BUT THEY ARE LABOR INTENSIVE AND CAN BE DISASTROUS
IF MANAGED POORLY

HUTCH DESIGN AND MANAGEMENT HAS IMPROVED
DRAMATICALLY IN THE PAST 40 YEARS





- **HUTCH TYPES**

KC COMPARED 4 HUTCH TYPES OVER 4 SEASONS AND 2 YEARS

U. OF VIRGINIA AND POLETHYLENE RECTANGULAR STYLE HUTCHES SUPPORTED SUPERIOR PERFORMANCE TO "IGLOO" STYLE AND PLYWOOD RECTANGULAR HUTCHES

WE HAVE GONE TOTALLY POLYETHYLENE RECTANGULAR HUTCHES DUE TO DURABILITY AND EASE OF MANAGEMENT

CALVES PERFORMED BEST IN WINTER AND POOREST IN SUMMER

SPRING TRIALS HAD THE LOWEST MORBIDITY AND MORTALITY

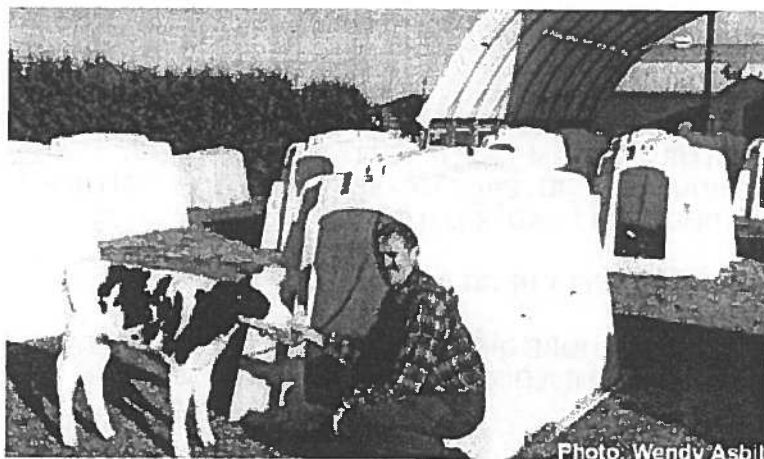
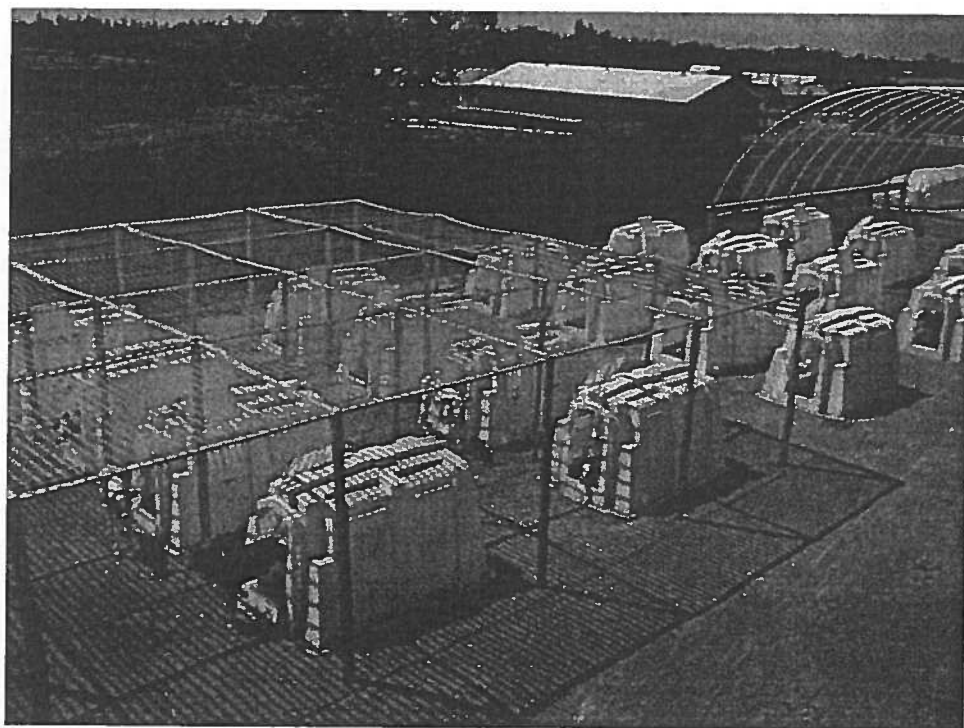


