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Cattle Management Strategies To Minimize Foothill Abortion

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General Information on the Disease

The Pajaroello (pa-ha-WAY-lo) tick (fig. 1) transmits the deltaproteobacterium that causes Foothill abortion when the tick feeds on a pregnant cow or heifer. This soft-bodied tick resides in dirt or litter under trees and bushes, locations where deer and cattle typically bed down. It does not embed itself in animal flesh, but rather feeds rapidly (for as little as 20 minutes) and drops back onto the ground. A tick feeds every 60 to 90 days and can survive for years in a dormant state without taking a blood meal. The bite of the Pajaroello tick (and transmission of the agent that causes the disease) on nonimmune pregnant heifers or cows 100 to 145 days before giving birth can result in abortion or the birth of weak calves. The impact of tick feeding between conception and 60 days of gestation is unknown, but contraction of the disease at this stage may cause early embryonic loss or late-term abortion. Therefore, tick exposure should be minimized just prior to breeding and at any time early in pregnancy. The tick has been found in foothill areas of California, northern and central Nevada, and southeastern Oregon (fig. 2), as well as in Mexico, at elevations of 600 to 8,000 feet.

Figure 1. Pajaroello tick (Ornithodoros coriaceus). *Photo:* W. Suckow.

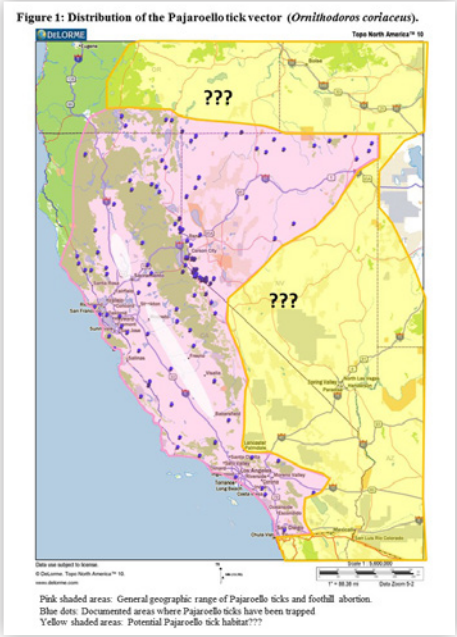

Figure 2. Distribution of the Pajaroello tick. Pink shaded area: General geographic range of Pajaroello ticks and Foothill abortion. Blue dots: Documented areas where ticks have been trapped. Yellow shaded areas: Potential Pajaroello tick habitat. *Source:* DeLorme Topo North America, used with permission.

Only a small percentage of ticks carry a sufficient number of the bacteria to infect cattle (Chen 2007; Teglas 2006). This concept is supported by how difficult it is to transmit Foothill abortion via artificial feeding of ticks on individual pregnant animals. Thus, it is probably not necessary or feasible to totally eliminate ticks from pastures to reduce losses from Foothill Abortion.

Although the disease occurs wherever the tick is present, it may not be recognized because tick numbers were not high enough to cause obvious losses, aborted fetuses were not recovered, or the disease was not diagnosed. Foothill abortion (and therefore the tick) appears to be moving north and east, based on outbreaks reported in southern Oregon. Any arid regions in the West with a thriving deer population could serve as habitat for the Pajaroello tick.

To develop management strategies that minimize the impacts of the disease you must know

- whether ticks are present in a pasture (identified by dry ice trapping; see below)
- the time when ticks are active (i.e., whether they were active in a pasture that a heifer or cow grazed 100 to 145 days before a calf was aborted or born weak) (fig. 3)
- the stage of pregnancy of a heifer or cow when grazing pasture where ticks may be present

Figure 3. Tick activity cycle.

Identifying Pastures that Have Pajaroello Ticks

Before any management strategies can be developed, you must identify pastures that have Pajaroello ticks. This can be done either by identifying ticks in bedding areas using dry ice (see below) or by identifying the pasture in which a cow was bitten (subtract the disease incubation period of 100 to 145 days from the date of the abortion or the birth of a weak calf).

