

UNIVERSITY OF CALIFORNIA
AGRICULTURE & NATURAL RESOURCES

SIERRA FOOTHILL RESEARCH & EXTENSION CENTER

Presents:

Annual Beef & Range Field Day
Beef Cattle Management



APRIL 5, 2008

In Cooperation With:

University of California Cooperative Extension
Dept. of Animal Science, UC Davis
California Animal Health & Food Safety (CAHFS) Toxicology Laboratory
School of Veterinary Medicine, UC Davis

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Beef and Range Field Day: Beef Cattle Management
UC Sierra Foothill Research & Extension Center
Saturday, April 5th, 2008

Agenda:

- 9:30 AM **Welcome and Introductions** – Art Craigmill, Director, SFREC
- 9:45 AM **Intro (Economics) and Grazing Management** - Jim Oltjen, Extension Specialist, Animal Management Systems, UC Davis
- Is there a cheaper way to supplement protein and energy?** – Roberto Sainz, Assoc Professor, Dept of Animal Science, UC Davis
- How to Determine Forage Quantity and Quality** – Roger Ingram – UCCE Farm Advisor, Placer/Nevada Counties
- Use of Alternative feedstuffs in your Beef Operation** - Glenn Nader, UCCE Farm Advisor – Yuba/Sutter/Butte Counties
- How do you monitor your animal's condition?** John Maas, Extension Veterinarian, School of Vet Med, UC Davis
- 11:00 **Animal Health (How to keep animals alive when Veterinary Care is unavailable?)**
- SFREC Animal Health Program** –John Maas, Extension Veterinarian, School of Vet Med, UC Davis
- Pinkeye – Recognition, Treatment, and Prevention** - John Angelos, Asst Professor, School of Vet Med, UC Davis
- Recognizing and managing common health problems of beef cattle** - Bruce Hoar, Asst Professor, School of Vet Med, UC Davis
- Foothill Abortion (EBA)** – Jeff Stott, Professor, School of Vet Med, UC Davis
- Poisonous Plants and Oak Toxicity** – Birgit Puschner and Bob Poppenga, California Animal Health & Food Safety Lab System, Davis, CA
- Noon** **Tri-tip BBQ Lunch** – Served by the Yuba-Sutter Cowbelles and SFREC Staff
- 12:20 **California Cattlemen's Association Officers – Industry Update**
- 1:00 **Concurrent Workshops – Repeated 3 Times**
- Poisonous Plants** – Birgit Puschner and Bob Poppenga, California Animal Health & Food Safety Lab System, Davis, CA
- Information on the SFREC Website** – Dustin Flavell, SFREC Superintendent
- Low Cost Supplementation of Protein and Energy** – Roberto Sainz, Assoc Professor, Dept of Animal Science, UC Davis
- Chute Side Health** – John Maas, Extension Veterinarian, School of Vet Med, UC Davis and Bruce Hoar, Asst Professor, School of Vet Med, UC Davis
- 2:30 **Adjourn**

For more information about the Sierra Foothill Research & Extension Center, go to:
<http://groups.ucanr.org/sierrafoothill/>

**Annual Beef & Range Field Day Proceedings
April 5, 2008**

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Is there a cheaper way to supplement protein and energy?

R. D. Sainz¹, R. B. Monteiro², L. F. B. Carvalho³, L. R. A. Sodré⁴, G. D. Cruz¹, D. M. Myers¹, J. W. Oltjen¹, and M. Arana⁵

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ABSTRACT: California's range livestock industry depends upon foothill rangelands as the main forage source, but due to its Mediterranean climate this is subject to marked seasonal variations in forage availability and quality. The inadequate quality during summer and quantity of forage during fall and winter season requires costly feed supplementation to balance deficiencies in protein, energy and minerals to maintain adequate performance. This abstract reports on a three-year study that evaluated one commercial and two low-cost supplements for weaned heifers grazing dry summer range. The supplements were: a commercial molasses-protein tub (COM; 30% CP), a dry high protein/energy/mineral mix (UCD-DR; 54% CP) and a home-made low-moisture molasses-based tub supplement (UCD-TUB; 64% CP). In each June of 2005, 2006, and 2007 60 weaned replacement Angus-Hereford heifers (240 ± 2.2 kg BW) were stratified by BW and allocated randomly to six groups: two supplement types, with three replicates (pastures) of 10 heifers for each treatment. Supplement treatments were COM and UCD-DR in 2005 and 2006; and UCD-DR and UCD-TUB in 2007. Heifers were allowed free-choice access to both supplements (using self-feeders for UCD-DR) at all times. Supplement intakes and daily costs averaged 547, 412 and 425 g/d (SD = 141, P = 0.21) and \$0.331, \$0.199 and \$0.173 (SD = 0.0835, P = 0.015) for the COM, UCD-DR and UCD-TUB groups, respectively. Heifers' ADG were 78, 309 and 284 g/d (SD = 97.0, P = 0.001) for the COM, UCD-DR and UCD-TUB groups, respectively. Providing protein/energy/mineral supplementation to heifers grazing dry summer range maintained ADG as expected. The dry mix tended to produce greater ADG, despite being consumed at a similar rate to the home-made molasses-based tubs. Both UCD supplements produced superior gains to the commercial product, at substantially lower cost. Producers can maintain performance and reduce costs of production on California annual range by formulating and mixing their own feed supplements.

Introduction

California's foothill rangelands make up the primary forage source for the state's extensive livestock industries. This region is subject to a Mediterranean climate, characterized by hot dry summers and cool wet winters. Forages are typically annuals that germinate with first rains in the fall, have slow or no growth in winter and rapid growth in spring. These grasses and forbs typically set seed and die by summer, so that summer/fall forage is standing dead material.

Qualitative and quantitative seasonality of forage availability presents challenges to producers in attempting to match the herd's nutritional requirements with the supply. This is particularly difficult during the dry season (summer), but also in fall and winter. According to George et al. (2001a,b), dry or cold conditions in fall and winter impair green forage production, which will be classified as poor quality and range supplementation may be necessary to maintain cattle performance. In summer, residual dry forage from the previous growing season is commonly available for grazing and provides energy but is low in protein and other vital nutrients. The leaching of nutrients by precipitation further decreases the nutritional quality of this 'standing hay', which reduces digestibility, dry matter intake, and animal productivity. Therefore, optimal management of livestock grazing California foothills annual range requires strategies to overcome deficiencies of protein, energy and essential minerals throughout most of the year. Most producers adopt a variety of strategies, including feed supplements, use of irrigated pastures in summer, and moving cattle to mountain meadows, all of which represent major costs of production. Therefore, development of cost-effective supplementation strategies for grazing livestock is essential to improve economic viability of the range livestock enterprise and optimize the nutritional balance and well-being of the animals.

The objectives of this study were to

- Compare growth performance of fall-born weaned heifer calves grazing dry summer range under different types of supplementation;
- Evaluate the effects of supplementation with a commercial (tub) protein/energy/mineral supplement or a low-cost UCD protein/energy/mineral formulation
- Conduct a cost-benefit study of the different supplementation strategies.

Materials & Methods

This study was conducted at the UC Sierra Foothill Research and Extension Center (SFREC), located near Browns Valley, California. The SFREC started monitoring seasonal productivity in 1979–1980 and reports an average annual production of 2,800 lb/ac (3,136 kg/ha) with a low of 1,071 lb/ac and high of 4,696 lb/ac (1,200 and 5,260 kg/ha, respectively). The average annual precipitation at SFREC during this period was about 31.5 inches (800 mm). The average precipitation at SFREC since rainfall records were started in the 1960s was 28.9 inches (734 mm) (George et al, 2001a). The annual means for temperature and relative humidity are about 25°C and 85%, respectively.

In 2005, 2006 and 2007, calves were weaned in May or June. Each year, 60 heifer calves were stratified by weight and assigned randomly to one of 6 groups: 2 supplement types x 3 replicates of 10 heifers each. Each group was placed in a separate pasture and given free choice access to one of two supplements: in 2005 and 2006, these were fed either a commercial molasses-based tub (30% crude protein) or a mixture formulated by us and prepared by A. L. Gilbert Co. (UCD-DR; 54% crude protein); in 2007 they were fed either COM-DR or a molasses-based tub (UCD-TUB; 64% crude protein) formulated and mixed at UC Davis (Table 2).

Animals were weighed with no shrink at weaning, and at the beginning, middle and end of the grazing period in September of each year. All feed supplement offered and refused was weighed to estimate average intake for each group. Average daily gains were calculated as the slope of the regression of individual body weight on time. Data were analyzed by one-way ANOVA with supplement type as the main effect and pasture replicate as the experimental unit (Minitab, Inc., State College, PA).

Results & Discussion

Table 1 shows the composition of a composite sample of dry range forage in July 2005. The crude protein value is below the required level (7%) to support rumen microbial growth (Poppi et al., 1995). At that level of protein, microbial growth would be sub-optimal, limiting rate of cell wall digestion and therefore intake and animal performance. Other nutrients that appeared below animal requirements include phosphorus and copper. Therefore, the UCD-DR and UCD-Tub supplements were formulated to correct these deficiencies at low (< 0.5 kg/d) intakes (Table 3).

In 2005 and 2006, heifers consumed similar amounts of the commercial tub and UCD-DR supplements (0.547 and 0.412 kg/d, respectively). Average daily weight gains, on the other hand, were greater ($P = 0.001$) in heifers fed UCD-DR (0.309 kg/d) than those fed the commercial tubs (0.078 kg/d). In addition, daily supplement costs were lower ($P = 0.015$) in heifers fed UCD-DR (\$0.199) than those fed the commercial tubs (\$0.331). In 2005, the UCD-DR supplement was given in open feeders, and these had to be supplied daily; labor requirements were high. For the 2006 study, automatic feeders were designed and built so that feeding could be done weekly, with much lower labor requirements (Monteiro et al., 2007).

In 2007, the commercial tubs were replaced with a molasses-based tub formulated and manufactured at UC Davis (Table 3). Like UCD-DR, the UCD-Tub supplement was formulated to correct deficiencies in the dry forage. Heifers fed the two UC Davis supplements had similar ($P > 0.05$; Table 3) daily intakes (0.412 and 0.425 kg/d), average daily gains (0.309 and 0.284 kg/d), and daily costs (\$0.199 and \$0.173).

In conclusion, supplements formulated to correct protein and mineral deficiencies in dry range forage could be fed at lower cost than commercial feed supplements and produced much greater gains in replacement beef heifers. Future work will focus on adult cows, and how supplementation may affect reproductive performance.

Literature Cited

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Monteiro, R. B., Cruz, G. D., Myers, D. M., Oltjen, J. W. and Sainz, R. D.. 2007. Alternative supplementation strategies for replacement beef heifers grazing dry California foothills annual range during summer. *J. Anim Sci.* 85 (Suppl. 1):257.

