VM80

Keep Herd Health Simple and Make it Fit the Beef Cattle Operation[1]

E. J. Richey[2]

To be able to use herd health programs effectively, they must be simple and fit the cattle operation. How is herd (animal) health kept simple? Know what a healthy herd is (Figure 1)!

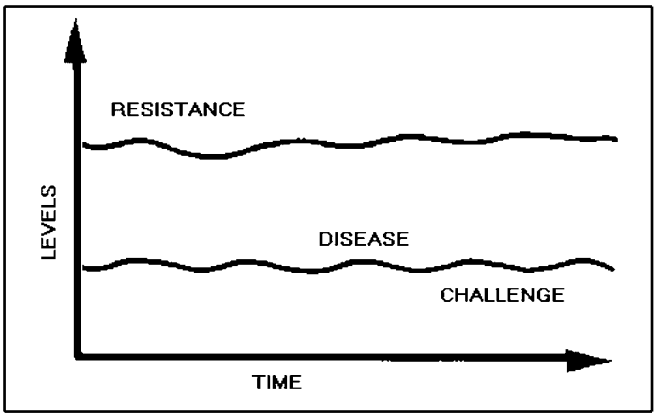

Figure 1.

If these levels intercept, for any reason, sickness occurs; if the resistance level drops to below the disease challenge level, sickness occurs (Figure 2); if the disease challenge level rises to above the resistance level, sickness occurs (Figure 3). The worst scenario occurs when the resistance level is dropping at the same time the disease challenge is on the rise; cattle get severely sick, very fast (Figure 4).

The resistance level of an animal or a herd can be lowered by excessive stresses put upon the herd. Such stresses include, but are not limited to:

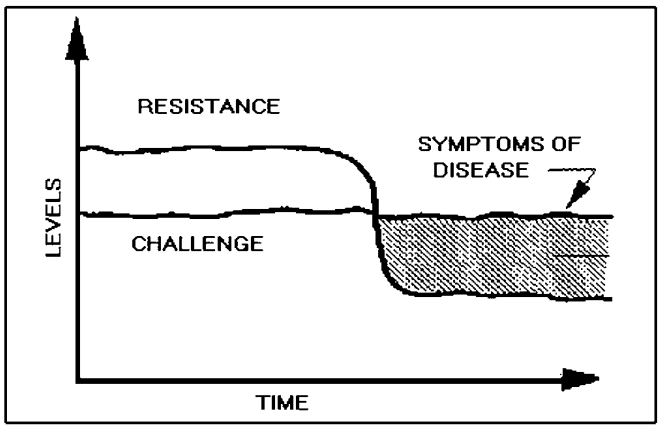

Figure 2.

- Poor Nutrition,
- Shipping
- Winter Storms
- Processing

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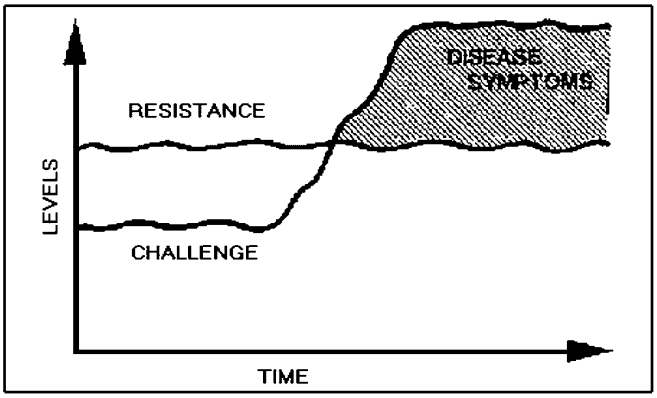

Figure 3.

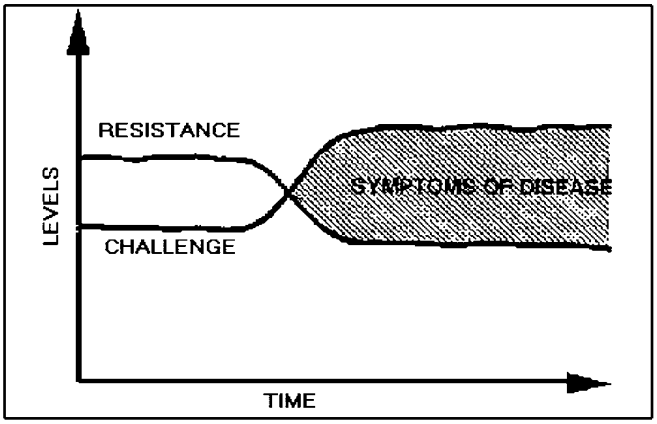

Figure 4.

- Heat Stress.

If a diseased animal is added into a susceptible herd or if susceptible cattle are added into a diseased herd then the disease challenge on the susceptible cattle is raised.

When susceptible cattle are highly stressed at the same time they are exposed to a disease, they can become rapidly and severely sick. An example of this scenario occurs when susceptible calves are shipped into the market system.

The resistance level must be kept constantly above the disease challenge level, regardless of the disease. There are healthy appearing herds, but will they remain healthy and are they producing optimally; can they survive a disease challenge? Herd health programs are designed to keep the herd healthy. Rather than live with the normal spread between the resistance level and disease challenge levels in an "unexposed herd", consider raising the resistance levels and reducing the disease challenge levels (Figure 5). By widening the spread between the resistance and disease challenge levels, a herd can withstand an unexpected drop in resistance or an unexpected exposure to disease.

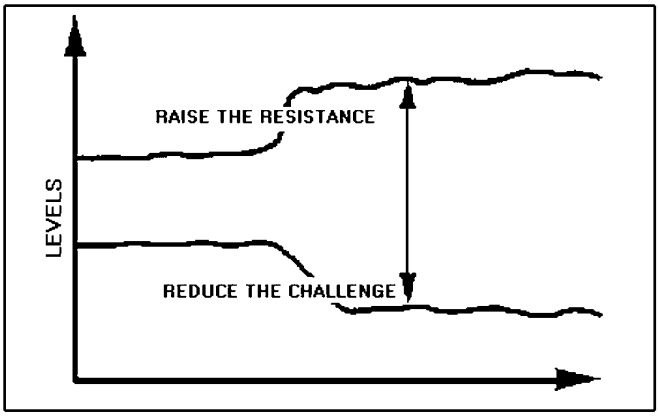

Figure 5.