Photo: Wendy Asbill



B. GREENHOUSE SHELTER/SHADE

KC STUDIES COULD NOT DEMONSTRATE ANY CALF
HEALTH OR PERFORMANCE BENEFIT WHEN CALVES
WERE HOUSED IN HUTCHES AND SHELTERED BY EITHER A
GREENHOUSE OR SHADE CLOTH

PEOPLE FELT BETTER

MAY BE MORE DIFFICULT TO CLEAN AND MAINTAIN
THE VENTILATION BENEFIT OF UNSHELTERED
HUTCHES

C. PLAN "B"

NEEDS TO BE A PLAN "B" WHEN THINGS GO WRONG

BEST EXAMPLE IS -30 TO -40°C WEATHER IN WINTER.
HOW LONG WILL A SCOURING CALF LAST IN A
HUTCH?

PURCHASE A COUPLE CLOSURE DOORS AND HAVE A
SUPPLEMENTAL HEAT LAMP AVAILABLE

BE CAREFUL! HUTCHES MELT AND BEDDING BURNS

OR HAVE A CALF PEN IN AN INSULATED BARN FOR
SICK CALVES

INCREASE MILK OR REPLACER FEEDING LEVELS IN
COLD WEATHER BY 25-50%

USE STRAW BEDDING IN WINTER FOR INSULATIVE
VALUE

USE DRY SHAVINGS THE REST OF THE YEAR TO
INCREASE ABSORBANCE AND REDUCE FLIES

LAST THOUGHT!

I LIKE HUTCHES BUT THEY MAY EVENTUALLY BE LIKE A
TOWER SILO. A PASSING FAD!

Building the Foundation

Dairy and Veal **Healthy Calf** Conference

2004

Practical Protocols for Practical People!

Dr. Nancy Charlton

Dr. Nancy Charlton graduated from the Ontario Veterinary College in 1993. Dr. Charlton joined Linwood Veterinary Services, located in Linwood, Ontario in 1996 and in 2000 became a partner. Dr. Charlton has interests in swine, dairy and calves.

Dr. Reny Lothrop

Dr. Reny Lothrop is one of six practicing veterinarians working for Main Street Animal Hospital, located in Cambridge, Ontario. Dr. Lothrop graduated from the Ontario Veterinary College in 1966 and has been a veterinarian for over 35 years. Dr. Lothrop's main areas of interest are in dairy cattle and veal calves.

Practical Protocols for Practical People

Garbage In - Garbage Out

Calf Barn (like a computer)

- What you put in determines its' productivity





Does the computer operator have
patience?

- If yes - *con't*
- If no - *shut down*

Now: garbage in/garbage out

- Gerry - dairy farmers have a responsibility,
one that should not be neglected easily or
given to wrong person
- For example: young unsupervised children
or disinterested adults

Purchasing Calves

- Do not buy sick calves
- Work with calf buyer to change philosophy
- At the very least pay for what you buy
- Look for three basic signs:

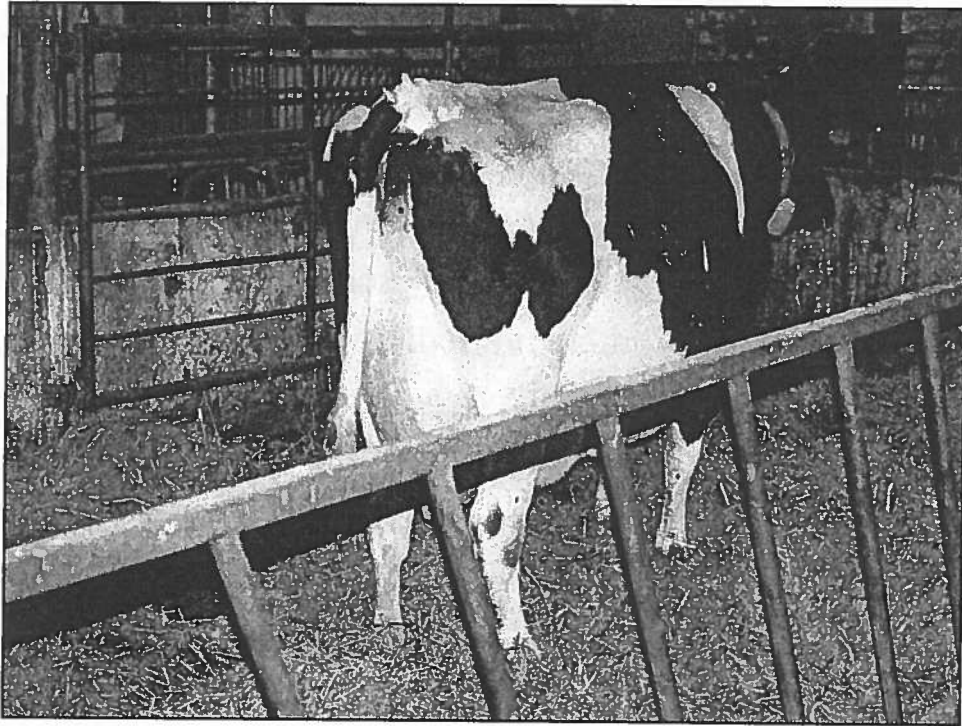
- Tail - no watery diarrhea, many calves will have loose yellow manure
- Navel Cord - no drainage or foul smell
 - thin and dry, preferably
- Mouth - good suckle reflex - difficult to assess from sales ring

Suckle Reflex (Poor)

- Out West early 90's ranchers moved to cross breeding to get away from it in Herefords
 - felt that crossbreeding produced a more vigorous calf
 - try baking soda in mouth to increase salivation

But, the beginning of a calf is determined by:

- Healthy dry cow period
- calving out a healthy calf(no cracked ribs, oxygen deprivation etc.)
- clean maternity pen - can not be overstated
- take in 4.0L + 2.0 L of “good quality” colostrum
- results in a bright, shiny, decent looking calf to purchase or raise(big or small)



Selling Calves

- Are we doing a good job?
- For years been promoting colostral intake and still not making headway
- Can monitor through vet on blood IGG levels, be surprised
- I will take the high road, when calves are low value you may ask why?

- When calves are worth a lot, may ask why if end buyer does not know source
- Over time promote more direct sales for improved health only
- Track success rate and develop reward programs
- Direct sales, IGG monitoring and health sheets = reward for good managers

- When calves are worth a lot, may ask why if end buyer does not know source
- Over time promote more direct sales for improved health only
- Track success rate and develop reward programs
- Direct sales, IGG monitoring and health sheets = reward for good managers

Life isn't perfect- some get sick

- Best not to wait
- learn to identify early: Scours usually 1st
- Backing off of feed
- Why?
 - Fever
 - Pain
 - Dehydration

What do we do?

- Something for fever/pain
- Something for dehydration
- Something for bacterial infections