Poppi, D. P. and McLennan, S. R.. 1995. Protein and energy utilization by ruminants at pasture. *J. Anim Sci.* 73:278-90.

Table 1. Pasture composition (dry matter basis)

Component	Value	Unit
Crude protein	5.5	% of DM
TDN	51.1	% of DM
NDF	63.7	% of DM
ADF	47.3	% of DM
Calcium	0.58	% of DM
Phosphorus	0.14	% of DM
Magnesium	0.18	% of DM
Potassium	1.49	% of DM
Sodium	0.046	% of DM
Iron	916	ppm
Manganese	112	ppm
Zinc	39	ppm
Copper	6	ppm

Table 2. Compositions of commercial and UC Davis supplements¹

Composition	Commercial tub	UCD-DR	UCD-Tub	Units
Total digestible nutrients	-	59	40	% of DM
Crude protein	30	54	64	% of DM
Calcium	2.00	2.03	1.54	% of DM
Phosphorus	2.00	3.31	2.62	% of DM
Magnesium	0.50	1.15	0.82	% of DM
Potassium	2.50	1.11	0.34	% of DM
Sulfur	-	1.17	0.80	% of DM
Sodium	-	4.74	3.90	% of DM
Chlorine	-	6.41	5.26	% of DM
Cobalt	3.3	9.6	10.9	ppm
Copper	330	569	459	ppm
Iodine	17	17	20	ppm
Manganese	1330	544	448	ppm
Selenium	4.4	4.1	3.5	ppm
Zinc	1000	2011	1633	ppm
Vitamin A	80	194	163	KIU/kg
Vitamin D	8	27	26	KIU/kg
Vitamin E	0.10	0.49	0.40	KIU/kg

¹UCD-DR, UC Davis dry range supplement; UCD-Tub, UC Davis molasses-based tub supplement.

Table 3. Weights, weight gains, and supplement intakes and costs of heifers on dry range and different types of supplement – 2005-07

	Commercial tub ¹	UCD-DR supplement ²	UCD-Tub supplement ³	SE	P
Initial wt, kg	250.8 ^a	237.5 ^{ab}	223.0 ^b	13.37	0.029
Final wt, kg	258.4	264.1	247.2	11.42	0.115
Average daily gain, kg/d	0.078 ^b	0.309 ^a	0.284 ^a	0.0970	0.001
Supplement intake, kg/d	0.547	0.412	0.425	0.1406	0.208
Supplement cost, \$/d	0.331 ^a	0.199 ^b	0.173 ^b	0.0835	0.015

^{a,b}Means in the same row not sharing a superscript are different ($P < 0.05$).

^{1,2,3}Commercial tubs were used in 2005 and 2006; UCD-DR was used in all three years; UCD tubs were used only in 2007. Note that initial weights were different between treatments due to the absence of the commercial tubs in 2007 and of the UCD tubs in 2005 and 2006.

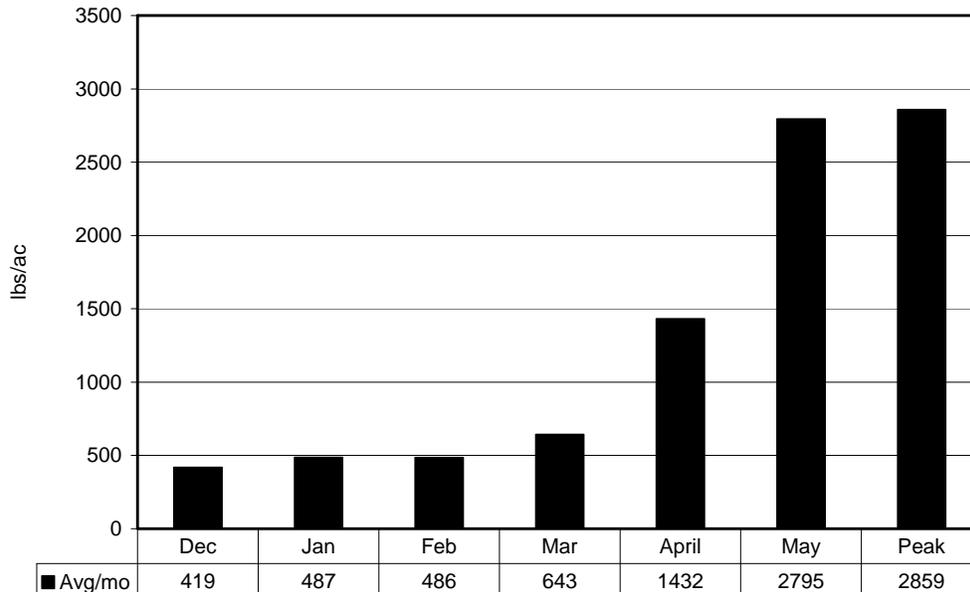
Growth Characteristics of Foothill Annual Rangelands By Roger Ingram

Rangelands in California are dominated by annual grasses, legumes, and forbs. Growth begins with germinating rains in the fall and peaks in May as plants put all their energy into forming a seed bank for next year's crop. California livestock producers spend six months out of the year (December – May) attempting to grow as much quantity as possible. The following six months (June – November) are spent rationing out standing feed until the next growing season. This standing feed must be monitored for loss of crude protein later in the season to determine potential protein supplementation needs.

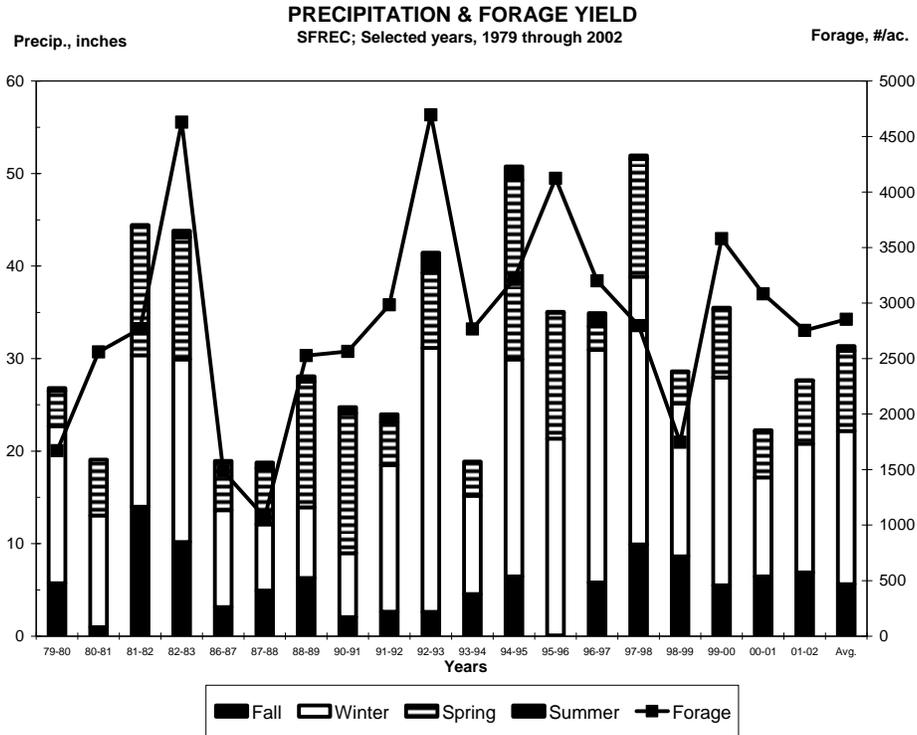
Annual Forage Growth

Annual forages germinate with fall rains and grow slowly from November – February. This slow growth is due to short day lengths and cold nighttime temperatures. Sometime in March, as days lengthen and temperatures warm, rapid growth begins if there is adequate soil moisture. Monthly average forage growth data from the Sierra Foothill Research and Extension Center (SFREC) shows forage quantity increasing 67% from December – February, 123% from March – April, and 100% from April – Peak Standing Crop.

SFREC Forage Growth by Month

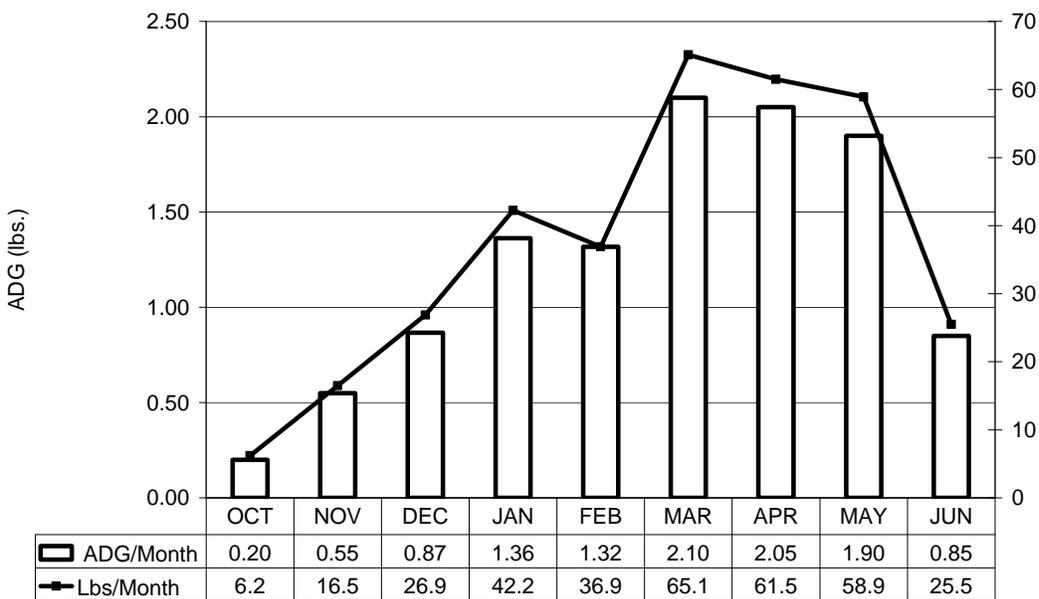


However, these average forage values vary from year to year based on both total precipitation and its distribution throughout the four seasons. Rainfall amounts by season, total precipitation and forage production are shown in the following graph. There is no real pattern as each year tends to take on its own unique characteristics. Two general trends will hold constant: higher than average rainfall will result in either average or higher than average forage production; and the majority of growth will occur March – May.



Grass growth is then consumed by animals for production. Past average stocker gains on SFREC range shows that the highest weight gains occur during the rapid growth from March-May as indicated below. During this period, stockers gained 185.5 total pounds which is 77% higher than the 105 pounds gained from December – February.