To keep cattle healthy and to keep health simple, one must: 1) Recognize disease challenges; 2) Know when they occur; 3) Raise the resistance before the challenge occurs (Figure 6); and 4) Reduce the challenge (Figure 7). To accomplish this, there are two basic tools available to work with: 1) Vaccines that raise the resistance to certain diseases and 2) Removal of diseased animals, parasite control, and antibiotics that reduce the challenges.

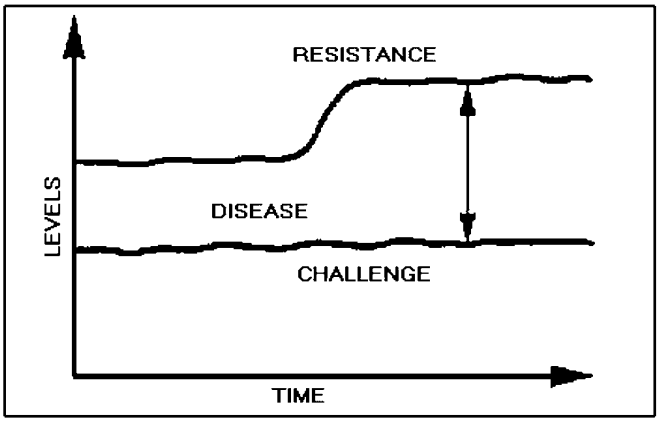

Figure 6.

CONTROLLING DISEASES

To control some diseases, raise the resistance to a high level, in other diseases simply reduce the challenge level; however, with others there is a need to both raise the resistance and reduce the disease challenge. If only the resistance (vaccine) is raised, a high disease challenge can overwhelm the raised resistance level (Figure 8).

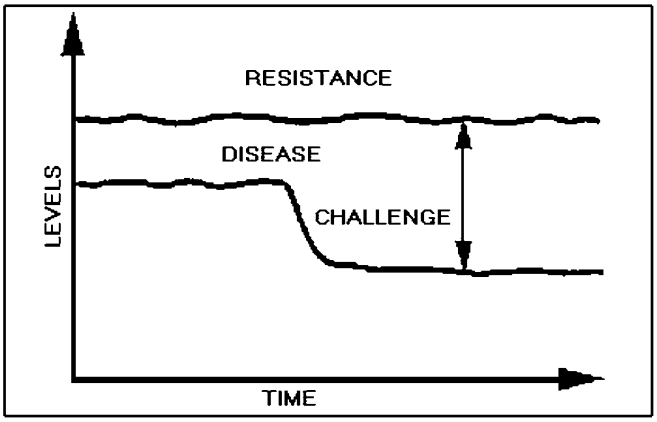

Figure 7.

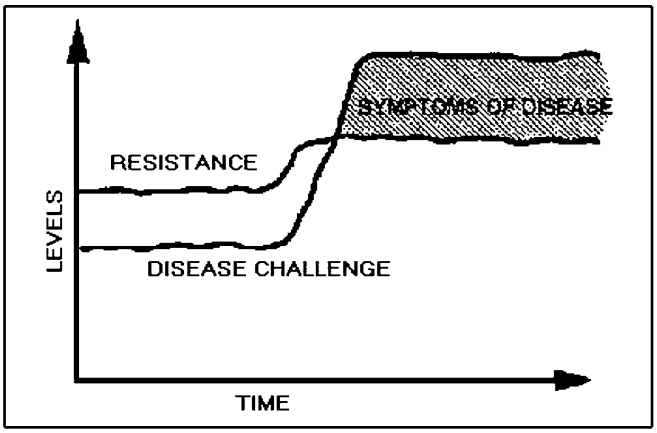

Figure 8.

The resistance level can be raised with vaccinations. If the occurrence of the disease challenge can be predicted, the resistance level can be raised before the challenge occurs. Once the herd has been initally vaccinated against a disease, periodic booster vaccinations administered before the disease challenge occurs will generally be sufficient (Figure 9).

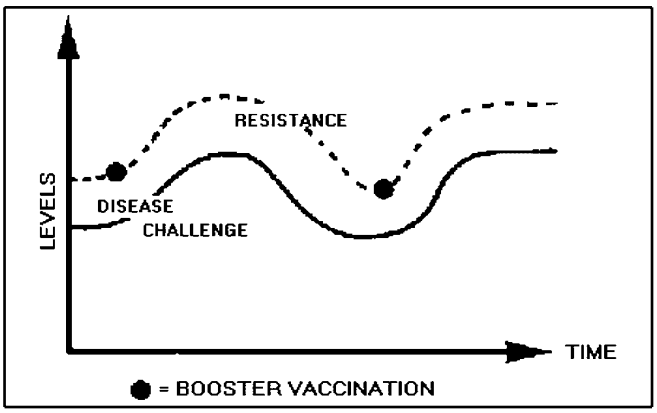

Figure 9.

An example of such a prediction is vibrio. Normally a re-booster is administered just prior to the breeding season to raise the cows resistance level to the vibriosis challenge. However, if the disease challenge lasts longer than the increased resistance level, protection is no longer available and a problem occurs (Figure 10).

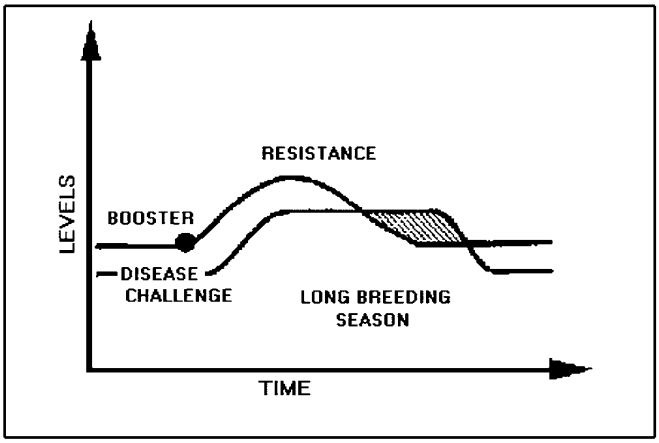

Figure 10.

In other cases, the booster vaccination may be given too early and the elevated resistance may not last through the up-coming disease challenge period (Figure 11).