Electrolytes

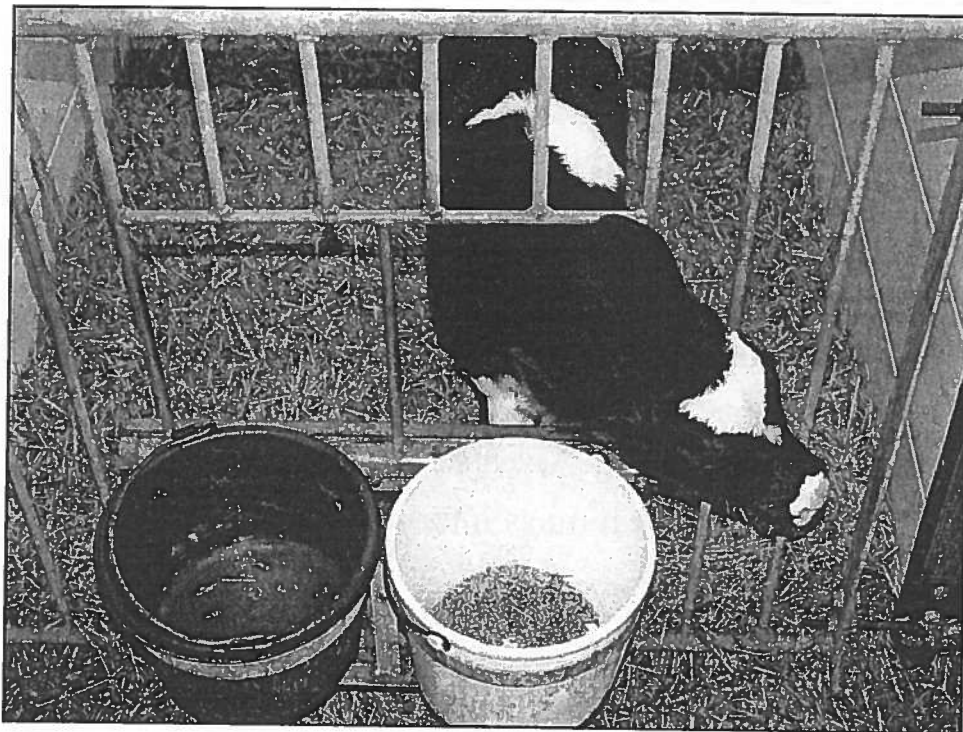
- Key is early & lot's, late and lot's equals down calf with a big belly of water
- Well balanced electrolytes is a must or else you can worsen the situation

Nutrition:

- Provide energy and nutrients
- Warm housing able to cheat
- cold housing impossible
- clean, dry, pens (knee test), no chilling
- clean equipment (can not be overstated - Sam has excellent sheets)

Feeding Milk

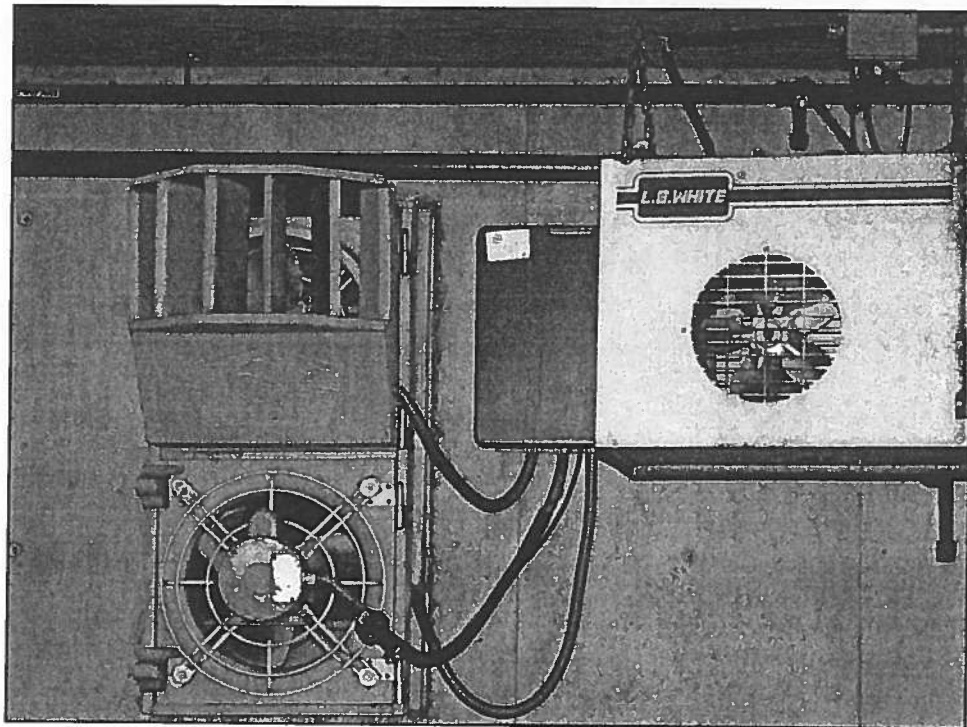
- Some situations - feed milk straight through
- Others require backing down to 1 to 1 1/2 litres per feeding
- Warm housing can cheat - no more than 24 hours off of milk and increase slowly