ADG ON ANNUAL RANGE- SFREC
Stocker calves, avg. 4 years



A Year In The Life of Annual Range

Roger Ingram, County Director and Livestock and Natural Resources Farm Advisor, Placer and Nevada Counties

No one knows from year to year how much growth we will have. Generally, adequate rainfall that is distributed throughout the growing season will translate to adequate forage supplies. Only time will reveal what will happen and how much forage we will grow.

While we are unsure of what the future will bring, there are certain trends that we can predict with certainty regarding forage quantity and quality. Quantity refers to the amount of growth. Quality refers to the energy and protein contained in the forage.

The information that follows is based on monthly forage sampling at the Sustainable Ranching research site from 1996 - 1999 located at the Sierra Foothill Research and Extension Center. Samples are analyzed for protein, energy, and 10 minerals. Sampling attempts to mimic what the cows are eating as closely as possible.

Quantity

While we can not predict how much total forage will be produced this year, we do know when that growth will occur. During the late fall, there has been enough rainfall to germinate plants. Late fall forage conditions have a mix of last year's brown residual and this year's green growth. Over following weeks, the brown residual will disappear into the soil leaving new green growth.

Quantity get started in fall with greenup, slows to a near standstill from early to mid winter (low quantity), and then takes off in late winter through mid spring (high quantity). From mid-spring to mid-fall, growth has stopped. One challenge for people who run livestock year round on annual range is to accumulate as much feed as possible during the growing season, and then ration it out until growth starts again.

Quality

Quality has a different pattern than quantity. Quality is highest during the slow growth period of late fall - mid winter. From late winter - mid spring, quantity will start to decline. Once growth stops, quality will continue to decline throughout the summer and fall.

What Happens To Protein

From a high of over 20% in late winter, protein will decline to around half that by the end of the growing season in May. Protein will continue to decline throughout the summer to less than 6% in August. By fall, protein may decline to less than 4%.

What happens to Energy

Energy declines slightly from March to May. By July, energy content will have declined anywhere from 33-40%. Energy levels seem to stay fairly consistent throughout the rest of the summer and fall. Once fall green-up occurs, energy and protein levels start to increase.

Quantity and Quality

The highest quality feed occurs in sometime between January through March. The most rapid growth occurs in April. After May, growth stops. Quality declines some during this fast growth and onset of seed formation. Once seed formation starts, growth stops on our winter annuals which is then rationed out to last until the next growing season. The quality of that standing feed will continue to decline throughout the summer.

Implications

During winter, feed quality is excellent. The lack of quantity poses a problem if animal demand is high - for example, a lactating cow. If the cow loses too much weight, you may have trouble getting her bred. Substitution feeding (to make up for the lack of quantity) will be needed to keep the cow in adequate condition to re-breed. This costs money to purchase or grow the hay along with the infrastructure and labor costs needed to store and feed to the cows.

During spring, quality starts to decline as quantity reaches its highest level. By the onset of seed formation, growth has peaked for the year. The amount of that peak will depend on rainfall amount and distribution along with the effectiveness of the water cycle on your land.

Quality will continue to decline over the next few months. The biggest concern for the rancher is the protein decline. The annual range forage is primarily cellulose. We can't digest cellulose and neither can the cow. Luckily, the cow has a fermentation vat called the rumen that houses microbes. Microbes can break down the cellulose and re-form the energy and protein volatile fatty acids and microbial protein. These end products are used to satisfy microbial requirements with the rest being available for the cow.

ESTIMATING CARRYING CAPACITY

Roger Ingram, County Director and Livestock and Natural Resources Farm Advisor, Placer and Nevada Counties

David W. Pratt, former UCCE Farm Advisor and now CEO of Ranch Management Consultants

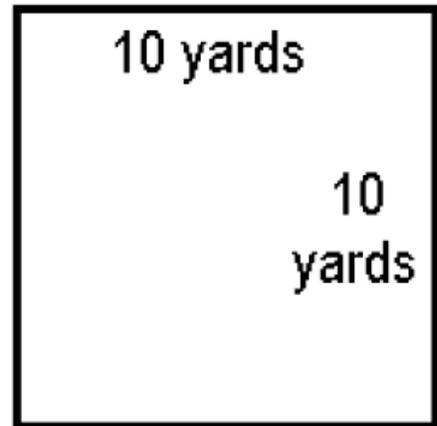
Several people use and teach the method described in this paper for estimating carrying capacity. I learned it from Dr. Stan Parsons at his *Ranching For Profit School*. It is best applied near the end of the growing season when little additional growth is expected.

PROCEDURE:

1. Pace off an area you think has enough forage to feed an animal for one day. Try to keep your paces one yard long. (This works best with four people, one to stand at each of the paced area. If you don't have enough people you can tap stakes in at the corners.)
2. If the area looks too small, everyone should take a step back. If the area is too big take a step in.
3. Multiply the length of the area (in yards) by the width.

This gives you the area required by one animal for one day in square yards.

4. Divide the square yards per acre (4840) by the square yards required per animal per day. The result is the number of stock one acre can support for one day (Stock Days per Acre, SDA).



$$10 \times 10 = 100 \text{ Square Yards}$$

$$4840 \text{ Sq.Yards/Acre} \div 100 \text{ Sq.Yards/Animal/Day} = \\ 48.4 \text{ SDA}$$

5. Multiply SDA by the number of acres in the paddock. The result is stock days per paddock. For example, if the square on the previous page is representative of a 12 acre paddock, then:

$$48.4 \text{ SDA} \times 12 \text{ acres} = 580 \text{ SD in the paddock}$$

6. Since the quantity of forage produced may vary within each paddock, you may have to average several estimates to come up with a reliable assessment of the SD per paddock.

By adding the stock days for each paddock on the ranch you can determine the total days of grazing available on the property.

TEST YOUR ESTIMATE

You'll be surprised at how quickly you can accurately evaluate the carrying capacity of pastures. However, your estimates are likely to be off a bit when you try this for the first time. The accuracy of your estimate can be tested simply by putting a stock in a small paddock to graze.

For example, we estimated that there are 580 stock days of feed available in our 12 acre paddock. If our herd consists of 200 head, there should be almost 3 days of grazing available in the paddock:

$$580 \text{ SD} \div 200 \text{ stock} = 2.9 \text{ Days}$$

If we check the paddock at the end of the second day and find we are out of feed, then our estimate was too high (we need to make our square larger next time). If we find there is more feed left than we anticipated at the end of the planned three day graze period, then our estimate was too low (we should make our square smaller next time).

You may want to check your estimates on a small area using some temporary portable electric fencing. With experience, simply monitoring the severity of grazing in the paddocks during the graze period is sufficient.

DEFINITIONS

STOCK DAY (SD): The amount of forage required to support one animal for one day.

STOCK DAYS PER ACRE (SDA): The number of animals that can be supported on one acre for one day.

Final Thoughts

While this method works best for the end of the growing season on annual rages, it can be used at anytime. For example, if winter has been dry, you could go and walk the paddocks to assess how many stock days you have left.

Measuring carrying capacity using this method will go quickly once gain experience and confidence in the method. David Pratt and I used to assess carrying capacity in May on part of the Campbell area of the Sierra Foothill Research and Extension Center. The 250-acre Campbell area was being used for a grazing research project. We installed 23 paddocks within the project area in 1996.

Every May, we would assess carrying capacity in all twenty-three paddocks using this method. It would take about two hours to complete the assessment. Once we knew the carrying capacity as expressed in stock days, we were then able to develop a feed budget. The feed budget allowed us to determine how much demand we had on a monthly basis from mid-May through December.

We then compared the stocking rate demand with the carrying capacity supply to determine if we were overstocked, stocked about right, or under-stocked. We knew this in May rather than waiting to see how things would be in September or October. In addition, by factoring the stock demand for November and December, we had a sixty-day drought reserve.

If we were over or under-stocked, we had time in May to determine the best course of action rather than hoping things worked out and having to resort to more drastic actions with few alternatives

On the following page is an example and template you can use to record squares. You can then do the math with a calculator or input into a spreadsheet

Estimating Carrying Capacity Sample

Paddock	Length (yards)	Width (yards)	Area Size of square (square yards)	SDA Stock Days per Acre	Paddock Paddock size (acres)	SD/ Paddock Stock Days
1	5	5	25	193.6	2	387.2
2	7	7	49	98.8	6	592.7
3	6	7	42	115.2	3.6	414.9
4	7	7	49	98.8	4.7	464.2
5	5	4	20	242.0	3.1	750.2
6	7	8	56	86.4	12	1037.1
7	7	7	49	98.8	11	1086.5
8	5	6	30	161.3	15.4	2484.5
9	8	8	64	75.6	7	529.4
10	6	6	36	134.4	13	1747.8
11	7	7	49	98.8	4.2	414.9
12	8	8	64	75.6	12.2	922.6
13	10	10	100	48.4	12.6	609.8
14	7	6.5	45.5	106.4	11.3	1202.0
15	10.5	11.5	120.75	40.1	13	521.1
16	6	8	48	100.8	17	1714.2
17	8	10	80	60.5	25	1512.5
18	16	14	224	21.6	22	475.4
19	13	13	169	28.6	20.4	584.2
20	19	17	323	15.0	15.4	230.8
21	6	6	36	134.4	13.4	1801.6
22	8	5.5	44	110.0	8.8	968.0
23	12	12	144	33.6	34	1142.8
					Total Stock Days	21594.3

Estimating Carrying Capacity Sample

Paddock	Length (yards)	Width (yards)	Area Size of square (square yards) Multiply Length X Width	SDA Stock Days per Acre 4840 / Product in the Previous Column	Paddock Paddock size (acres)	SD/ Paddock Stock Days Multiply SDA X Paddock size in acres
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- 1
- 2
- 3
- 4
- 5
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- 7
- 8
- 9
- 10

Use of Alternative feedstuffs in Your Beef Operation

Glenn Nader, UCCE Farm Advisor – Yuba/Sutter/Butte Counties

One of the advantages of cattle production in the Sacramento Valley is the alternative feeds that are available for cattle. They are usually cheaper than grains and hays in providing energy, protein, and bulk filler to a diet. These feeds are sold by food processing plants, commodity brokers, or the growers. Challenges in feeding them include:

- Variation in their nutrient value
- Handling requirements,
- Possible nutrient imbalances that can occur from feeding high levels in the diet.

Concentrated Energy Sources

The increase the price of corn and all grains has increased all the feed costs. Rice bran historically has been popular as an energy feed due to its fat content. It also contains protein, B vitamins, and very high levels of phosphorus in a form that is readily available to the animal. Feeding levels should not exceed 20% of the ration. The high amount of unsaturated fats lowers the cellulose digestion and impacts fat metabolism and absorption. Animals fed too much rice bran will go off feed or can get an impaction.