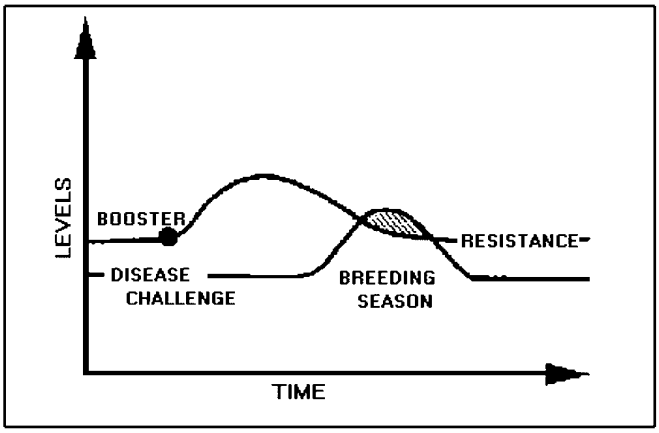

Figure 11.

Why do things like this happen? Because the health does not fit the cattle operation. For example, take a look at the adult cow cycle in a herd with a 60-d breeding season (Figure 12).

A herd health program can be easily adopted into this operation; the management provides many opportunities to gather cattle and adopt health procedures into the adult cow herd: 1) at pre-calving; 2) pre-breeding; 3) pre-weaning; and 4) post-weaning.

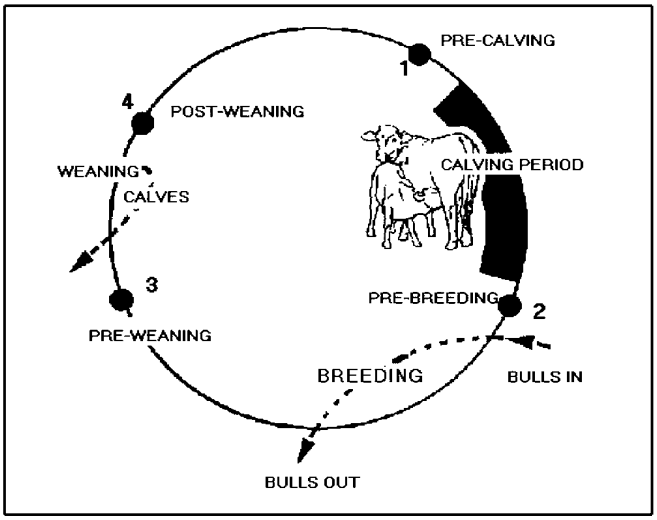

Figure 12.

To booster vaccinate this herd against vibriosis, the most opportune time would be between calving and breeding, the pre-breeding window (Figure 13).

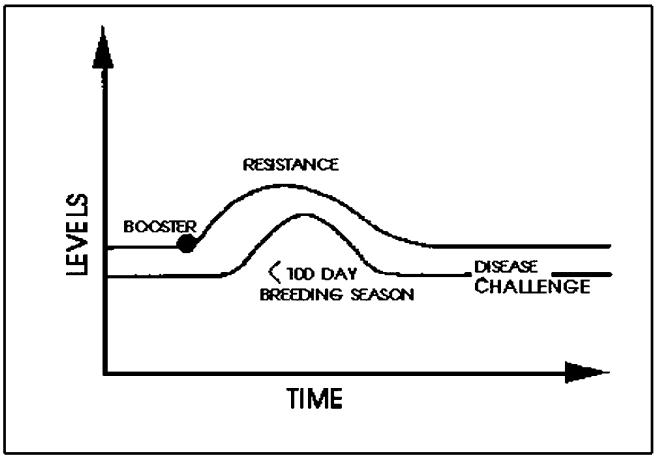

Figure 13.

If the breeding season is extended, the pre-breeding window available is lost. Thus, an excellent opportunity to booster vaccinate the herd for vibriosis immediately before the breeding season is lost (Figure 14).

When forced to vibrio booster the cow herd at the pre-calving window rather than the pre-breeding window, the resistance level stimulated by the vibrio booster probably will not last as long as necessary. Because of this there may be a requirement to re-booster the vibrio vaccination during the breeding season to extend the resistance level (Figure 15).

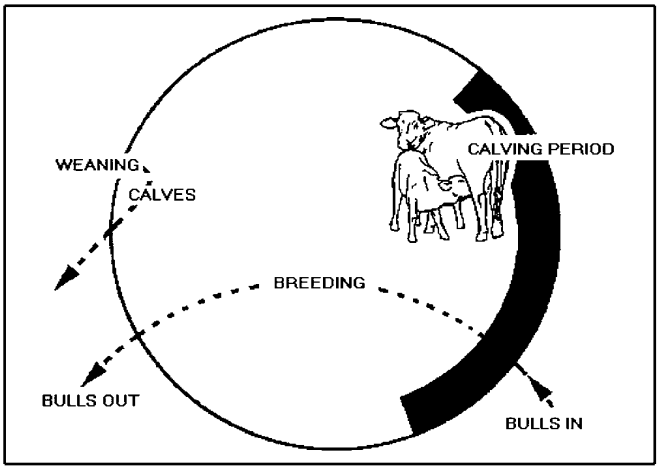

Figure 14.

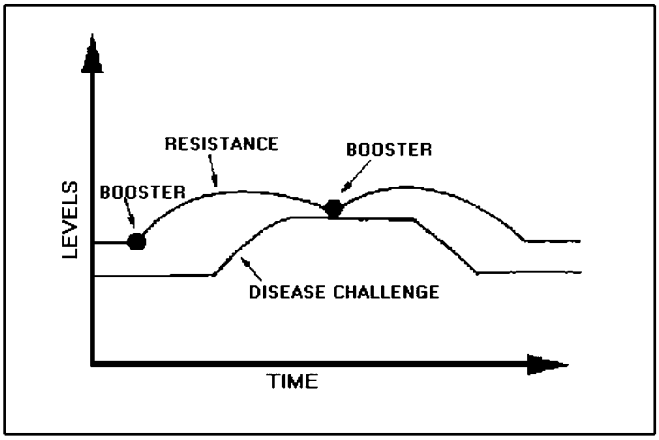

Figure 15.

If vibriosis is a problem in the herd, this more-or-less dictates when two of the "cow-workings" will occur (Figure 16).