After scours: Mycoplasma infections
and/or pneumonia

- Requires: good air quality good quality nutrition and early intervention
- ideally all in/all out to break cycle
 - something for pain
 - something for the Mycoplasma bacterium
- If too many then mass intervention may be required



Weaning Pneumonia and Coccidiosis

- Wean on medicated crumbles spring and fall, pays back hands down
- Feed supplement with deccox/rumensin/bovatec
 - easy pay back
- Correct Protein level - too low then immune system and growth suffers



Again

- Clean, dry pens
- chilling - immunosuppression and sickness
- Three month old calves tend to get ignored, wean earlier and move so that if hauling straw and feed is too much work, simplify it for group housing



Vaccination Protocols

- Farm specific
- Do not vaccinate between 3 and 5 weeks of biological life
- Fan of modified-live, can use earlier
- Bacterins such as those for *Pasteurella* spp can be hard on young Holsteins, more harm than good

Rearing baby calves - in charge of a nursery

- Nobody builds a pig nursery unless they are committed to spending their day in there when piglets arrive
- All babies require:
 - Time
 - A keen eye
 - Lot's of TLC when sick

- If you have all 3 of these, then stick with it.
- You have should have quality started calves and you can hit *send*
- If not, *hit delete and shut down!!*

Selling and Buying of Calves

R. K. Lothrop D.V.M.

Background Information on Calf Health

Studies of calf mortality and treatment rates on dairy farms and on veal farms indicate that producers are not doing very well at calf rearing. The National Animal Health Monitoring Survey (NAHMS) in the U.S.A. showed that 10.8 % of heifer calves born alive died prior to weaning from scours and pneumonia. This calf mortality figure has increased since a previous NAHMS study in 1991 that reported that 8.4 % of calves born alive died prior to weaning from disease. Dr. Jan Sargeant conducted a survey of calf mortality and morbidity of white veal and red veal farms in Ontario in 1994. She reported a mortality rate of 3.7 % of calves raised on white veal farms and 5.4 % of calves raised on red veal farms. Additionally, Dr. Sargeant reported that 60 % of those calves required treatment during the production cycle. It is obvious that improvements in calf raising and welfare are needed.

The Importance of Sufficiency of Transfer of Colostral Antibodies

Elsewhere in this conference the issues around providing colostrum to the calf have been addressed. The veal producer, as a purchaser of male calves from a dairy farmer, knows very well the implications of good colostrum management will have on purchased calves. The veal producer realizes that about one half of male calves are going to arrive at their facility not having had sufficient antibodies from inadequate colostrum management at birth. Those calves missing sufficient colostrum feeding are more likely to succumb to illness. Those veal producers who purchase calves direct from dairy farm quickly learn whose calves are provided excellent care at birth. Protocols for colostrum management of calves are presented at this conference.

The Value of Adequate Caloric Intake of Calves

Others at this seminar have described the importance of providing adequate nutrition to calves. Buyers of veal calves do pay premium prices for large framed calves that have an excellent body condition score at the time of purchase. Calves that are compromised by insufficient levels of feeding, who are thin on account of an adverse environment prior to being offered for sale and or have had previous infections require intensive care on arrival at veal farms. A healthy calf in good condition has only 18-24 hours of reserve energy in the form of fat to sustain it during a period of time when it may not be provided food (selling, transportation and disease).

Biosecurity of Purchased Calves

The health of the calf may be a reflection of the state of its dam at the time of calving. Cows at calving are immunosuppressed and likely to be shedding large numbers of pathogens into the environment. Additionally, cows at calving may be quite dirty-the calf's efforts to nurse may result in ingestion of large numbers bacteria, viruses and parasites even before colostrum is provided. The calf's dam can be active carriers of E.coli, salmonella, coccidia, cryptosporidia and rota-corona viruses.

The calf a producer offers for sale may be carrying a bioburden of infectious agents. It is pretty obvious that a calf with diarrhea is probably replicating large numbers of infectious agents into its environment. What may be less obvious is that calves that have not had sufficient colostrum or are immunocompromised by insufficient nutrition or other stressors (chilling, heat, transportation, dehydration) can also present with a bioburden of infectious agents.