Almond hulls are a good source of energy, but are low in protein. They can be fed in troughs or a hot wire can be placed on the edge of the stack and moved it in as the cattle consume the hulls. There is some waste of the product with this approach, but saves labor. The major problem with purchase of hulls is that some processors sell loads of hulls that also contain low nutrient contaminants of shell or twigs. It is prudent to get a purity percent when obtaining price quotes on almond hulls. A limited supply of walnut and almond meal is now available from the production of oil products. Walnut meal that is high in protein has been reported to stop the cycling of breeding cows.

As consumption of vegetable oils increases, more oil seed meal is available. The effectiveness of the processing plant to extract the oil from the seed will vary the energy value. Safflower is the most common in Northern California. Seed screening are produced from the cleaning of seed crops. Pigweed seed can be a major component of screenings and although the green plant stocks are high in nitrates the seeds are not so there is no risk of nitrate poisoning. Screening values vary greatly due to the variation of the seed crop that is screened and the weeds present. Bean processors will have tested lots that are rejected for human consumption and then are sold to livestock operations. Beans work best for sheep and need to be cracked or softened to facilitate consumption by cattle. The production of fruit juices (pear and prune) provides a wet pomace. The percent moisture will vary with the processor and the fruit. Due to the moist content of the pumice, it needs to be fed within a week of production at the plant.

Protein Sources

Tomato pomace can be obtained from processors. Cattle producers that are close to the plants can obtain the pomace in the high moisture form and ensile it. Most feed the dried product. In one study the protein value varied from 12%-27%. The high acidity can limit the amount fed in a ration to maintain a normal rumen pH. Many limit it to no more than 20% of the diet. Dried poultry litter nutrient values vary with the bedding material used in boiler operation. It is important the material is composted correctly by the chicken operation. Limited cotton production in the north part of the state has provided some whole cottonseed. It is also high in energy and is very palatable and can be fed up to 8 pounds per cow with good results.

Roughages

During droughts or when dry matter is limited rice straw and corn stover have been supplemented. A survey of over 70 rice straws found that they vary greatly in protein (2-7%) and Acid Detergent Fiber (ADF) 44 to 55%. An Oregon State study on corn stover is reported below and illustrates the variability of that product.

Corn Stover Analysis Results

	DM	CP	TDN	NO3-N
1	85.8	3.7	53.4	
2	82.1	4.5	52.5	1270
3	84.6	5.1	54.3	1560
4	77.8	5.2	49.8	750
5	84.8	3.9	55.2	705
Average	83.02	4.48	53.04	1071

all results are reported on a Dry Matter basis

It is recommended that before purchasing either of these products that a laboratory analysis should be conducted for crude protein and ADF, which is used to predict TDN. This allows the producer to select a product of the higher nutrient value. A recommendation for acceptable rice straws for beef operations is a protein of 4.5% or higher and an ADF of 50% or lower.

Average Values (%)	<u>Dry</u> <u>Matter</u>	<u>Crude</u> <u>Protein</u>	<u>TDN</u>	<u>Crude</u> <u>Fiber</u>	<u>Ash</u>
Rice Bran	91	14	76	12	14.8
Almond hulls	91	4.2	54	17	6.6
Walnut meal	93	17.1	67	27	4.9
Prune pomace	18	14.6	76	--	3.3
Pear pomace	22	6.3	76	--	1.8
Safflower meal	92	23.9	55	34	4.3
Clover screenings	88	33.1	68	13.1	13
Pinto beans	90	25.2	83	4.5	4.8

Protein Sources

Tomato pomace, dried	92	23.9	73	26.3	3.5
Dried Poultry litter	76	19.4	37	21	--
Cottonseed	93	24.9	98	18	3.9

Roughages

Rice straw	91	4.5	41	35.1	16.6
Corn stover	90	5.9	50	37.1	5.8

Source –By-Products and Unusual Feedstuffs in Livestock Rations. Western Regional Extension Publication No. 39, October 1980. 22 pages

*Using Body Condition Scores
To Monitor the Condition of Your Beef Cattle and
Factoring this into a Cattle Health Program*

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For beef cow herds, the last one-third of pregnancy (the 3rd trimester) is a critical time for both calf survival and for breeding performance of the females in the following year. It is a time that gives us a chance to look backward and see how well we have matched our management program to the needs of the cattle and to predict how well we are going to do in the future.

Two of the primary considerations are (1) adequate and appropriate nutrition of the pregnant cows and heifers, and (2) appropriate vaccination programs to prevent abortions and to provide the calf with protection via the antibodies in the colostrum or first milk. Other considerations such as parasite control, are also important to take action on as needed; however, good nutrition and appropriate vaccines can combine to prevent problems (or if managed incorrectly—cause problems).

Nutrition of the pregnant cow/heifer determines (1) the general health and vigor of the calf, (2) the quantity and quality of the colostrum for the calf, and (3) the chances of the cow/heifer to become pregnant early in the breeding season and therefore, to have another calf within 12 months. One practical way to judge nutrition of pregnant cows/heifers is via Body Condition Scores (BCS). The standard method is to rate cows from 1 to 9, with a BCS of 1 being extremely emaciated (and probably near death) and a BSC of 9 being quite obese. Body Condition Scores of 5 through 7 are generally considered optimum (Table 1); however, this can vary depending on the environment for which the cattle are adapted. It is important to remember that BCS is mainly an estimation of fat covering, so don't count long hair or a big belly (pregnancy or "hay belly") as contributing to BCS. The weight gain of the fetus, fluids and membranes of the last 90 days of pregnancy is about 100 pounds. Therefore, cows in optimum condition (BCS 5-7) should gain this amount, which is about 1 pound/day. Also, cows that are fat (BCS 8 or 9) **should not** be put on a weight loss program as this can seriously affect the health of both the cow and the calf. Allow fat cows to gain about 1 pound/day and accomplish the weight loss later, during lactation. Cows or heifers that are too thin, BCS of 4 or less need special attention and should be fed separately. For example, a cow with a BCS of 3 should gain about 260 pounds over the last 130 days of pregnancy, or about 2 pounds/day. This would require a ration with an average TDN (Total Digestible Nutrients or energy) of about 65%. This would be a diet of 30% barley and 70% good

alfalfa hay. Feeding high energy diets to these thin cows may not be economically palatable; however, attempts to have them gain the majority of the appropriate weight for the health and survivability of the calf will have positive economic rewards, even if the cow may not breed back readily after calving.

Another practical way to assess nutrition of cows being fed hay as most or all of their diet is estimating intake as a measure of feed quality and nutrition. Low quality feeds which often do not supply adequate nutrition, limit consumption to about 1.5% of body weight per day or less. That is, a 1,000 pound cow could consume *only* 15 pounds of low quality forage on a dry matter basis—which is about 17 pounds on an as fed basis. On the other hand, with medium or high quality forages (grass hay or alfalfa hay) consumption will be 2.0 to 2.5% body weight. That is 20 to 25 pounds dry matter or 22 to 28 pounds as fed for a 1,000 pound cow (hay is usually about 90% dry matter and 10% moisture). These higher quality hays will easily support adequate weight gains in pregnant cattle as long as their BCS are 4 or above.

The necessary energy and protein fed to these pregnant cows allows for the calf to develop normally and for the formation of adequate colostrum of high quality. Cows and heifers that are nutritionally deficient in protein and energy during the last trimester *do not* produce adequate colostrum to protect the calf during the first 2-3 months of life. Therefore, problems with sick or dying calves can be caused by a lack of adequate nutrition during pregnancy (particularly the last 3 months).

The details of supplementing pregnant cows is always a difficult one and most generalities are not useful for individual production units. However, it is important to supplement only what is lacking in the diet. For example, if average to good to quality forage is being fed, with a crude protein content of 9-11% (grass hay) or 15-17% (medium quality alfalfa hay) it would be a mistake to feed expensive protein supplements. Ten percent crude protein in the diet is usually sufficient. If the cows in the above situation are thin it would make sense to feed additional energy; however, additional protein would not be needed (cottonseed meal, urea, soybean meal, etc). Minerals, trace minerals, and/or vitamins may be necessary as supplements and the need for these types of supplements will often be known by experience on the operation in question. Advice from your veterinarian, livestock advisor, and nutritionist will be important in guiding decisions about which nutrients to supplement your cattle. The nutrient, amount, and best method are all important considerations.

With a good feeding program in place many health and reproductive problems never occur. However, certain infectious diseases can affect the cow or heifer, the fetus, and/or the newborn calf. Therefore, some vaccinations may be very important for the pregnant cow or heifer and should be considered for administration during the 3rd trimester of pregnancy. These include IBR (Infectious Bovine Rhinotracheitis), BVD (Bovine Virus Diarrhea), Leptospirosis, and several other agents. Your veterinarian will recommend vaccines that are both safe and effective, take their advice seriously to prevent risk to the cow and the fetus. Also vaccines given during the 3rd trimester will result in increased concentrations of antibodies against these agent in the colostrum and

this will help protect the calf after birth. Examples of these types of vaccines include Rota virus, Corona virus, and K-99 E. coli agents. All of these vaccines given to the cow will help protect the calf *after* ingestion of colostrum. Any decisions regarding vaccines given during the 3rd trimester should be made in consultation with your veterinarian. Poor decisions can result in animal health problems and/or a considerable waste of time and money. Remember, if the nutritional status of the animals is not good their immune system will not function properly and even good vaccines administered in the best manner will not provide adequate protection from disease. For these reason and others, it is important that cows/heifers *not* lose weight or BCS during the last 3 months of pregnancy.

Table 1. Optimum Body Condition Scores for Beef Cows

BCS 5	Moderate	Cow has generally good overall appearance. Upon palpation, fat cover over the ribs feels spongy, and areas on either side of the tail head have obvious fat cover.
BCS 6	High Moderate	Firm pressure is needed to feel the bones of the spine and rib bones where they originate. A large amount of fat is present over the ribs (side of chest and abdomen) and around the tail head.
BCS 7	Good	Cow appears fleshy and obviously carries considerable fat. Very spongy fat covers the ribs and over and around the tail head. “Rounds” or “pones” are beginning to show around the vulva.

**UNIVERSITY OF CALIFORNIA SIERRA FOOTHILL RESEARCH AND EXTENSION CENTER
ANIMAL HEALTH PROGRAM**

This document describes the routine animal health procedures followed at the University of California Sierra Foothill Research and Extension Center (SFREC). These guidelines are reviewed, updated and approved annually by the SFREC Animal Research Committee. **This revision is dated January, 2008.**

The active ingredients and vaccines are available under a number of brand names. Brand names used in these recommendations are examples only and not specific endorsements or recommendations.

ALWAYS READ AND CAREFULLY FOLLOW DRUG AND VACCINE LABEL INSTRUCTIONS.