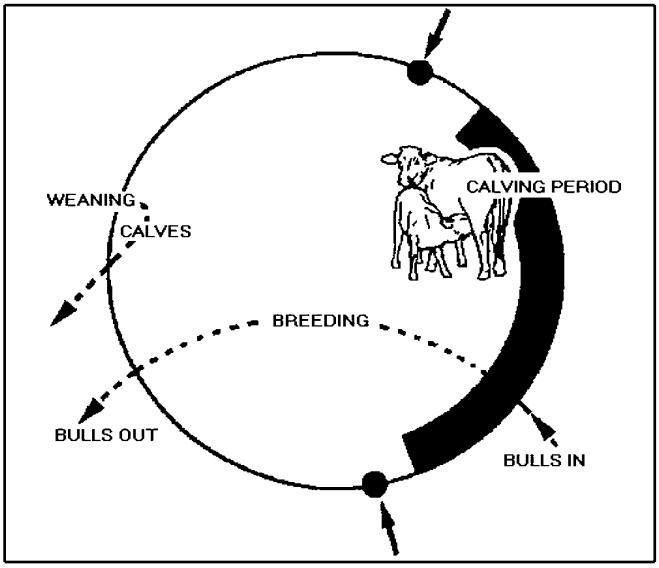

Figure 16.

A herd that has year-round breeding complicates attempting to provide year round resistance against vibriosis (Figure 17).

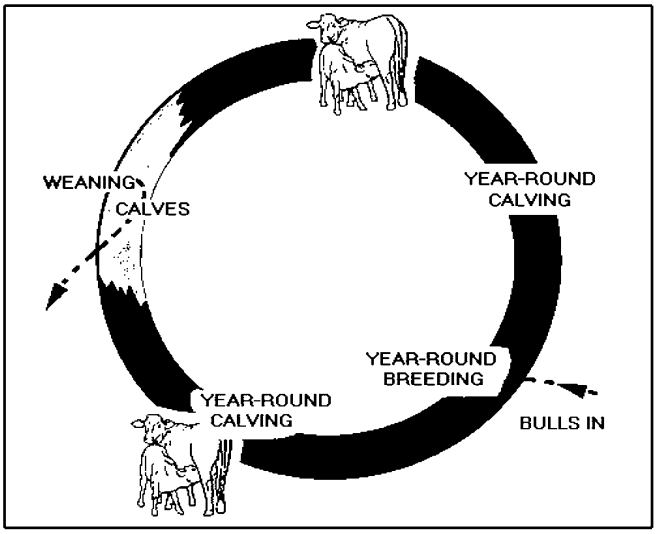

Figure 17.

Although not an efficient approach, protection can be provided by re-boostering several times during the long disease challenge period (Figure 18). In this case, during the breeding season.

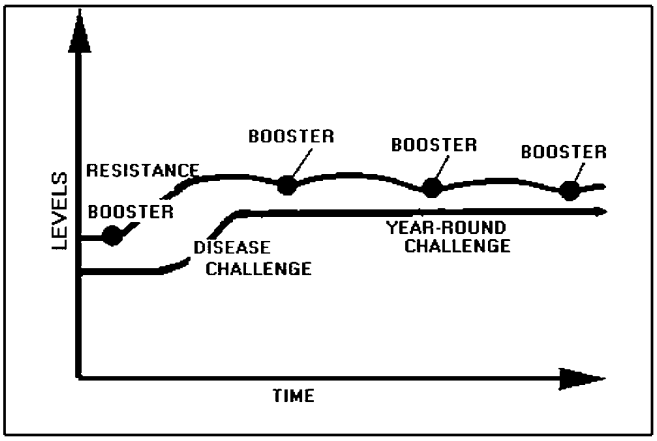

Figure 18.

Another alternative is to select a vaccine with an adjuvant that provides a longer "depot-effect" thus prolonging the antigenic stimulus to the body. This results in higher/prolonged blood antibody levels in the animal; thought to be indicative of higher/prolonged resistance levels (Figure 19).

A good rule-of-thumb: the longer the "depot-effect" the higher the resistance level or the longer the resistance level and the higher-the-price. Many management systems will allow a booster

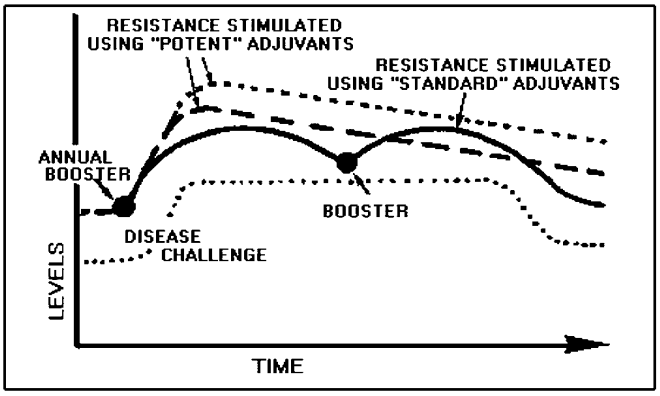

Figure 19.

vaccination at the needed time with a vaccine that has a less expensive adjuvant, whereas other management systems may require vaccines with the more expensive adjuvant.

DISEASE CHALLENGES

Disease challenges include infectious diseases, parasite diseases, nutritional diseases, toxic diseases, and many more. Disease challenges not only kill cattle; they also reduce production and reproduction, are a threat to the fetus, and are a danger to new-born calves. Herd health is to prepare today for what may or will occur tomorrow; herd health is "preventative" medicine, not "fire-engine" medicine.

Whether it be the adult cow herd, the bull battery, the calf crop, or the replacement heifers; a health program for the entire herd can be designed that will interact between each group. The basic principles are:

1. Keep it simple: recognizing the disease challenges, knowing when they occur and then raise the resistance and/or reduce the challenge;

2. Understand the beef cattle cycles; and

3. Make the health fit the cattle operation.

The first step in designing a preventive herd-health program for a particular beef herd is to "understand the beef cattle cycles". How do the cycles for the different classes within the herd interact? A graphic representation of the beef herd can be very advantageous, not only for the veterinary practitioner but for the herd managers as well. Beef cows and breeding bulls function in 12 mo cycles

rather than linear calendars; replacement heifers enter cycles of 24 to 36 mo depending upon age of breeding. The herd can be represented graphically as overlapping circles, eclipses and curves showing where the different classes that overlap, are combined, or separated. Within each class there are important periods such as the "calving period", "breeding season", and "weaning". Dates added to these occurrences and activities greatly enhance the graphic representation. Figure 20 is an example of an overview of a beef herd with a breeding season of 100-110 d. Addition of dates for the beginning and end of the calving periods and breeding seasons, the date of calf weaning, and the age at which replacement heifers are bred, results in an overview that provides a quick reference as to how the herd is managed.

