Hygiene and Standard Operating Procedures

Every calf raiser knows that keeping calves healthy is neither simple nor easy. Many factors work in combination to determine calf health or infection levels.

Try thinking of the equation between immune resistance to infections and disease causing pathogens as a balance scale. On one side are the pathogens. On the other side are the immune resources. As long as the immune side is "heavier" than the pathogen side, the calf stays healthy. When the pathogens "out weigh" the immune resources, the calf is clinically ill.

As calf managers, our goal is to add to the immune side of the balance and subtract from the pathogen side. This presentation focuses on the subtracting from the pathogen side through hygiene procedures. Steps to develop and use standard operating procedures (SOP's) are described:

- Identifying the enemy
- Selecting the weapons – hygiene procedures
- Procedures don't come out of thin air
- Protocols do not equal performance
- Protocol "drift" and monitoring hygiene procedures

Identifying the Enemy

Let us be clear about common assumptions before discussing the selection process. **First,** we assume that the pathogen profile may differ significantly from farm to farm. The term, "pathogen profile" here refers to both the species and concentration of pathogens to which calves may be exposed.

Second, this same profile is going to differ depending on the point of exposure on an individual farm. That is, the primary pathogens in the calving area usually will differ somewhat from those in the calf housing area. In addition, the colostrum pathogen profile may differ from that found in milk/milk replacer.

Third, the farm's pathogen profile will vary across seasons of the year. We know that pathogen survival depends on environmental conditions including temperature, humidity and availability of growth media. These three conditions vary widely on farms from season to season resulting in wide swings in pathogen populations.

We know that there is virtually an army of pathogens ready to cause infections in calves. Therefore, the hygiene procedure selection process starts with identifying the enemies, source by source.

In general, calving areas represent the most dangerous point of contact. The presence of adult animals virtually insures that we will have an abundant supply of all the significant viruses and bacteria. *Coccidia and cryptosporidia* parasites often will be present.

Calf housing, as a point of pathogen exposure, may or may not differ from the calving area depending on its degree of physical isolation from adult animals. Well-isolated calf housing, depending on air quality, may have much lower viral exposure.

However, in the absence of good hygiene, bacteria and parasites may build up to very high concentrations in calf housing. These levels may be high enough to overwhelm the immune resources of most calves.

Laboratory analysis of colostrum and milk/milk replacer samples is the most reliable means of identifying the primary bacterial and parasitic pathogens. Experience has shown that the most common scours-causing pathogen in colostrum is the coliform bacteria, *E. coli.*

In a survey of well-managed Wisconsin dairy farms, McGuirk found that approximately eighty percent of the farms had at least one coliform contaminated colostrum sample. Of all the survey colostrum samples, about eighty percent of them contained enough coliform bacteria to cause treatable scours.

Our work at Attica Veterinary Associates (AVA) suggests that, in addition to coliforms, the most common bacterial contaminants in milk/milk replacer are Staph and Strep species bacteria. McGuirk's follow-up work with preweaned calves demonstrated that these two species had little effect on scours rates until they were present in relatively large numbers (in excess of 100,000 cfu/ml). Many of our AVA samples from farms experiencing scours problems contain Staph and Strep species bacteria well above 250,000 cfu/ml.

Selecting the Weapons – Hygiene procedures

In general, fecal coliform bacteria are the most dangerous pathogens present in every calving area. Removing adult cow manure and soiled bedding from the calving pen or area is the first line of defense.

An added benefit to frequent cleaning of calving areas is the removal of the birth fluids that support further bacterial growth. Careful and consistent navel dipping is a hygiene step that not only kills pathogens at the navel opening but also helps close the umbilical cord.

Separating the calf from the dam shortly after birth is a hygiene procedure. By controlling this aspect of the calf's environment, we have removed a huge source of fecal coliform bacteria.

An additional control component is the rate of air exchange in the calving area. High viral concentrations are much less likely if there is good ventilation.

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Calf housing may be a huge reservoir of pathogenic bacteria and parasites. The use of porous construction materials such as plywood or wooden boards makes thorough cleaning difficult at best.

The only proven hygiene method for killing both parasites and bacteria in calf housing areas is steam cleaning. When this means is not practical, high temperature, high pressure cleaning is the next best alternative. In addition, allowing pens/hutches to thoroughly dry and sit idle for a week or two at least between calves permits pathogen populations to die off.

Keeping calves away from wet conditions that support pathogen growth and survival is an effective procedure for suppressing exposure. Clean, dry bedding is one element. The better the drainage for the exercise area, the drier it will be. Any means that achieves this goal, "dry," is an effective weapon against bacteria and parasites.