CALVES (unweaned):		Age
Birth:	Tag, Weigh, Nolvasan™ solution on naval if assisted birth or exposed to contaminated areas.	1 day
Branding:	Hot Iron "UC"	2.5 - 5 months
Castration:	"Knife" Method/ E-Z Bloodless Castrator	2.5 - 5 months
Dehorn:	Most are polled; sterile knife	< 3 mos.
	Dehorner, Horn Iron, ALAR Guide	> 3 mos.
	Use local anesthesia if greater than 1 month of age	
General:	Provide supplemental selenium to all calves by injection, boluses or supplemental feeding	
Prophylaxis:		
1st Vaccination	Modified Live vaccine - BVD, IBR, PI3, BRSV (+ Lepto 5-way)	2.5 - 5 months
	Clostridial 8-way (OK because cows have 2 previous Bovishield™)	2.5 - 5 months
Booster	Modified Live Vaccine - BVD,IBR, PI ₃ , BRSV (+ Vibrio/Lepto 5-way)	2 weeks prior to weaning
	Feedlot Steers and heifers - Mannheimia hemolytica vaccination	2 weeks prior to weaning
Anaplasmosis	Anaplasma marginale vaccination - After selection of replacements (for cattle < 11 months of age)	5-10 months of age
Anthelmintics	Dectomax™, Ivomec™, Valbazen™ (Rotation suggested)	Wean/Postwean
Tetanus	Clostridium tetani antitoxin and vaccination at castration, at separate sites (only if castration is by banding)	2-3 mos.
Shipping	Prefer 45 days preconditioning after weaning before shipping.	
Treatments:		
Scours	LA-200™ (Sustained release oxytetracycline) & long acting sulfamethazine 1 - 3 x every other day; Banamine™ daily as necessary. Oral fluids/electrolytes if needed	
Pneumonia	LA-200™ (Sustained release oxytetracycline) & long acting sulfamethazine 1 - 3 x every other day; Banamine™ daily as necessary. 2nd treatment -Baytril™ (enrofloxacin) 1x, 3rd treatment Nuflo™ (florfenicol) 1x, 4th treatment Excede™ (ceftiofur)	
Anaplasmosis	LA-200™ (Sustained release oxytetracycline) 1-3x every other day, or Oxytetracycline 3x daily	
Pinkeye	Nuflo™ (florfenicol), 2nd treatment LA-200™ (sustained release oxytetracycline) & Patch 1x	
Coccidiosis	Long acting sulfamethazine 3x every other day; treat group with preventive, if necessary, such as Corid™, Bovatec™, Decox™, and/or Rumensin™	
Abcesses	Drain/Flush/Betadine™ or Nolvasan™ topical/Fly-repellant/PPG if necessary	
Foot Rot	Clean Wound/Oral Sulfa/PPG or IM LA200™ (Sustained release oxytetracycline)	
	The herd manager, in consultation with the attending veterinarian, has the discretion to alter timing of vaccinations and other health management activities if conditions are such that using the current protocol may adversely impact animal health. The cl	
	Epinephrine Rx should be on hand for anaphalactic shock.	
	Mineral supplements (including selenium) will be provided year round to ALL animals.	
	Diagnosis of unknown causes of death or illness: Cause of disease to be determined if possible with assistance of Center veterinarian and UCD VMTH and California Animal Health and Food Safety Laboratory	

CALVES (weanlings and yearlings):		Age
Number Brand:	Freeze Brand (Alcohol and dry ice)	12-24 mos.
General:	Provide supplemental selenium to all calves by injection, boluses or supplemental feeding	
Prophylaxis:		
Booster	Modified Live Vaccine - BVD,IBR, PI ₃ , BRSV (+ <i>Vibrio/Lepto 5-way</i>)	PostWean
	Feedlot Steers and heifers - <i>Mannheimia hemolytica</i> vaccination	PostWean
	Clostridial 8-way (can be given at same time as Brucellosis for heifers)	PostWean
Anaplasmosis	<i>Anaplasma marginale</i> vaccination - After selection of replacements (for cattle < 11 months of age)	5-10 months of age
Brucellosis	<i>Brucella abortus</i> (RB-51) vaccine by veterinarian	5-10 mos.
Anthelmintics	Dectomax™, Ivomec™, Valbazen™ (<i>Rotation suggested</i>)	Wean/PostWean
Coccidiosis	Decox™, Bovatec™, Rumensin™, Medicated Block (free choice)	PostWean
Shipping	Prefer 45 days preconditioning after weaning before shipping.	
Treatments:		
Scours	Oral fluids/electrolytes and if needed, LA-200™ & long acting sulfamethazine 1 - 3 x every other day; <i>Banamine™</i> daily for up to 3 days	
Pneumonia	LA-200™ (<i>Sustained release oxytetracycline</i>) & long acting sulfamethazine 1 - 3 x every other day; <i>Banamine™</i> daily as necessary. 2nd treatment - <i>Baytril™</i> (<i>enrofloxacin</i>) 1x, 3rd treatment <i>Nuflo™</i> (<i>florfenicol</i>) 1x, 4th treatment <i>Excede™</i> (<i>ceftiofur</i>)	
Anaplasmosis	LA-200™ (<i>Sustained release oxytetracycline</i>) 1-3x every other day, or Oxytetracycline 3x daily	
Pinkeye	<i>Nuflo™</i> (<i>florfenicol</i>), 2nd treatment LA-200™ (<i>sustained release oxytetracycline</i>) & Patch 1x	
Coccidiosis	Long acting sulfamethazine 3x every other day; treat group with preventive, if necessary, such as <i>Corid™</i> , <i>Bovatec™</i> , <i>Decox™</i> , and/or <i>Rumensin™</i>	
Abcesses	Drain/Flush/ <i>Betadine™</i> or <i>Nolvasan™</i> topical/ <i>Fly-repellant</i> / <i>PPG</i> if necessary	
Foot Rot	<i>Nuflo™</i> (<i>Florfenicol</i>), 2nd treatment LA-200™ (<i>sustained release oxyteracycline</i>), or 3rd treatment Oral Sulfa/PPPG	
	The herd manager, in consultation with the attending veterinarian, has the discretion to alter timing of vaccinations and other health management activities if conditions are such that using the current protocol may adversely impact animal health. The cl	
	Epinephrine Rx should be on hand for anaphalactic shock.	
	Mineral supplements (including selenium) will be provided year round to ALL animals.	
	Diagnosis of unknown causes of death or illness:	
	Cause of disease to be determined if possible with assistance of Center veterinarian and UCD VMTH and California Animal Health and Food Safety Laboratory	

COWS (Fall Calvers):		Month
General:	Provide supplemental selenium to all cows by injection, boluses or supplemental feeding	
Prophylaxis:		
PreBreeding vaccination	If open - Modified Live vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + (Spirovac™)	Nov.
Annual Re-vaccination	Clostridial 8-way	Nov/Dec
Anthelmintics	Dectomax™, Ivomec™ +, or Valbazen™ (Rotation suggested)	May
Calf Scours	If pregnant - E. coli, Rota virus, Corona virus vaccine (Scourguard™) (Only in years following high incidence of calf scours)	Prior to calving
Treatments:		
Anaplasmosis	LA-200™ (Sustained release oxytetracycline) 1-3x every other day, or Oxytetracycline 3x daily (Only if cattle can be restrained without overexciting them)	
Foot Rot	Clean Wound/Oral Sulfa/PPG,Nuflor™ (IM), Banamine™	
Pinkeye	Eye patch 1x/ Florfenicol (Nuflor™) if needed, Banamine™	
Pneumonia	Florfenicol (Nuflor™), Ceftiofur (Excede™)	
Calving:		
Dystocia	Assist as necessary; most difficult cases to VMTH in Davis	
Prolapse	1. "Shrink" Tissue w/powdered sugar 2. Re-place tissue 2a. Epidural - Lidocaine™ 3. Pin vulva if necessary 4. Administer systemic penicillin Retreat as needed 5. Remove pins 6. Cull cow and, where possible, offspring	
Metritis & Retained Placenta	1. Systemic Penicillin 2. Administer Lutalyse™ Repeat steps 1 & 2 as needed	
Pregnancy Exam:		
	45 days after bulls removed from cows	Post Wean
	If substantial abortion problem, boost w/modified live vaccine - BVD,IBR,Pis,BRSV + Vibrio/Lepto 5 way + (Spirovac™)	
	The herd manager, in consultation with the attending veterinarian, has the discretion to alter timing of vaccinations and other health management activities if conditions are such that using the current protocol may adversely impact animal health. The cl	
	Epinephrine Rx should be on hand for anaphalactic shock.	
	Mineral supplements (including selenium) will be provided year round to ALL animals.	
	Diagnosis of unknown causes of death or illness:	
	Cause of disease to be determined if possible with assistance of Center veterinarian and UCD VMTH and California Animal Health and Food Safety Laboratory	

COWS (Spring Calvers):		Month
General:	Provide supplemental selenium to all cows by injection, boluses or supplemental feeding	
Prophylaxis:		
PreBreeding vaccination	If open - Modified Live vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + (Spirovac™)	May
Annual Re-vaccination	Clostridial 8-way	May/June
Anthelmintics	Dectomax™, Ivomec™ +, or Valbazen™ (Rotation suggested)	Nov.
Calf Scours	If pregnant - E. coli, Rota virus, Corona virus vaccine (Scourguard™) (Only in years following high incidence of calf scours)	Prior to calving
Treatments:		
Anaplasmosis	LA-200™ (Sustained release oxytetracycline) 1-3x every other day, or Oxytetracycline 3x daily (Only if cattle can be restrained without overexciting them)	
Foot Rot	Clean Wound/Oral Sulfa/PPG,Nuflor™ (IM), Banamine™	
Pinkeye	Eye patch 1x/ Florfenicol (Nuflor™) if needed, Banamine™	
Pneumonia	Florfenicol (Nuflor™), Ceftiofur (Excede™)	
Calving:		
Dystocia	Assist as necessary; most difficult cases to VMTH in Davis	
Prolapse	1. "Shrink" Tissue w/powdered sugar 2. Re-place tissue 2a. Epidural - Lidocaine™ 3. Pin vulva if necessary 4. Administer systemic penicillin Retreat as needed 5. Remove pins 6. Cull cow and, where possible, offspring	
Metritis & Retained Placenta	1. Systemic Penicillin 2. Administer Lutalyse™ Repeat steps 1 & 2 as needed	
Pregnancy Exam:		
	45 days after bulls removed from cows	Post Wean
	If substantial abortion problem, boost w/modified live vaccine - BVD,IBR,Pis,BRSV + Vibrio/Lepto 5 way + (Spirovac™)	
	The herd manager, in consultation with the attending veterinarian, has the discretion to alter timing of vaccinations and other health management activities if conditions are such that using the current protocol may adversely impact animal health. The cl	
	Epinephrine Rx should be on hand for anaphalactic shock.	
	Mineral supplements (including selenium) will be provided year round to ALL animals.	
	Diagnosis of unknown causes of death or illness:	
	Cause of disease to be determined if possible with assistance of Center veterinarian and UCD VMTH and California Animal Health and Food Safety Laboratory	