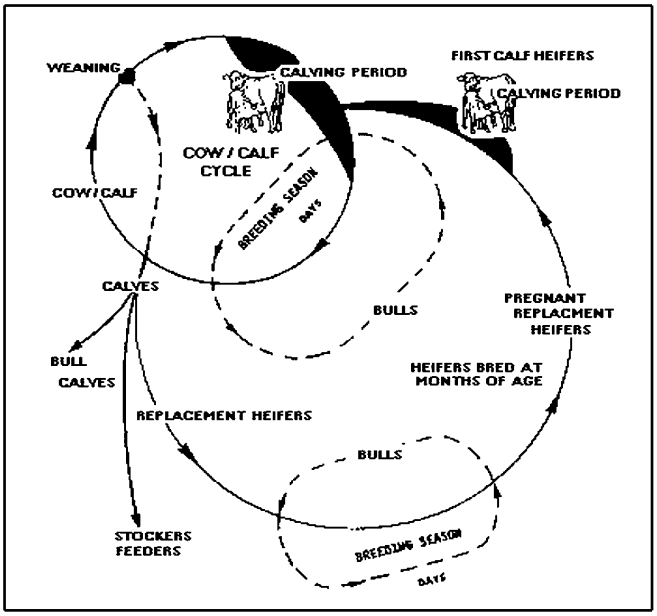

Figure 20.

The next step in designing a preventive herd-health plan is to recognize the disease challenges to which the herd is exposed or can be potentially exposed to. In Florida, the following list (Table 1) of disease challenges is routinely considered; however, not all ranches are exposed or potentially exposed to all the listed disease challenges and will be deleted as required.

The potential disease challenges can be categorized into one of your basic categories, each signified with a number and a brief explanation as to how the category affects the herd or what can be accomplished by controlling the category of disease challenges (Table 2 and Figure 21).

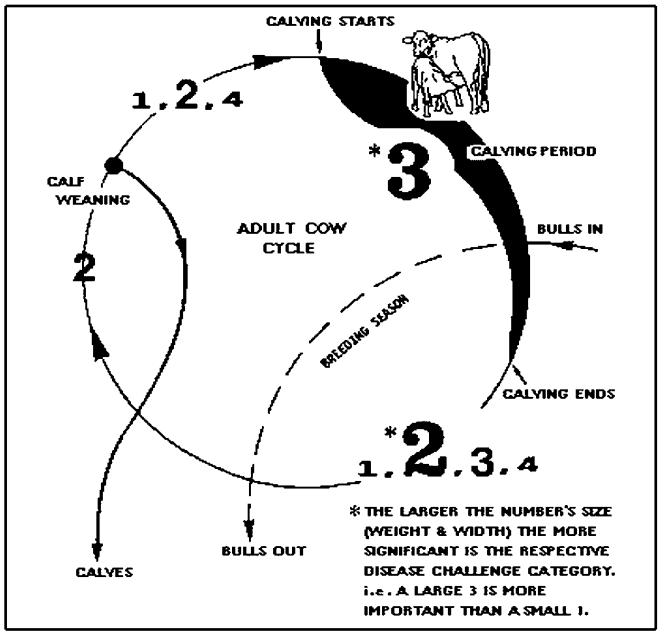

Figure 21.

The category of disease challenges that affect each class of cattle and the diseases that fit within category can be listed. Importantly, identify the disease challenges and when they occur. For the adult cow, defined as any female that has calved, all four categories of disease challenges, and the individual challenges associated with each category are listed (Table 3). The challenges occurrence are illustrated for the adult cow cycle. The following Table 3 and Figure 21 illustrate the categorized disease challenges and when they occur in the adult cow herd. The larger the physical size (height and width) of the number on the diagram, the more important the respective disease challenge category at that time of the cycle (Figure 21).

PLANNING A HERD HEALTH PROGRAM

When planning a health program for the calves, survival and development are the greatest concerns. Therefore, categories #1 (Survival and Development) and #3 (Protection for the New-Born Calf via "Fortified" Colostrum) and the individual disease challenges are listed that are associated with these two categories (Table 4). The challenge categories are graphically illustrated for the calf portion of the herd cycle (Figure 22).

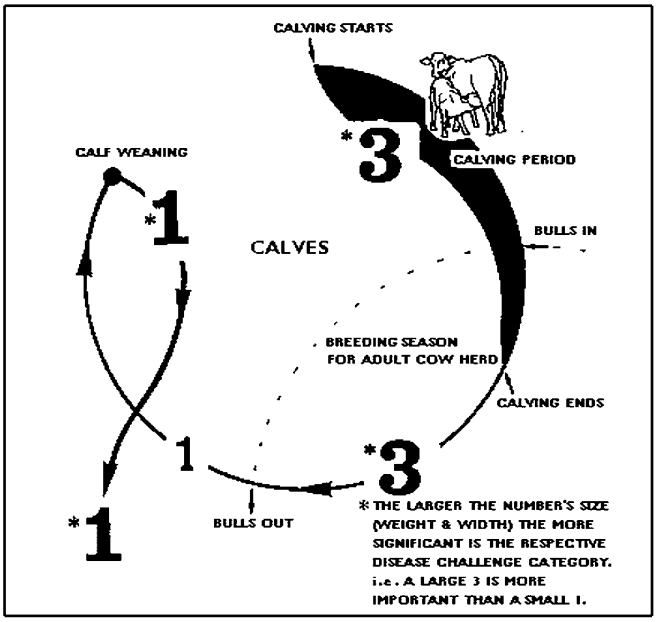

Figure 22.

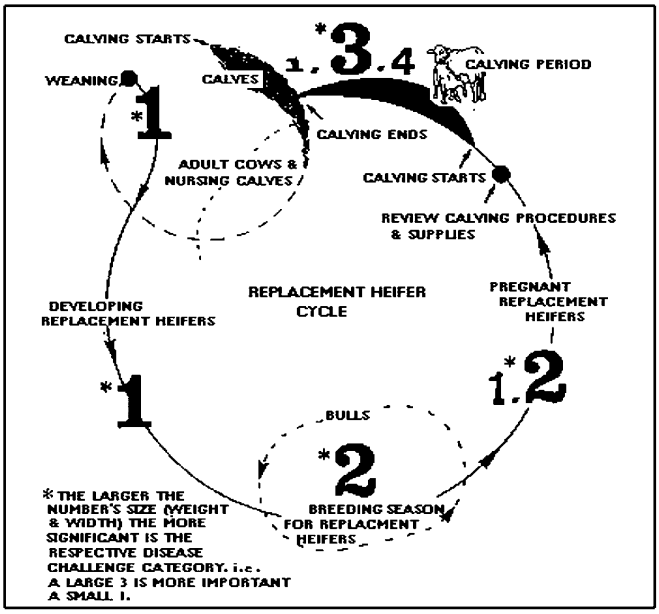

Figure 23.