PROTOCOLS FOR THE SELLING AND PURCHASING OF CALVES

Dairy Producer

- Provide a clean, dry, well-bedded environment for the calving cow.
- Remove the calf at birth to its own warm, dry, well bedded environment.
- Obtain colostrum from dam within 2 hours of calving following good udder preparation.
- Ensure that colostrum is of excellent quality.
- Utilize only clean feeding equipment for feeding of calves
- Provide a minimum of 3-4 litres of colostrum within 2 hours of birth (suckle or esophageal feeder).
- Continue to feed colostrum getting at least 6 litres into the calf within 6-12 hours of birth and for 2-3 days following birth.
- House the calf in individual calf pens (well bedded and ventilated) until offered for sale.
- Provide free choice water on a daily basis.
- Feed a minimum of 3 litres of milk or milk replacer twice daily.
- Identify the calf with an NLID ear tag.
- Offer the calf for sale only if healthy (dry navel, no soiling from scours, good appetite and good body condition score).

Purchaser

- Offer priority of purchase to a local producer who consistently provides strong calves that do well in your production unit.
- Offer a premium for larger calves of the desired body type who have a body condition score of 2.5-3.5.
- Avoid purchasing those calves that are excessively thin, have swelling of the umbilicus, have soiling of the rear end from scour and have nasal or eye discharge.
- Assemble calves in numbers to make up a lot. Avoid continued additions of calves to any lot of calves.
- Realize that if calves are bought at auction and have to be transported there are serious consequences for the calves;
 - the calves will be under severe stress.
 - the calves will be exhausted, dehydrated, acidotic and scared.
 - the calves will be hungry.
 - depending on the season the calves may be chilled and/or overheated.
 - the grouped calves will be exposed to many pathogens at the very time their immune system is unlikely to cope with infections.
- If calves are assembled ensure calves are able to be transported in clean and bedded trucks to arrive at your facility within 18 hours of leaving the dairy producer's farm.

On Arrival

In order of needs, the newly arrived calf is going to require:

1. Re-hydration
2. Rest
3. Calories

Newly arrived calves are not 'electrolyte deficient'. Electrolytes can be used to re-hydrate the calves if it encourages the calf to consume water. Remember that milk or milk replacer feeding is the ultimate source of both energy (and an excellent source of water and electrolytes).

- Assemble calves in groups and do not provide continuous addition of new calves.
- House the calves in dry, well ventilated housing.
- Provide water or milk replacer feedings (remember that these calves may be exhausted and have a priority for rest when they arrive so patience is important to see that all the calves are looked after).
- Provide an on arrival vitamin or antibiotic start program. Your veterinarian is in the best position to make this recommendation.
- Immunizations can be provided in the first week after arrival. Your veterinarian can best advise on specific vaccination recommendations.
- Prepare and deliver milk replacer as per manufacturers recommendations (weight, volume, mixing and feeding temperature)
- Use clean feeding utensils.
- Provide a sufficient amount of calories to meet the needs for maintenance and desired growth but in addition provide for environmental and disease challenges. (minimum 3+ litres twice daily).
- Monitor for disease and provide treatment early in the course of disease.

BUILDING THE FOUNDATION

Dairy and Veal Healthy Calf Conference

2004

Kemptville, Ontario

Protocols for Selling and Buying of Calves

Reny Lothrop D.V.M.

Organized by:



Sponsored by:



Ontario

Ontario Ministry of
Agriculture & Food



Agricultural
Adaptation
Council



Dairy Farmers
of Ontario

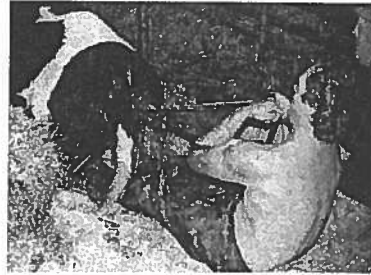
Calf Health

- NAHMS 2002 10.8% of heifers born alive died prior to weaning (1991 study 8.4%)
- OFMAP 1998 16.8 % of dairy calves died prior to weaning
- Veal Study 1994 Ontario Calves (Sargeant)
 - White Veal Mortality 3.7%
 - Red Veal Mortality 5.4%



Calves Are 'Babies'

- **30-50% of births from Holsteins assisted (66% in heifers)**
- **Difficult calvings:**
3.8 times more likely to get sick and 4.5 times more likely to die



Calves are 'Babies'

- **Producer needs to anticipate and compensate for fact that perhaps up to 50% of calves may not have had adequate transfer of immunoglobulins from colostrum at the source farm.**



Calves Are 'Babies'

- Calves have difficulty in coping with chilling
- Calves have only one day of fat reserves
- Calves have a very naïve immune system



Calves Are 'Babies'

"The adult cow world is not a friendly one for calves.