Bulls		Month
General:	Provide supplemental selenium to all bulls by injection, boluses or supplemental feeding	
Prophylaxis:		
PreBreeding	Modified Live Virus vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + Spirovac™ Clostridial 8-way	Dec. Dec.
Anthelmintics	Valbazan™/Ivomec Plus™/Dectomax™ (Rotation suggested)	May
Reproductive	Tract exam and semen test (BSE), Tritrichomonas testing	Nov.-Dec.
Treatment:		
Anaplasmosis	LA-200™ (Sustained release oxytetracycline) 1-3x every other day, or Oxytetracycline 3x daily (Only if cattle can be restrained without over exciting them)	
Foot Rot	Clean Wound/Oral Sulfa/PPG, Nuflor™ (IM), Banamine™	
Pinkeye	Eye patch 1x/Florfenicol (Nuflor™) if needed, Banamine™	
REPLACEMENT HEIFERS (Fall Calvers):		
General:	Provide supplemental selenium to all heifers by injection, boluses or supplemental feeding	
Prophylaxis:		
PreBreeding	Modified Live Vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + Spirovac™	Oct.
Booster	Modified Live Vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + Spirovac™	Nov.
Booster	Clostridial 8- way	Oct/Nov.
Reproductive	Tract score - DVM	Dec.
REPLACEMENT HEIFERS (Spring Calvers):		
General:	Provide supplemental selenium to all heifers by injection, boluses or supplemental feeding	
Prophylaxis:		
PreBreeding	Modified Live Vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + Spirovac™	April
Booster	Modified Live Vaccine - BVD, IBR, PI3, BRSV + Vibrio/Lepto 5-way + Spirovac™	May
Booster	Clostridial 8- way	April/May
Reproductive	Tract score - DVM	June
	The herd manager, in consultation with the attending veterinarian, has the discretion to alter timing of vaccinations and other health management activities if conditions are such that using the current protocol may adversely impact animal health. The cl	
	Epinephrine Rx should be on hand for anaphalactic shock.	
	Mineral supplements (including selenium) will be provided year round to ALL animals.	
	Diagnosis of unknown causes of death or illness: Cause of disease to be determined if possible with assistance of Center veterinarian and UCD VMTH and California Animal Health and Food Safety Laboratory	

<i>HORSES</i>		Month
Vaccinations	5-Way - E/W Encephalomyelitis,	February - 1x a year
	Rhinopneumonitis EHV1 & EHV4, Influenza type A2, and Tetanus (need booster 3-4 weeks after 1st vaccine)	
	West Nile - 2x a year (need booster 3-4 weeks after 1st vaccine)	February and August
	Rabies	1x a year
Anthelmintics	Pyrantel Pamoate	August and February
	Ivermectin	October and April
	Benzimidazole	December and June
	The herd manager, in consultation with the attending veterinarian, has the discretion to alter timing of vaccinations and other health management activities if conditions are such that using the current protocol may adversely impact animal health.	
	Epinephrine Rx should be on hand for anaphalactic shock.	
	Free choice salt provided.	
	Mineral supplements will be provided year round to ALL animals.	
	Diagnosis of unknown causes of death or illness:	
	Cause of disease to be determined if possible with assistance of Center veterinarian and UCD VMTH and California Animal Health and Food Safety Laboratory	

Pinkeye Prevention and Treatment: March 2008 Update

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The basic strategies that have historically been recommended to prevent herd outbreaks of pinkeye involve fly control, weed control, and vaccination against the bacteria that we believe are important in causing pinkeye. Recent discoveries into the bacterial causes of pinkeye have added to our understanding of this important cattle disease. In the following paragraphs, recommendations for preventing pinkeye will be discussed; remember that recommendations may not work for your specific herd/management situation, so you will need to discuss these recommendations with your veterinarian to determine what will work best for your specific herd.

Fly control

One bacterial agent that we know causes pinkeye in cattle is *Moraxella bovis* (*M. bovis*). It makes proteins that can kill the thin layer of cells covering the clear part of the eye. Various species of flies, particularly face flies, can carry these bacteria from cow to cow, and help spread this organism within a herd. In addition, other flies such as horn flies, stable flies, horse flies, and other bloodsucking flies mechanically transmit several disease organisms as well as cause irritation and decreased weight gains (see <http://ipm.ncsu.edu/AG369/> for additional information on various species of flies). Controlling fly populations by using insecticide impregnated ear tags in combination with face/back rubbers, can help prevent pinkeye and block the spread of infection in a herd. Calves are generally considered to be more susceptible to infection with the pinkeye agent, and it is most important to put fly tags in the calves' ears versus the cows. A table summarizing some of the available insecticide products is attached at the end of this article.

Both face flies and horn flies can develop a resistance to insecticides over time, so for maximum prevention, it is advisable to change the classes of drug you use each year or two and to delay the ear tag application until the fly population is relatively high, so that the possibility of the flies developing resistance is lowered. Sprays, back rubbers, face rubbers, and dust bags can be helpful in reducing the fly populations early in the season, before ear tag application. Then, as the fly populations increase, apply the fresh ear tags to achieve maximum benefit. Always follow the manufacturer's label directions for ear tag application (for example, the manufacturer might recommend 2 ear tags). ***In the fall, remove the ear tags*** to reduce the chances that flies develop resistance to the drug in the ear tag.

Face flies and horn flies lay their eggs in cow manure and the larvae can **only** develop in cow manure. Therefore, some of the compounds that are fed or given orally that kill the larvae in the manure pat can be very effective. One example of this is the insect growth regulator methoprene. This compound is an insect growth regulator (IGR), which is safe, and resistance does not develop to this product. It can be used in "feed through" products, where the drug passes through the manure unchanged and kills the fly larvae in the manure. Other insecticide

products are available that can kill the fly larvae when used as a “feed through”, such as Rabon. Rabon is an organophosphate and resistance can develop.

Notice that a product available one year may not be available the next.

Weed Control

As far as weed control, it is recommended to clip pastures if grass is too long and headed out, in order to decrease irritation to the cow's/calve's eyes that might promote a pinkeye outbreak.

Vaccination

A variety of different vaccines exist to prevent pinkeye and currently there is no single vaccine known to prevent all cases of pinkeye. Different strains of bacteria cause pinkeye and no vaccines are currently available that protect against all strains. Some producers will work with their herd veterinarians to have vaccines made against the specific strain of bacteria present in the herds. Such vaccines are called "autogenous vaccines." Generally these autogenous vaccines are made by private vaccine manufacturers. To have an autogenous vaccine made, it is necessary to actually take cultures of infected eyes and find out what bacteria are present in the eye. In 2002, researchers at UC Davis were testing an experimental antibiotic to see if it would be an effective treatment against pinkeye in calves. We identified *M. bovis* in the eyes of some calves with pinkeye, however, in the eyes of most of the calves with pinkeye we identified bacteria agent that were related to *M. bovis*, but which were not *M. bovis*. After about 5 years of research, we were able to definitively identify these bacteria as a new species of Moraxella and we named it *Moraxella bovoculi* (*M. bovoculi*).

At the present time, commercially available vaccines to prevent pinkeye are designed using *M. bovis* isolates. There are some vaccine companies that will make autogenous vaccines that incorporate other Moraxella species such as *M. bovoculi*, however, these must be made under strict FDA guidelines and can only be used in the specific herd from which the bacteria were isolated. Assuming that you are inclined to vaccinate against pinkeye, we currently recommend that you start your vaccination program by using a commercially available vaccine. If this vaccine is not working, we recommend that you have your veterinarian collect some eye fluid from animals affected with pinkeye and submit the samples to a diagnostic laboratory to identify which species of Moraxella are present in the eye. Remember, however, that not all eyes will grow Moraxella, even if they have active pinkeye. Therefore, it's best to submit cultures from more than one animal; the exact number really depends on how much money you are willing to invest in cultures. If cost is not an issue, we typically recommend culturing 5-10 different animals. Diagnostic laboratories are getting better and better at identifying *M. bovoculi*. Depending on the herd and severity of the pinkeye problem, you might then consider working with your veterinarian to have an autogenous vaccine made. Due to the high cost of some autogenous vaccines, as well as the risk for adverse drug reactions, we currently recommend that you start your vaccination program by first using a commercially available product and then resort to an autogenous product if the commercial product is not working.

Regardless of the vaccine product you are using, it is recommended that you start the vaccine protocol 6-8 weeks before the pinkeye cases are “scheduled” to start. If you start vaccinating when pinkeye cases are already occurring, it will be 6-8 weeks before the protective effects of the vaccine become apparent. Always follow the directions on the bottle of the vaccine. Some are designed to work with a single shot; others are designed to be boosted again

at some time following the first vaccine. If you do not follow the directions on the label, chances are that the animals you vaccinate will not receive the best benefit from the vaccine and you will not be getting the most prevention possible for your investment.

Treatment

Because a pinkeye affected eye can be covered with billions of infective bacteria that you can inadvertently spread between calves, we recommend that you wear disposable gloves between your examinations of calves/cows, or at least wash or disinfect your hands between animals. Latex gloves can be obtained from your veterinarian or other source for animal health products. After you have touched the eye (extracted the foxtail or treated the eye) or nose area, throw the gloves away. They can be badly contaminated with the pinkeye bacteria. If you used a halter or nose tongs to restrain the animal, disinfect this equipment as well. Nolvasan® is a good disinfectant choice. For treatment, the use of disposable needles and syringes is always recommended.

No matter how rigorous your pinkeye prevention program is, chances are that you will still experience pinkeye cases in your herd. For treating pinkeye cases, there are a lot of different approaches, some recommended by veterinarians, and some not recommended by veterinarians. Producers historically have put a variety of substances into the eyes of pinkeye-affected cattle, and some of these things are probably not very healthy for the eye. In thinking about whether to put something in the eye of a cow/calf with pinkeye, its probably best to ask yourself whether you would want it put into your own eye. If the answer is "NO", its best not to put it in the eye of a cow/calf.

NOTE: if any antibiotic product is not labeled for pinkeye, you must obtain a prescription from your veterinarian, as this constitutes an extra label use of this product. Also, always observe the manufacturer recommended pre-slaughter drug withdrawal periods.