Health programs for the replacement heifers, much like the adult cows, include consideration for all four categories of disease challenges. However, unlike the adult cows, category #1 (Survival and Development) is a major issue in the young heifer. As the heifer develops and begins to be looked upon as a breeding animal, categories #2 (Reproduction and Fetus Protection) and #3 (Protection for the New-Born Calf via "Fortified" Colostrum) become very important with category #1 decreasing in significance. For the replacement heifer, the implementation of coverage against categories 1, 2 and 3 in reality have provided coverage for category #4 (Disease Barrier for the Herd). As the replacement heifer develops into an adult cow, the same disease challenges will continue to occur; however, the affect of those challenges may change. Once a heifer reaches adulthood, the chances of her dying from certain infectious diseases is greatly reduced. Only the reasons to protect her against disease challenges changed; the need to protect her remains. Table 5 and Figure 23 illustrate the categories of disease challenges, the diseases associated with each category, and the occurrence of the challenges in the replacement heifer cycle.

In most commercial beef herds, new bulls are purchased each year to provide a continuing improvement of genetic traits and to prevent inbreeding. Because the bulls originate outside the herd, category #1 challenges (Survival and Development) are important issues immediately after purchase and category #4 challenges (Disease Barrier for the Herd) become major considerations when the new bulls join the existing bull battery and breeding females.

Finally, category #2 (Reproduction) occurs when the bulls are added to the breeding females. Category #1 challenges (Survival and Development) become less important after the bulls have been with the herd for several seasons. Table 6 and Figure 24 illustrate the categories of disease challenges, the diseases associated with each category, and the occurrence of the challenges in the breeding bull cycle.

The health program needs to be designed to complement the management of the herd. It is extremely difficult to begin a health program by requiring numerous management changes. Management changes can come later; concentrate on trying to make the health program fit the existing management. Basically, the information needed to begin drafting a preventative health program is:

- Dates that the breeding season begins and ends in the cow herd?

- Predominant breed of cattle in the herd.

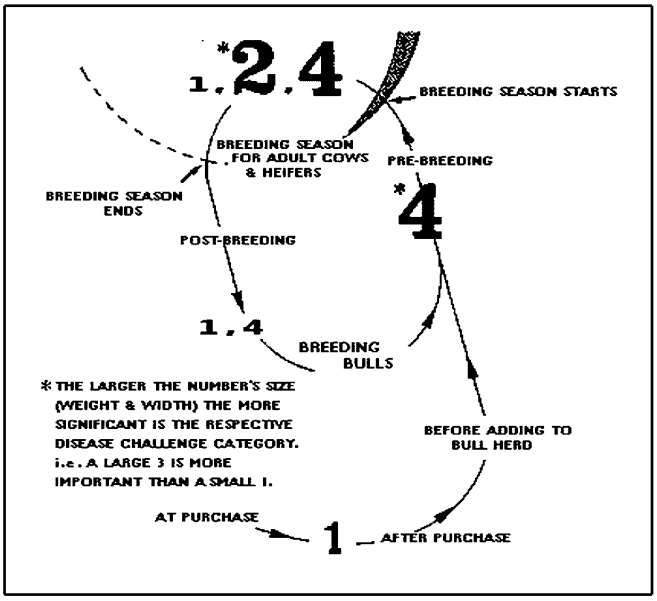

Figure 24.

- When are cows gathered for routine processing? Cows are gathered when their nursing calves are gathered.
- What is the anniversary date for the herd's Brucellosis Free Certification?
- Are calves normally creep fed prior to weaning?
- When are calves routinely worked? Remember that nursing calves are gathered when the brood cows are gathered for processing.
- Approximate date of calf weaning.
- Is ownership retained on weaned feeder calves or are the feeder calves marketed through a commingled market system or direct marketing system?
- Age at which replacement heifers are bred.
- Dates that the breeding season begins and ends in the replacement heifers?
- Are breeding bulls purchased or raised from herd calves?
- Are there any diseases that have been a problem in the past?

The veterinarian that has been involved with this operation should know what disease challenges must be guarded against. Make a list of the challenges and categorize them into types of challenges. Construct cycles, add the appropriate dates, and mark the locations when the respective class of cattle are gathered or worked. The big question is: are the times cattle are gathered conducive to adding an adequate preventive medicine program to the herd? To answer this, remember the rules to keeping health simple are: 1) recognize the disease challenges; 2) know when they occur; 3) and then raise the resistance and/or reduce the challenge.

If the cattle working times, designated working windows, allows one to follow these rules, then an adequate preventive medicine program for the herd can be designed.

EXAMPLES

For demonstration purposes, the following five diagrams represent a simple health program that has been designed for a 2500 head commercial cow-calf operation in south Florida (Figure 25, Figure 26, Figure 27, Figure 28, Figure 29). The following information was gathered in an interview with the manager of this operation:

- Adult cows are bred from February 1 through May 22 (calculates to 110 d breeding season).

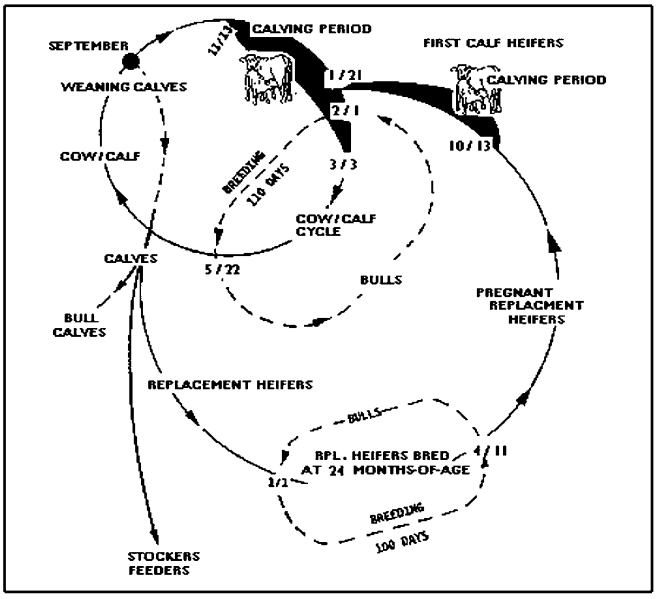

Figure 25.