Areas that May Have Ticks

Places in pastures where deer bed and where deer activity is obvious usually have the Pajaroello tick. If deer numbers are down in your area, you may need to ask others about what the local deer populations were several years in the past. Observe protected areas where cattle bed in hot weather. Ticks have been found under oak, pine (including pinyon pine), and juniper trees, manzanita, high brush, and protected outcroppings. Wet areas or irrigated pastures are usually free of the tick unless they have trees or brush on dry areas.

Using Dry Ice to Trap Ticks

Attracting Ticks

Dry ice can be used to attract Pajaroello ticks (see Hokama and Howarth 1977). This method works best in warmer weather and in pastures that cows have not grazed for at least 2 months. The dry ice gives off carbon dioxide (CO_2), which simulates a host animal's breathing. Ticks come to the dry ice from many feet away prepared to feed.

For best results, trap ticks during the peak tick activity period for the location. This will normally be May to October for most coastal and Central Valley areas and June to September in the Intermountain Area. Abnormally warm years can extend tick activity dates for 30 to 60 days. Collect ticks before livestock are placed in a pasture. Remember that ticks feed only every 60 to 90 days. Thus, if cattle or deer have been in the area prior to collection, the ticks may have already fed and will not be attracted to the dry ice. Field experience indicates that ticks probably will not be found in areas where ants are numerous, either because animals do not bed

there or ants may prey on the ticks. Wear gloves to handle the dry ice to prevent freeze burns.

Dry ice can be obtained from a variety of stores or markets or directly from ice distributors. Schedule dry ice deliveries, since it may not always be available on demand. Use an ice chest to store the dry ice during transport and collection. Dry ice can be stored in a freezer overnight if needed. Dry ice requires good ventilation because it can be dangerous to humans in a closed, confined area such as a car or a small room.

Place dry ice in deer and cattle bedding grounds under brush and trees. When working on hillsides, the downhill side of trees or shrubs is best. Avoid creek beds, flood plains, and wet areas. Wear protective clothing (high boots, long-sleeved shirts) to avoid personal tick exposure. Consider using a tick repellent on your socks and pant legs, since the aftermath of a Pajaroello tick bite can be quite painful.

Trapping Methods

One method uses a 1-inch-deep pie pan to carefully screen a relatively small area (fig. 4). Bury the pan so the edges are level with the ground surface. Place the dry ice on top of an inverted paper cup in the center of the pan. (If you place the dry ice directly on the bottom of the pan, the ticks may crawl onto the ice and be frozen.) The slick side of the pan prevents ticks from crawling out. Leave the site for 30 to 60 minutes before checking the pan for ticks.

Figure 4. Pajaroello tick collection with dry ice. *Photo:* Mike Oliver.

A second, faster, method is useful for screening a wide area. Under suspect trees, clear debris from the ground in a circle 18 inches in diameter and place a piece of dry ice 3 to 4 inches in size in the center of a white paper or cloth, which will make ticks easy to see. Select the next location within sight of the previous location, clear the ground, and place another piece of dry ice on a white paper or cloth. Repeat this procedure, moving in a circular or looping pattern in the pasture. Check each piece of dry ice every 10 minutes or so, as it will evaporate and eventually disappear. Look for ticks crawling toward or resting near the ice. The ticks may stop moving when you first walk up to the dry ice. Be patient. Moving ticks are best detected by looking slightly to one side of the suspected area instead of directly at it.

Cattle Management Strategies

Three management strategies can minimize Foothill Abortion: avoidance, changing breeding seasons, and regulating the exposure of cattle. Because each ranch is unique, management strategies should be clearly thought out by considering all factors involved in the economical production of cattle.

- Avoidance
  - ◊ Do not graze tick-infested pastures when heifers are under 6 months pregnant
  - ◊ Graze stocker steers through a pasture first
- Change breeding dates or season
- Exposure
  - ◊ Expose cattle to ticks before breeding
  - ◊ Expose cattle to the tick after 6 months of pregnancy
  - ◊ Both pre- and post-exposure are more effective in the mountainous areas of California than in the Central Valley and coastal areas.