Ventilation is seldom classified as a hygiene procedure. It is, however, critical for reducing bacteria and viral exposure in calf facilities. Nordland has measured the bacterial concentration in calf barn air. Typical bacterial counts in air, he reports, equal:

- Outdoor air = 100-300 cfu/cubic meter
- Clean office air = 1,000 cfu/cubic meter
- Well ventilated barn = 10-15,000 cfu/cubic meter
- Chronic pneumonia barn = more than 500,000 cfu/cubic meter.

The survival of airborne pathogens is highly dependent on humidity. When humidity levels go over seventy-five percent, bovine pathogen survival is extended.

Calves release about 90g of moisture per 45kg body weight per hour into their environment via urine, feces and respiration. For example, fifty calves averaging 68kg release about 150 to 170 litres of water daily. Only by providing adequate fresh airflow can airborne moisture be removed and the humidity brought down to a level at which pathogens cannot survive. Reducing noxious gases depends on airflow rates, as well.

Contaminated colostrum is as lethal for newborn calves as adult cow manure. Harvesting clean colostrum and keeping it clean until a calf drinks it is the major hygiene challenge. For a review of the essential points in reducing coliform contamination of colostrum see "Colostrum: Reducing Coliform Counts." Click HERE for this reference or paste this URL into your Internet browser:
http://www.atticacows.com/library/newsletters/ColostrumReducingColifrmCountChklstUK32N17.pdf

The cleaning procedure for equipment referred to above is described in the "Cleaning Milk Containers Checklist." Click HERE for this reference or paste this URL into your Internet browser:
http://www.atticacows.com/library/newsletters/WashingMilkContChklstUK43R17.pdf

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In the bag, milk replacer is very close to a sterile product. Nevertheless, inadequate equipment hygiene protocols combined with lack of protocol compliance often result in highly contaminated milk replacer.

On-farm observations support the conclusion that liberal use of chlorine bleach may suppress coliform populations. Nevertheless, biofilm buildup on equipment may support an overwhelming growth of Staph and Strep species bacteria. For "Biofilms threaten calf health" reference, click HERE. Or, paste this URL into your Internet browser: http://www.atticacows.com/library/newsletters/BiofilmsThreatenCalfHealthUK107R17.pdf While not directly related to persistent scouring problems, high populations of these bacteria have an immunosuppressive effect indirectly allowing other pathogens to cause scouring in calves.

Procedures don't come out of thin air.

Translating selected procedures for each of the pathogen exposure points (calving area, calf housing, colostrum, milk replacer) into standard operating procedures (SOP) is the next step in successful pathogen management.

Successfully setting up work site protocols depends on both summarizing technical knowledge about the job and gleaning farm-specific job performance details from the experienced employee(s). Usually there is a scientific basis for certain steps that must be included in an overall task. A helpful form for organizing this information may be found by clicking HERE. Or, paste this URL into your Internet browser: https://ecommons.cornell.edu/bitstream/handle/1813/36910/sopsdir.pdf?sequence=1&isAllowed=y .

For example, the temperature of wash water for milk equipment has to remain at 49° or higher in order for milk solids to remain in suspension. Farm-specific details often describe conditions or constraints associated with certain steps. For example, continuing the wash water illustration above, in cold weather the employee may have discovered the only way to achieve the desired wash water temperature is to wait at least 2 hours after the milking equipment wash has run to do the manual was-up of colostrum and milk replacer equipment. On this farm, this is an essential condition for meeting the scientific standard.

All of the experts in SOP or protocol development talk about "buy in." By this they refer to ownership of the protocol(s) by the persons doing the work. "It is my protocol. I am willing to follow it," is an example of a "buy-in" attitude.

I am firmly convinced that achieving this foundation for protocol compliance is really worth the extra time that goes into it. Short, to the point, employee meetings can identify farm-specific information and a description of the task from the point of view of the

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person doing it regularly. This information may not always be compatible with procedures defined solely from a scientific point of view.

My experience is that the end product from an employee group is always a compromise between the scientific ideal and the initial employee defined process.

Even though I advocate laminating work site protocols and posting them at the job site, I do not mean to suggest that laminating is the same as "chiseling them in stone." Regular protocol evaluation and revision involving the experienced employees that do the job day-to-day is just as important as developing the protocols.

Protocols do not equal performance.

Wherever there are two or more persons, there are two or more ways to do the same task. This is true even if there is a protocol to which everyone is committed. Small variations on the main theme actually turn out to be trivial. Big deviations, however, can result in undesirable outcomes.

Getting everyone to follow the same "theme" requires training. Taking time for education or training in any business means time not spent "on-the-job." The predominant attitude in dairy farming that training time is lost time is most unfortunate.