Listed below are the more commonly used intramuscular or subcutaneously administered drugs that are known to be effective against pinkeye:

1. Long-acting tetracycline (BIO-MYCIN® 200 or Liquamycin® LA-200®)

Dose: 20 mg/kg body weight (4.5 ml/100 lbs)

Route: both products are labeled for subcutaneous use and it is recommended that these be used sub-Q whenever possible as they can be very irritating to tissues. In addition, BIO-MYCIN® 200 is approved for intramuscular use against pinkeye.

Frequency: Two injections 48 to 72 hours apart.

Label: Both products are labeled for pinkeye and you will not need your veterinarian's prescription if you follow the label instructions.

2. NuFlor® (florfenicol)

Dose: 20 mg/kg body weight (3 ml/100 lbs)

Route: Intramuscularly

Frequency: two injections 48 hours apart

Alternatively, NuFlor® can be used as single injection for longer action.

Dose: 40 mg/kg body weight (6 ml/100 lbs)

Route: Subcutaneous

Frequency: one treatment

Label: NuFlor® is not currently labeled for pinkeye and you must have your veterinarian's prescription to use this drug for pinkeye in cattle.

3. Excede®(ceftiofur)

Dose: 6.6 mg/kg body weight (1.5 ml/ 100 lbs)

Route: Subcutaneous--at the base of the ear or the middle one-third of the ear. If injected in the middle third of the ear, it is possible to inadvertently inject the drug into an artery, which is fatal. The currently recommended dosing at the base of the ear is easier and probably safer; you should get your veterinarian to train you in the proper administration of this drug. Video links for how to inject this drug are provided at:

<http://www.excede.com/display.asp?country=US&lang=EN&drug=XT&species=BF&sec=400>

Frequency: one injection provides therapy for 7-8 days.

Label: Excede® is not currently labeled for pinkeye and you must have your veterinarian's prescription to use this drug for pinkeye in cattle.

4. DRAXXIN® (tulathromycin)

Dose: 2.5 mg/kg body weight (1.1 mL/100 lb)

Route: Subcutaneously in the neck.

Frequency: one injection

Label: DRAXXIN® is not currently labeled for pinkeye and you must have your veterinarian's prescription to use this drug for pinkeye in cattle.

None of the above methods require any injections into the eyes of cattle. Continued use of tetracyclines in areas with high numbers of anaplasmosis cases might make the cattle susceptible to sickness due to anaplasmosis. Consult with your veterinarian regarding this potential problem.

One popular age old treatment option is to give Penicillin as an injection under the white part of the eyeball (the sclera). If you are not expert in this method, have your veterinarian train you on the proper way to administer this treatment. Do not attempt this method without training. To achieve good results, give 1 ml (1 cc) under the sclera of both eyes for at least 3 days. This method achieves good results; but is probably less effective than the use of oxytetracyclines, NuFlor®, Excede®, or DRAXXIN®. Again, you will need a veterinarian's prescription for the use of penicillin not labeled for use in pinkeye.

For many years Furox sprays or powders (Nitrofurazone, Furox®, Topazone®, NFZ Puffer, P.E. 7, etc.) placed into the eye were used for the treatment of pinkeye. This method was not as effective as the above methods. However, beginning in 2002 this treatment became illegal for cattle. This is irrespective of whether you have a prescription or not. **Do not use the furacin-type drugs in cattle any more.**

There are also some liquids and spray-type products still available for pinkeye treatment. These products only stay in the eye for about 7 minutes before the tears wash it out and therefore, are much less effective than any of the methods described above. As with all treatments that are placed directly into the eye, proper restraint is necessary and the use of disposable latex gloves is recommended.

For many years, treatment with dexamethasone (Aziium®) has been popular. Research indicates that when this is given under the sclera, there is no difference in the rate of healing. Therefore, use of this product is not usually recommended.

Keep written records of treatments and results. Discuss these with your veterinarian as you reevaluate pinkeye prevention and treatment plans for the future. Also, if your cattle are copper deficient or selenium deficient, the number of pinkeye cases will be greater and the severity will be worse. Be sure your mineral program is working, as this is important in the animal's immune response against pathogens.

ADDITIONAL IMPORTANT POINTS TO REMEMBER FOR FLY CONTROL AND PESTICIDE USE:

1. Plan ahead for insecticide and ear tag purchases; fly season will arrive.
2. Consult with your veterinarian regarding active ingredient(s) in these products and their record of effectiveness in your area.
3. Always follow instructions, warnings, and precautions: these products can be toxic to you, your children, pets, and others working with them around the chute. Use disposable latex gloves when handling the ear tags. Keep the donuts and coffee away from the tags!
4. Follow label withdrawal times and keep records of treatment dates, products and lot numbers.

CALIFORNIA REGISTERED PESTICIDES FOR BEEF CATTLE: 2007

EAR TAGS

<u>PRODUCT NAME</u>	<u>ACTIVE INGREDIENT</u>	<u>CHEMICAL CLASS</u>	<u>MANUFACTURER</u>
Co-Ral Plus	Diazinon + Coumaphos	Organophosphate	Bayer
Cylence Ultra	beta-Cyfluthrin	Pyrethroid+PBO	Bayer
Diaphos R_x*	Diazinon + Chlorpyrifos	Organophosphate	Y-TEX
Double Barrel	Cyhalothrin + Pirimiphos	Organophosphate	Schering- Plough
Dominator	Pirimiphos	Organophosphate	Schering- Plough
GardStar Plus	Permethrin	Pyrethroid	Y-TEX
Max-Con	Cypermethrin + Chlorpyrifos	Pyrethroid + Organophosphate	Y-TEX
New Z Diazinon	Diazinon	Organophosphate +PBO	Farnam
New Z Permethrin	Permethrin	Pyrethroid	Farnam
Patriot	Diazinon	Organophosphate	Boehringer- Ingelheim
OPTimizer	Diazinon	Organophosphate	Y-TEX
Python & Python Magnum	Zeta-cypermethrin	Pyrethroid	Y-TEX
Saber Extra	Cyhalothrin	Organophosphate	Schering- Plough
Super Deckem II	Permethrin	Pyrethroid	Destron- Fearing
Warrior	Diazinon + Chlorpyrifos	Organophosphate	Y-TEX
X-Terminator	Diazinon	Organophosphate	Destron- Fearing
Zeta Gard*	Zeta-cypermethrin	Pyrethroid	Y-TEX

***Available only through a licensed veterinarian.**

SPRAYS

<u>Active Ingredient</u>	<u>Example Brand Names</u>
Coumaphos	Co-Ral
Dichlorvos	Vapona
Permethrin	Ectiban, Permethrin, Atroban, Permethrin, Insectrin
Tetrachlorvinphos	Rabon
Tetrachlorvinphos-Dichlorvos	Ravap
Spinosad	Elector

POUR-ON APPLICATIONS

<u>Active Ingredient</u>	<u>Example Brand Names</u>
Cyfluthrin	Cylence
Fenthion	Lysoff
Permethrin	DeLice, Expar, Hard Hitter, Ectiban, Atroban, Ultraboss,
Cyhalothrin	Saber
Spinosad	Elector

BACK RUBBERS AND FACE RUBBERS

<u>Active Ingredient</u>	<u>Example Brand Names</u>
Permethrin	Ectiban, Insectrin
Tetrachlorvinphos-Dichlorvos	Ravap

DUST BAGS

<u>Active Ingredient</u>	<u>Example Brand Names</u>
Permethrin	Permethrin, Ectiban
Tetrachlorvinphos	Rabon dust
Zeta-cypermethrin	Python

FEED-THROUGH INSECTICIDES

<u>Active Ingredient</u>	<u>Example Brand Names</u>
Tetrachlorvinphos	Rabon oral larvicide
Methoprene	IGR Mineral, Starbar

Please Note: the active ingredients are available under a number of brand names and those listed are examples only and not specific endorsements or recommendations.

ALWAYS READ AND FOLLOW LABEL INSTRUCTIONS CAREFULLY.

Recognizing and managing common health problems of beef cattle

Bruce Hoar, Asst Professor, Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis

Effective health programs involve both prevention and treatment of disease problems. Preventative measures are typically more cost-effective to implement than attempting to deal with a disease outbreak, however there are times when treatment will be unavoidable. The goal of this presentation is to help you to decide what you can do yourself, and when to call the veterinarian.

Early recognition of and response to health problems is key to avoiding significant financial impacts in a herd. Some of the early signs that an animal may be diseased include diarrhea, weight loss, lameness, stiff movement, loss of appetite, general depression, low head carriage, droopy ears, nasal or ocular discharge, irregular respiration, rough and / or dull hair coat, and skin lesions.

Accurate disease diagnosis is a very important component of any health management program. Once a diagnosis has been made, any treatments need to be used appropriately to meet established guidelines for product use and withdrawal times.

There are two classes of drugs available for treating animals: over the counter (OTC) and prescription. OTC drugs can be purchased and used as directed on the label without establishing a relationship with a veterinarian. Prescription drugs, or off label use of an OTC drug, require establishment of a valid veterinary-client-patient relationship (VCPR). The components of a valid VCPR include assumption of responsibility by the veterinarian for making medical judgments regarding the health of the animal, the need for treatment, and the agreement of the client to follow the veterinarian's directives. Furthermore, the veterinarian must have sufficient knowledge of the case to make a diagnosis by virtue of an exam of the animal and the premises where the animal is kept. The veterinarian must be available for follow-up evaluation. Also, there must be a determination that there is no marketable drug specifically labeled to treat the condition, or that treatment at the label dosage is ineffective. The animal must be clearly identified and maintained and extended withdrawal period prior to marketing must be observed.

It is important to understand the normal vital body signs since diseases typically affect them. For example, an abnormal temperature is often one of the first objective signs of a health problem. The "normal" temperature range for cattle is from 100.5 °F to 103.0 °F; however this can vary depending on the time of day, amount of physical activity, and ambient temperature. Other vital signs that may help in diagnosis include pulse (normally 40 to 70 per minute in adult cattle) and respiratory rate (normally 10 to 30 per minute).

Beef Quality Assurance guidelines for processing / treatment

- Follow all FDA/USDA/EPA guidelines for product(s) utilized.
- All products are to be used per label directions.
- Extra-label drug use shall be kept to a minimum, and used only when prescribed by a veterinarian working under a valid Veterinary Client Patient Relationship (VCPR).
- Strict adherence to extended withdrawal periods (as determined by the veterinarian within the context of a valid VCPR) shall be employed.
- Treatment records will be maintained with the following recorded:
 - Individual animal or group identification.
 - Date treated.
 - Product administered and manufacturer's lot/serial number.
 - Dosage used.
 - Route and location of administration.
 - Earliest date animal will have cleared withdrawal period.