An Important Disclaimer Regarding Tick Activity

When we talk about peak tick activity, we are referring to the season when ticks are most likely to transmit the bacteria if they bite cattle, which is usually the season when it is hot enough that cows bed in shade where ticks may be present. This season is the warm months of spring through fall. However, experienced personnel have collected the Pajaroello tick in every month of the year, even when there were still patches of snow on the ground. Researchers' work with ranchers strongly suggests that ticks begin transmitting the causative bacteria whenever daytime temperatures consistently reach 70°F or higher. This situation has unfortunately resulted in cattle aborting as the result of tick exposure that occurred during an unseasonably warm December or February.

Avoidance

Avoiding the ticks, and therefore the disease, can be accomplished by grazing cattle in pastures where they will not be exposed to ticks (such as irrigated pasture, wet meadows, or tick-free pastures identified by trapping) during the first 6 months of pregnancy. A short breeding season will make this method easier to implement. Another option is to run stocker cattle in the pasture first to graze off the best forage and get bit by the ticks. Given that ticks usually feed only every 60 to 90 days, this provides a two-month window that likely has a reduced exposure for grazing heifers or cows.

Change Breeding Dates

Calving dates were traditionally oriented to match range resources so that breeding would occur during the highest nutritional phase of the year. Altering the breeding season can reduce the risk of tick exposure to pregnant cattle. For example, in the Intermountain Area, the best time to breed cattle to avoid tick activity would be in the fall (see fig. 5); in the inland valleys, the best time for breeding would be in the spring (see fig. 6).

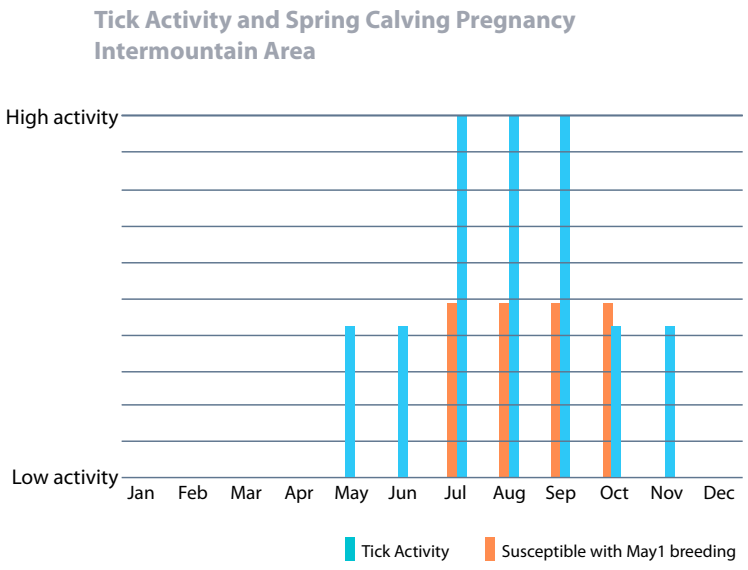

Figure 5. Tick activity and spring calving pregnancy in Intermountain Area.

Pre-Breeding Exposure of Heifers

Heifers can be exposed to the tick before breeding, causing them to develop immunity to the disease. Recent research (Stott 2016) suggests that animal age and sexual maturity do not influence the ability to develop immunity following infection. The impact of maternal immunity on the ability of calves to develop natural and long-term immunity is unknown. Given that antibodies are not the primary immunologic mechanism of immunity, the impact of maternal immunity is probably negligible.