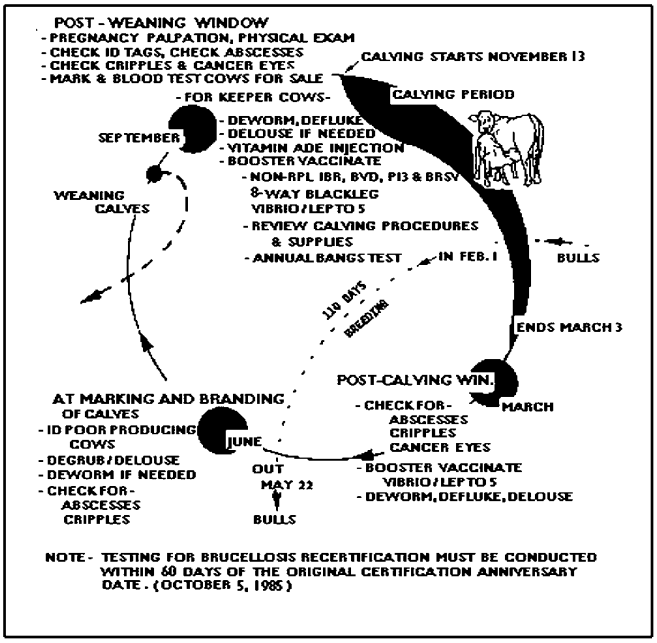

Figure 26.

- The predominant breed of cows is Hereford (average length of gestation = 285 d). Calving season for the adult cows begins on November 13 and lasts through March 3.

- Cows are routinely processed in September following calf weaning. Cows are also gathered at calf processing in March and June.

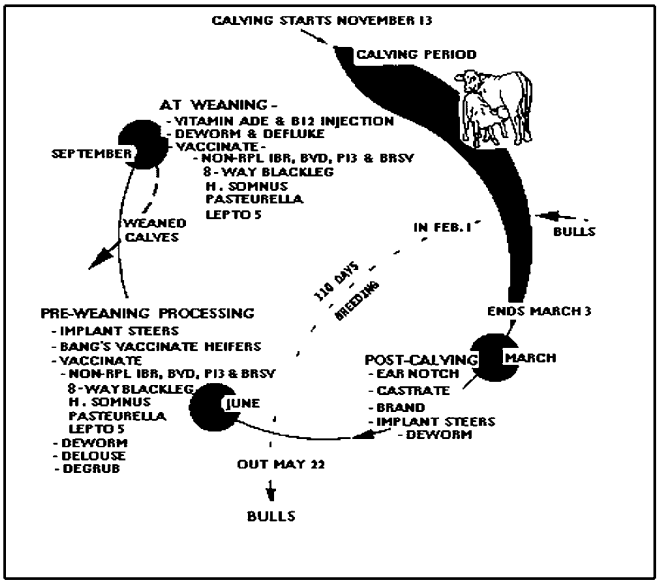

Figure 27.

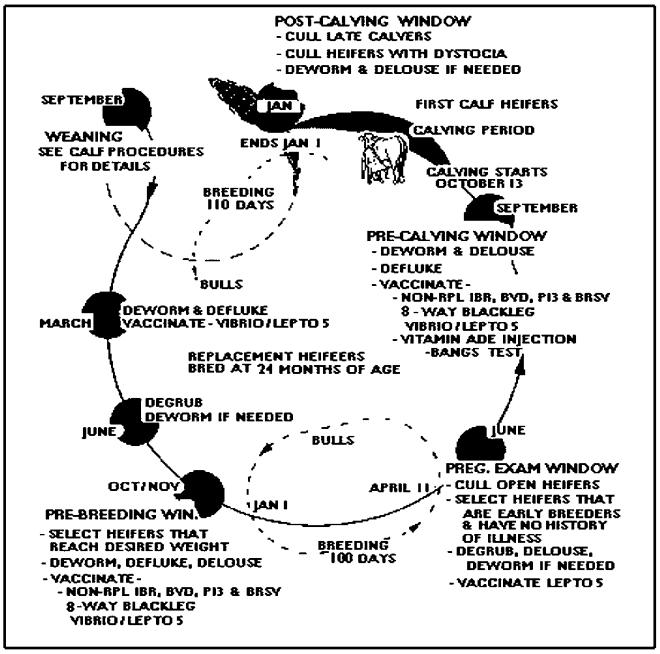

Figure 28.

- October 5 is the anniversary date for the herd's Brucellosis Free Certification.

- The calves are not creep fed prior to weaning.

- Calves are routinely worked in March, June and at weaning in September.

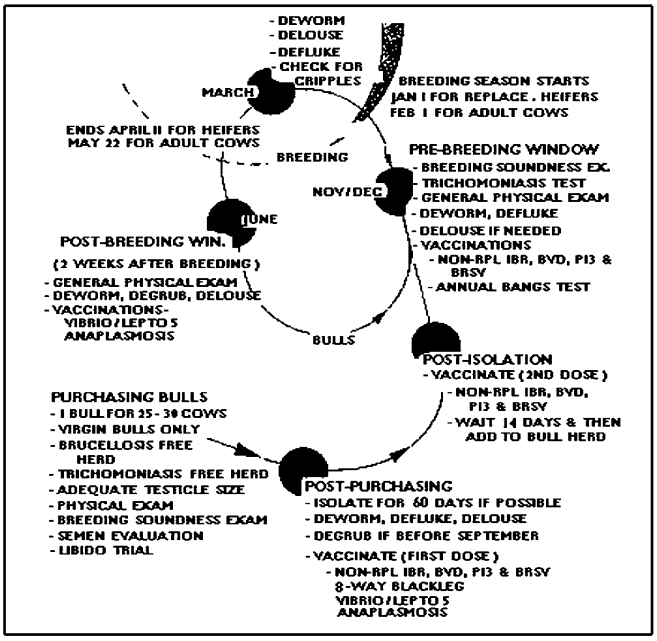

Figure 29.

- September 1 is the approximate date of calf weaning.

- The calves are usually contracted and are shipped directly to an out-of-state buyer.