Cattle routinely harbor, multiply and shed viruses and bacteria that often have little effect on themselves, but can cause serious illness to calves"

G. Bertoldo D.V.M.
Linwood Vet Services Client Meeting 2003



Calves Are 'Babies'

Bioburden

A Predisposing Cause of Calf Disease

- Calves that do not receive sufficient transfer of colostral antibodies may shed enormous numbers of pathogens (even though they may look healthy)
- Calves that are sick also replicate and shed vast quantities of pathogens into their environment



Calves Are 'Babies'

Sale, Transportation and Assembly of Calves

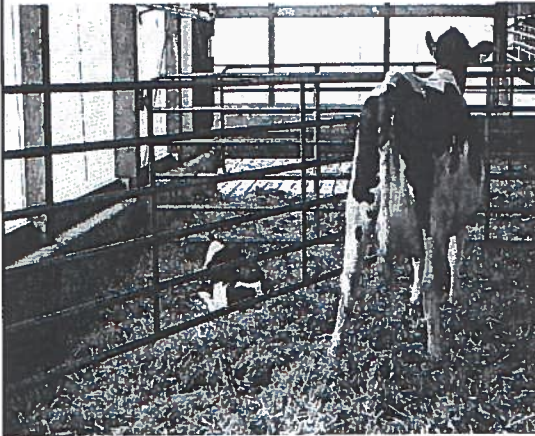


- The calves will be stressed
- The calves will be exhausted, hungry, dehydrated and scared
- The calves may be chilled or overheated
- The calf will be exposed to pathogens

Lots of opportunity for serious illness!

Healthy Calf Protocols

Preparing The Bull Calf for Sale



- As soon as feasible separate the calf from the dam
- Get 3-4 litres of colostrum into the calf within 2 hours of birth
 - Quality
 - Quantity
 - Quickly
 - Qleanly
- Additional feedings of colostrum

Healthy Calf Protocols

Preparing The Bull Calf for Sale

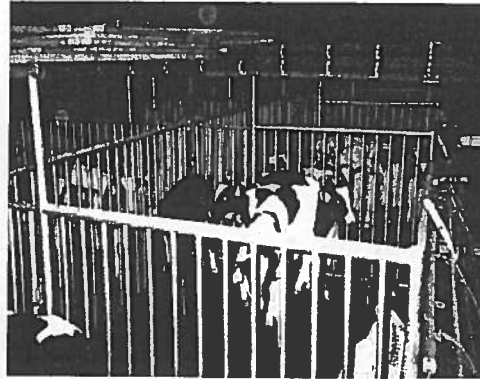
- Remove calf to a fresh, straw bedded individual calf housing
- Continue to feed whole milk or properly prepared milk replacer at a minimum of 3 litres twice daily given at 38-39°C
- Provide free choice clean water



Healthy Calf Protocols

Selection of the Bull Calf

- Obtain direct from known source wherever possible
- Buy from producer with a reputation for the best calves
- Obtain calves 5-14 days of age
- Select larger calves
- Avoid the thin calves
- Dry navel, no soiling of rear quarters



Healthy Calf Protocols

Transportation of the Calf



- Vehicles need to be clean and well bedded
- Avoid transport of calves with other classes of livestock
- Guideline: Maximum of 12 hours on the road
(Remember a healthy calf has only 24 hours of energy reserve)
- Need a 'gentle' driver as calves tend to stand as long as truck is moving

Healthy Calf Protocols

Transportation of the Calf

- Next to contamination of trucks chilling is the next most important issue.

(Calves that miss one or two feedings and placed on an open stock trailer may have core body temperatures reduced by up to 1°C.)