More likely, development of immunity in calves and weaners depends on how much tick exposure they receive prior to breeding. Pre-exposure has been used in coastal areas of California; the degree of success of pre-exposure depends on the density and feeding habits of the ticks. Pre-exposure may also require a change in grazing patterns, reserving the worst tick-infested pastures for use by heifers. Operations with both spring and fall calving have incorporated switching replacement heifers from one herd to

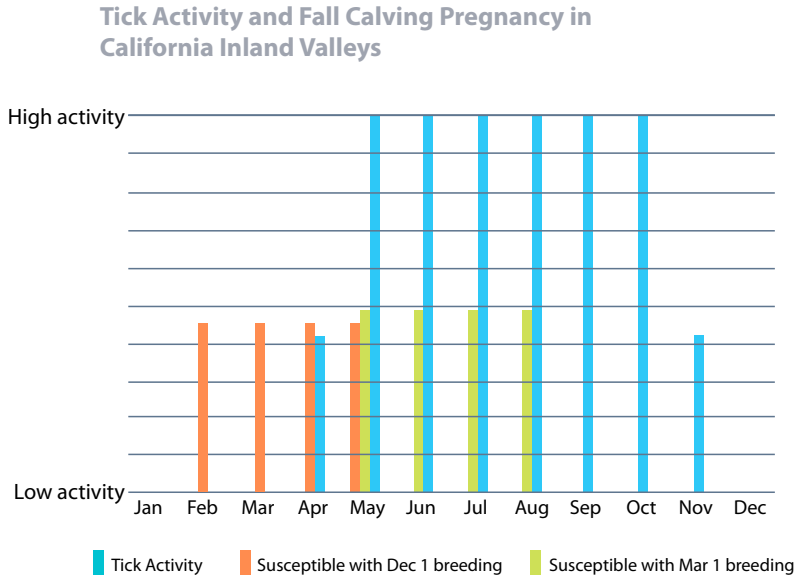

Figure 6. Tick activity and fall calving pregnancy in California inland valleys.

the other and breeding at 18 months of age to minimize Foothill abortion. For example, heifers from a spring herd can be bred at 18 months of age in a fall herd, which had the advantage of avoiding tick activity in the Intermountain Area during the susceptible period. Heifers from the fall herd are bred at 18 months and exposed to ticks during the summer prior to breeding in the fall. This system decreases Foothill Abortion, but it requires 6 extra months before obtaining a return on investment. The cost of this delay should be compared with the losses from Foothill Abortion.

Post-Breeding Exposure

Keeping heifers and/or cows in pastures not infested with ticks until all of the cows are beyond the sixth month in pregnancy, then placing them in pastures with high numbers of ticks can increase natural immunity to Foothill Abortion while having minimal or no impact on the majority of fetuses. This strategy may not meet vegetation goals on public or private lands. The success of this strategy depends on the tick activity during the period of exposure and the number of ticks that are within the rangeland.

Loss of Immunity

As with vaccinations that require annual booster shots, immunity to the bacteria that causes Foothill abortion requires the cow to be exposed to tick feeding annually or bi-annually (boosted) in order to continue that immunity. Studies have shown that immunity lasts at least 2 years but will likely wane over time unless the cows are re-exposed (Stott 2016). Tick density undoubtedly impacts the length of immunity. Only a small percentage of ticks carry sufficient numbers of bacteria to transmit disease; therefore, movement of cattle through tick habitat does not guarantee exposure. Cattle that aborted in the past may produce a second abortion upon being returned to Pajaroello tick habitat.

An Intermountain Area Management Example

A Lassen County ranch near Susanville had a level of 50% Foothill Abortion. These cows calved in February and March and were grazed on Forest Service permits in the mountains. The ranch had a four-pasture system on their Forest Service summer range. By subtracting 3 to 4 months from the time of the abortions and dry ice tick trapping, one pasture was found to be the major tick source. Ranchers created a September to October calving herd to run in this pasture that would be over 6 months pregnant when they were exposed to the tick. The spring-calving herd grazed the other three pastures with lower tick populations. The tick-free pastures were comprised mostly of meadows, and the tick-infested pasture was predominantly timber or brush with rock outcroppings. Also, the spring-calving herd calving date was moved from March to April. The spring-calving cows went on the Forest Service pastures on June 1. The combined efforts of this strategy reduced the ranch's Foothill Abortion rate to near zero.

Since each ranch is a unique operation, you may want to discuss the various solutions and their financial impacts with your local veterinarian and UCCE Livestock Farm Advisor.

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