- Replacement heifers are bred to calve as 3 yr-olds (bred at approximately 24-26 mo of age).

- Breeding of replacement heifers begins 31 d before the cow herd on January 1. The heifers' breeding season last through April 11 which calculates to be 100 d in length. Heifer calving begins October 13 and lasts through January 21 for 285 d gestation.

- Breeding bulls are purchased for this operation.

- Redwater, vibriosis, and leptospirosis has been a problem in the cow herd. Purchased bulls have experienced severe challenges of anaplasmosis. Nursing calves have died with blackleg and weaned calves have exhibited pneumonia problems after shipping; just recently, BRSV was diagnosed in the shipped calves.

Based upon history of surrounding herds and personal experience the producer and veterinarian considered the following list of potential disease challeges on the beef herd:

Infectious Bovine Rhinotracheitis (IBR)

Bovine Virus Diarrhea (BVD)

Parainfluenza Virus - 3 (PI-3)

Bovine Respiratory Syncytial Virus (BRSV)

Haemophilus somnus

Pasteurella

Clostridial Diseases (7-way Blackleg)

Redwater

G/H/P/I/C Leptospirosis

Anaplasmosis

Vibriosis

Trichomoniasis

Brucellosis

E. coli Scours

Rotavirus

Coronavirus

G.I. Worms

Lung Worms

Grubs

Lice

Flukes

Coccidia

Individual animal examination and history of diseases in the general area allowed deletion of

certain disease challenges from the initial herd health plan. To allow the herd health to be managed using this plan the herd first had to be properly vaccinated for appropriate diseases and treated for external and internal parasites. For the adult cows and bulls, the initial vaccinations were administered during calf working times.

Preventative health program presented in this manner are more easily understood, easily followed, and easily referenced. Alternatives that have included lengthy manuscripts, confusing calendars, and excessive detail have proven to be less effective. Most beef cattle producers will not use overly cumbersome health plans. Well designed health programs allow the beef producers to concentrate on improving herd genetics, pasture management, and marketing calves. For additional information on designing herd health programs see Howard (1986) and Radostits and Blood (1985).

LITERATURE CITED

Howard, J.H. 1986. *Current Veterinary Therapy - Food Animal Practice 2*. W.B. Saunders Co., Philadelphia, PA.

Radostits, O.M. and D.C. Blood. 1985. *Herd Health*. W.B. Saunders Co., Philadelphia, PA.

Table 1. Potential Disease Challenges on the Beef Herd.

Infectious Bovine Rhinotracheitis (IBR)
Bovine Virus Diarrhea (BVD)
Parainfluenza Virus - 3 (PI-3)
Bovine Respiratory Syncytial Virus (BRSV)
Haemophilus somnus
Pasteurella
Clostridial Diseases (7-way Blackleg)
Redwater
G/H/P/I/C Leptospirosis
Anaplasmosis
Vibriosis
Trichomoniasis
Brucellosis
E. coli Scours
Rotavirus
Coronavirus
G.I. Worms
Lung Worms
Grubs
Lice
Flukes
Coccidia

Table 2. Categorization of Potential Disease Challenges to all Classes of Cattle.

1	Survival and Development	
		Includes those challenges that cause death or retard development and growth or substantially reduce performance.
2	Reproduction and Fetus Protection	
		Includes challenges that will interfere with the reproductive performance of the animal or place the fetus of a pregnant female at risk.
3	Protection for the New-born Calf	
		Challenges that attack the new-born calf.
4	Disease Barrier for the Herd	
		Disease challenges which we must either keep at a "subclinical" stage or prevent from being introduced into the herd.

Table 3. Potential Disease Challenges on the Adult Cow and Categories Affected.

1 Survival and Developement	2 Reproduction and Fetus Protection	3 Protection for the New-born Calf[a]	4 Disease Barrier for the Herd
Redwater Anaplasmosis G.I. worms Lung worms Grubs Lice Flukes	IBR BVD H. Somnus Leptospirosis-5 Anaplasmosis Vibriosis Trichomoniasis Brucellosis G.I. worms Lung worms Grubs Lice Flukes	IBR BVD PI-3 H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 E. Coli Rotavirus Corona virus	IBR BVD PI-3 BRSV H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 Anaplasmosis Vibriosis Trichomoniasis Brucellosis G.I. worms Lung worms Grubs Lice Flukes

[a] provided via "fortified" colostrum

Table 4. Potential disease challenges on the calves and the categories affected.

1 Survival and Development	2 Reproduction and Fetus Protection	3 Protection for the New-born Calf[a]	4 Disease Barrier for the Herd
IBR BVD PI-3 BRSV H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 G.I. worms Lung worms Grubs Lice Flukes Coccidia	NOT APPLICABLE	IBR BVD PI-3 H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 E. Coli Rotavirus Coronavirus	NOT APPLICABLE

[a] provided via "fortified" colostrum

Table 5. Potential Disease Challenges on the Replacement Heifers and the Categories Affected.

1 Survival and development	2 Reproduction and fetus protection	3 Protection for the new-born calf[a]	4 Disease barrier for the herd
IBR BVD PI-3 BRSV H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 G.I. worms Lung worms Grubs Lice Flukes	IBR BVD H. Somnus Leptospirosis-5 Anaplasmosis Vibriosis Trichomoniasis Brucellosis G.I. worms Lung worms Grubs Lice Flukes	IBR BVD PI-3 H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 E. Coli Rotavirus Corona virus	IBR BVD PI-3 BRSV H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 Anaplasmosis Vibriosis Trichomoniasis Brucellosis G.I. worms Lung worms Grubs Lice Flukes

[a] Provided via "fortified" colostrum

Table 6. Potential Disease Challenges on the Breeding Bulls and the Categories Affected.

1 Survival and developement	2 Reproduction and fetus protection	3 Protection for the new-born calf[a]	4 Disease barrier for the herd
IBR BVD PI-3 BRSV H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 G.I. worms Lung worms Grubs Lice Flukes	IBR BVD H. Somnus Leptospirosis-5 Anaplasmosis Vibriosis Trichomoniasis Brucellosis G.I. worms Lung worms Grubs Lice Flukes	**NOT APPLICABLE**	IBR BVD PI-3 BRSV H. Somnus Pasteurella 7-Way Blackleg Redwater Leptospirosis-5 Anaplasmosis Vibriosis Trichomoniasis Brucellosis G.I. worms Lung worms Grubs Lice Flukes

[a] Provided via "fortified" colostrum