- The grouped calves will be exposed to many pathogens at the very time their immune system is unlikely to cope with challenge

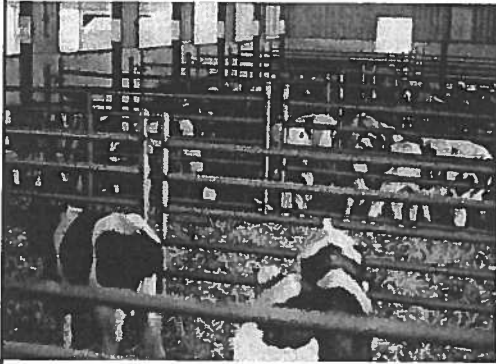


Healthy Calf Protocols

On Arrival at Farm

- Weigh calves
- Sort into like sized groups
- Avoid any additions to the group
- Calves, by their nature are composed of more water and its is critical they be rehydrated.
- Calves have a priority to rehydrate, then rest and finally feeding
- On arrival calves are not electrolyte deficient!
- Calves will be exhausted- it will take a great deal of patience to provide for their immediate needs

Healthy Calf Protocols On Arrival at Farm



- On arrival group medications including vitamins, injectable iron and antibiotics may be in the routine protocol prescribed by veterinarian
- Vaccination within 24-60 hours of arrival may be recommended by veterinarian

Healthy Calf Protocols On Arrival at Farm

Reasons not to bring new calves into an assembled group

- Potential for introduction of new pathogens putting both the new arrival and the original group at risk

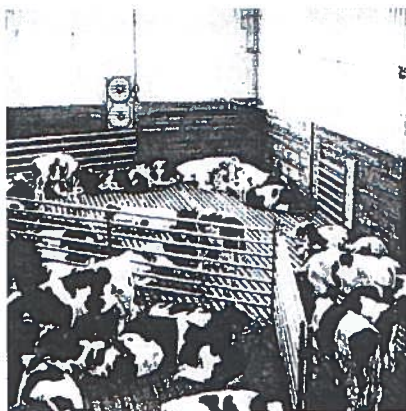
- Change in social order very stressful to calves
- Continuous introduction of calves into a group under treatment may provide an opportunity for development of antibiotic resistance

Healthy Calf Protocols On Arrival at Farm

- **Prepare and deliver milk replacer as per manufacturer's recommendations:**
- **Volume**
- **Mixing**
- **Feeding Temperatures**
- **Clean Feeding Equipment**



Healthy Calf Protocols On Arrival at Farm



- **Provide sufficient calories to meet needs for maintenance and desired growth in addition provide calories for disease challenges**
- **Minimum 3 litres twice per day**

My 10 Wishes

- **Separate the calf away from the cow at birth**
- **Feed minimum of 3 litres of quality, clean colostrum within 2 hours of birth of the calf followed by another 3 litres within 10 hours of birth**
- **Remove the calf immediately to well bedded and well ventilated housing**
- **Be more careful with cleanliness of feeding equipment**

My 10 Wishes

- **Feed calves at least 3 litres of milk or properly prepared milk replacer twice daily**
- **Provide fresh clean water free choice**
- **Buy calves preferentially from a known supplier of quality calves**
- **Assemble calves as a group and keep the group intact (no additions)**
- **Provide rest, water and nourishment in that order on arrival at assembly**
- **Provide comfortable and well ventilated calf housing**

My 10 Wishes

- **Seek veterinary advice on medicated start programs and vaccination protocols**
- **Feed at least 3 litres of milk or milk replacer daily (or more)**





A proud sponsor of the Ontario Veal Association

new-life mills limited



'Feeding Your Future'

Providing high quality people, products and services in an environment that ensures food and animal safety. Call today for more information on all that New-Life Mills has to offer.

Cambridge Regional
Sales Office
1-800-463-1196

Denfield Mill
1-800-265-7040

Inkerman Mill
1-800-565-5175

Tavistock Mill
1-800-265-8538

Wyoming Mill
1-800-265-7507



ONTARIO VEAL ASSOCIATION

130 Malcolm Road, Unit #2, Guelph, Ontario N1K 1B1

Tel: 519-824-2942 Fax: 519-824-2534

www.ontarioveal.on.ca