High levels of compliance to well developed protocols result in predictable and excellent results. Outcomes like this are profitable. Low levels of compliance to even good protocols result in unpredictable and often ineffective results.

Most of the training for calf care hygiene protocols revolves around learning skills. The conversation surrounding the training activity may add details of the science behind the steps. But, the core of the training remains learning to correctly perform a skill.

The vocational education model is appropriate for skill training. This model specifies three steps that may be seen as a cycle. Step one is demonstration of the skill by an experienced person for the learner.

Step two is practice of the skill by the learner. Step three is evaluation of the learner's performance by the instructor.

The reason these three steps are often seen as a cycle is that the learner's first try at the skill may include one or more errors or omissions. If the learner's performance is not satisfactory, the demonstrate-practice-evaluate sequence is repeated.

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Protocol "drift" and monitoring hygiene procedures

Over time there is a tendency for protocol compliance to decrease. Behaviors not specified in the protocol are added. Protocol steps are dropped. "Shortcuts" are introduced. We "drift" away from the protocol specified standards. For a checklist on monitoring protocol compliance click HERE. Or, paste this URL into your Internet browser:
http://www.atticacows.com/library/newsletters/MonitorHygieneProtocolsUK91R17.pdf .

One result of low compliance levels is inconsistent calf care. One person goes about hygiene task their way. The next person performs the same jobs differently. While there might be a slight chance both employees are achieving the desired outcomes, the more likely case is neither of them are being either effective or efficient. Consistent, timely and appropriate care for calves is essential for good health and desirable gains.

There is no substitute for direct observation of a person doing the job. That is the way one sees the deviations from the protocol specified performance of the task.

I watched a person set a wet nursing bottle on a manure covered floor. Then, the bottle was dunked into a five-gallon pail to refill it for another calf. The protocol specified that the bottle be set down inside a clean pail, not on a dirty floor. Yes, it was only a momentary deviation. But, it was one with big consequences for the fourth or fifth calf fed in this manner.

Once observed, deviations from the protocol-specified procedures can have two meanings. The most obvious conclusion is that the employee needs to be retrained. Getting persons "back-on-the-track" is a never ending job for supervisory people. It is naive to think that this activity will ever go away.

The other and often overlooked meaning is that the protocol needs to be revised. One of the recommended supervisor behaviors for protocol development is to encourage employees to find their own solutions to problems. When deviations occur, they may be employee initiatives in finding solutions to unanticipated problems in task performance. Or, a "short-cut" for a task may have the same outcome and be much more efficient.

Monitoring performance outcomes is more complicated than observing protocol compliance. In a replacement heifer calf operation, we can only estimate consequences of hygiene procedures.

One increasingly common method is to sample colostrum and milk replacer just as it is being fed to calves. When cultured in a laboratory, these samples provide a picture of how well we are controlling pathogen intake via liquid feeds.

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Feeding or mixing equipment just prior to use can be rinsed with sterile water. Culture results from these samples estimate bacterial contamination levels on our "clean" equipment. Use the reference, "Bacteria quality control: collecting rinse samples" for a sampling procedure. For this click HERE. Or, paste this URL into your Internet browser: http://www.atticacows.com/library/newsletters/BacteriaQualityControlRinseUK70N17.pdf .

Overall pathogen exposure rates can be estimated by keeping track of treatable cases of scours and respiratory illness. These rates, however, reflect both the pathogen exposure levels and the strength of the immune resources. Nevertheless, high rates of both illnesses reflect a breakdown of the hygiene measures that should be in place. Many times calf operations find that it only takes lack of compliance on one protocol to cause widespread illness. This is the "one weak link" problem. This may be true in spite of careful, timely care in most other aspects of the operation.

Summary

Every calf raiser knows that keeping calves healthy is neither simple nor easy. When pathogens to which calves are exposed "out weigh" the immune resources, calves get clinically ill. This presentation focused on the subtracting from the pathogen side of this pathogen:immunity equation through hygiene procedures.

The four primary pathogen exposure points for newborn and preweaned calves are the calving pen, calf housing, colostrum and milk/milk replacer. By systematically identifying the primary pathogens at each of these exposure points a producer can select the most effective hygiene procedures to reduce pathogenic pathogens in calf's environment.

Work-site protocols can be developed jointly by management and employees to cover the primary hygiene procedures. These protocols provide not only a working guide for day-to-day task performance but they also serve as a training tool. Both new hires and experienced staff need to be familiar with all the steps in a job and their proper sequence.

Monitoring hygiene procedures is essential for an effective and efficient calf rearing operation. Everyone eventually drifts away from protocol-specified behaviors. The need for and focus of retraining efforts should be derived from on-the-job observations. All deviations from protocols should not be considered in a negative light. Innovations could represent an improvement in a protocol.

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