When cattle are processed as a group, all cattle within the group shall be identified as such, and the following information recorded:

- Group or lot identification.
- Date treated.
- Product administered and manufacturer's lot/serial number.
- Dosage used.
- Route and location of administration.
- Earliest date animals will have cleared withdrawal period.

All cattle shipped to slaughter will be checked by appropriate personnel to assure that animals that have been treated meet or exceed label or prescription withdrawal times for all animal health products administered.

All processing and treatment records should be transferred with the cattle to next production level. Prospective buyers must be informed of any cattle that have not met withdrawal times.

Most common causes of morbidity (sickness) in calves (1996, National Animal Health Monitoring System)

	< 3 weeks old	>3 weeks old
Respiratory disease	0.5 %	0.8 %
Scours or diarrhea	2.4 %	1.7 %
Pinkeye	0.1 %	1.1 %
Foot rot	0.0 %	0.2 %

Most common causes of morbidity (sickness) in cows (1996, National Animal Health Monitoring System)

	Heifers	Cows
Respiratory disease	0.9 %	0.3 %
Scours or diarrhea	1.0 %	0.5 %
Pinkeye	1.9 %	1.2 %
Foot rot	0.8 %	0.8 %
Cancer eye	0.0 %	0.3 %
Mastitis	N/A	0.2 %
Retained placenta	N/A	0.4 %
Abortion	0.3 %	0.3 %

Drugs expressly prohibited in food animals:

- Chloramphenicol
- Clenbuterol
- Diethylstilbestrol (DES)
- Dimetridazole
- Fluroquinolones (except as specifically approved)
- Furazolidone
- Ipronidazole
- Glycopeptides
- Nitrofurazone
- Phenylbutazone (female dairy cattle 20 months of age or older)
- Sulfonamides in lactating dairy cows, except those specifically approved.

Things to keep in your vet supply box:

Vet clinic phone number

Treatment sheets (at least a notepad and pen)

Needles and syringes

Identification method – marking crayon, ear tag, back tag, leg wrap

Thermometer (working)

Epinephrine (refrigerator)

Bloat treatment – trocar (sharp jackknife), poloxalene (Therabloat)

Disinfectant

Appropriate antibiotics (in consultation with your veterinarian)

FOOTHILL ABORTION RESEARCH AT UC-DAVIS

(Jeffrey L Stott, Professor of Immunology, School of Veterinary Medicine)

Foothill abortion was recognized as a significant deterrent to the cattle industry as early as the 1920's. Founding of the Veterinary School at UC-Davis in the 1940's was due in part to the need to address this unknown disease. Foothill abortion was well-described in the 50's and the pathology of the diseased fetuses was characterized in the 60's. A multitude of potential etiologic agents were pursued vigorously beginning in the late 50's and included members of the Chlamydial Group, retroviruses and spirochetes.

A major advance in understanding foothill abortion came with the demonstration in the 1970's that a soft-shell tick, *Ornithodoros coriaceus* (typically referred to as the Pajaroello tick), was a natural vector of the foothill abortion. Research directed at identifying the foothill abortion pathogen was complicated by the inefficient and unpredictable transmission of disease following the experimental feeding of ticks on susceptible pregnant heifers.

The current group of investigators at UC-Davis, in collaboration with researchers at the University of Nevada-Reno, developed a reliable method of experimental transfer of foothill abortion in the late 90's using cryopreserved tissue homogenates of thymus derived from select foothill abortion cases. This led to their identification of the etiologic agent in 2005. A bacteria in the *Myxococcales* group, which is a member of the large Deltaproteobacterium Family, was identified using advanced molecular biology techniques. The only other animal pathogen ever identified in this bacterial Family was *Lawsonia intracellularis*, a bacteria associated with a costly enteritis in pigs. Extensive efforts, in association with the California Animal Health and Food Safety Laboratory System, were made to grow the pathogen in cell cultures and synthetic media over the next several years. Similar to its distant cousin, *L. intracellularis*, the bacterial agent of foothill abortion continues to resist *in vitro* propagation, making characterization of the pathogen and vaccine production most difficult.

In partnership with the CCA's Livestock Memorial Scholarship Fund, UC-Davis researchers are pushing hard towards developing a vaccine for foothill abortion. One of the greatest recent successes is the infection of laboratory mice. Mice with severe combined immunodeficiency are susceptible to infection with the bacteria and efforts are currently underway to purify the pathogen from mouse necropsy tissues. The necessity of this approach was driven by the recent determination that the majority of bacteria in infected bovine fetuses has been "wounded" by the fetuses immune response and falls apart during laboratory manipulation.

With the laboratory purification of the bacterial pathogen, efforts will now be focused on characterizing the bacterial proteins and genome for the purpose of identifying candidate vaccine proteins. The most advanced molecular techniques will be applied including partial to complete sequencing of the bacteria genome, creation of protein expression systems by shotgun cloning of pieces of the bacterial DNA and direct identification of select bacterial protein sequences using a proteomics approach. This latter effort is being initiated in May through a collaborative venture with a Laboratory in Scotland that is conducting similar work with *Lawsonia intracellularis*.

Epizootic Bovine Abortion

(EBA; Foothill Abortion)

Jeffrey L Stott, UC-Davis School of Veterinary Medicine

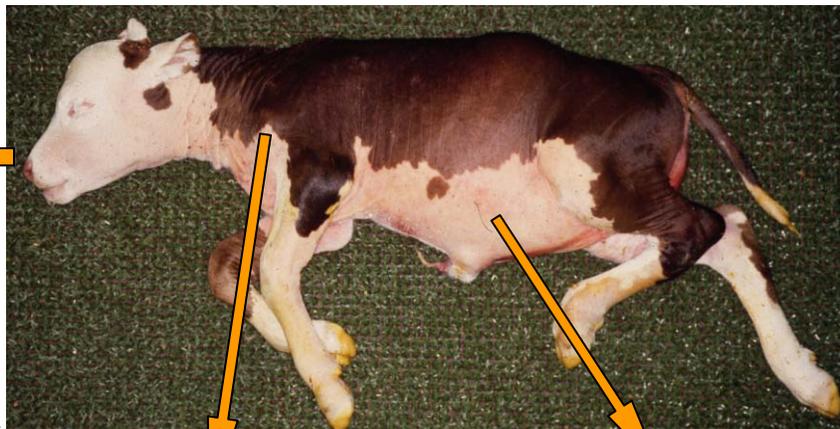


Tick Vector of *Epizootic Bovine Abortion*
Common name = *Pajaroello Tick*

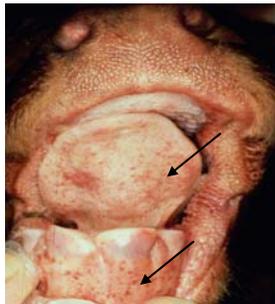


EBA Fetal Pathology

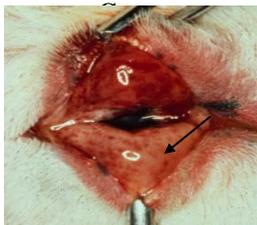
(Pathology may vary in any given fetus)



Mucosal Hemorrhages



Tongue &



Eye



Enlarged Lymph Nodes

Internal Pathology



Fluid in Belly



Enlarged Spleen
(liver not involved)



Enlarged, Mottled Liver

Beef and Range Field Day: Beef Cattle Management
UC Sierra Foothill Research & Extension Center
Saturday, April 5th, 2008

POISONOUS PLANTS

Birgit Puschner and Bob Poppenga

ABSTRACT

Livestock animals are at the mercy of toxic plants when these plants are present in feeds or hay. Alfalfa hay or forage, which is commonly offered to livestock animals, may pose a risk if contaminated with poisonous plants. Undesirable effects may result from ingestion of large amounts of alfalfa by livestock but may also be associated with the ingestion of small amounts of highly toxic plants present in alfalfa. In many cases, livestock animals, especially horses are selective about what they eat, but instances such as herbicide applications may change palatability or increase toxicity in some plants. Most plant poisonings have no specific treatments and thus, are best prevented by avoiding exposure to toxic plants in the first place. Hay and feed should be carefully inspected for contamination with potentially toxic weeds before the first feeding and owners should establish excellent working relationships with suppliers and growers. Producers and farm managers, along with veterinarians and diagnosticians play important roles, and all contribute information that may be important to a poisoning case. Once all the information is available, all evidence is collected, and proper sampling of specimens has occurred, a summary of findings can be provided and will be instrumental in preventing reoccurrences.

Livestock poisoning associated with the ingestion of hay contaminated with nitrate accumulators, pyrrolizidine alkaloids, foxtail and oleander will be discussed in more detail. Awareness of poisonous plants growing in a certain geographical region and their associated clinical signs are instrumental in making a diagnosis, and initiate treatment. More importantly, the recognition of poisonous plants in hay or forage may help prevent plant poisonings in animals. In addition, botulism is briefly discussed.

Nitrate accumulators: There are a number of common crop and pasture plants, and weeds that can accumulate toxic nitrate concentrations. Among weeds, pigweed (*Amaranthus* spp.), nightshades (*Solanum* spp.) and lamb's quarters (*Chenopodium* spp.) have been found to contain nitrate at a potentially toxic concentration. Among crop plants, especially oat hay, and sorghum have been incriminated with nitrate toxicosis, but alfalfa itself may contain potentially toxic nitrate concentrations. Alfalfa hay may be contaminated with pigweed or lamb's quarters, thus, presenting a potential source for nitrate poisoning. Nitrate accumulates in the vegetative tissue, particularly in stems with less in the leaves. Seeds generally do not contain toxic nitrate levels. Heavy fertilization of pastures, herbicide treatment, drought, cloudy weather, and decreased temperature may increase the nitrate concentrations in plants. Nitrate poisoning is primarily a problem in ruminants because of the reduction of nitrate to nitrite by ruminal microorganisms. Cattle are especially susceptible to nitrate toxicosis. The nitrite ion produces methemoglobin, which cannot react with oxygen, so anoxia occurs. Methemoglobin leads to dark brown or

chocolate-colored blood, a common feature of nitrate/nitrite poisoning. Clinical signs of acute nitrate poisoning include depression, dyspnea, tremors, ataxia, rapid heartbeat, and terminal convulsions. Death may occur within 6-24 hours of ingestion. Diagnosis is based on appropriate clinical signs and laboratory analysis of nitrate and nitrite in serum, blood, ocular fluid, rumen contents, and forage. Forage nitrate levels of 0.3% and above are potentially dangerous, with acute poisoning likely to occur if the nitrate level exceeds 1%. Forage management techniques can affect the concentration of nitrate and can reduce the risk. Careful use of nitrogen fertilizers, harvest under appropriate conditions, supplementation of ration with corn, ensiling, and testing hay and forage for nitrate content are approaches to minimize the risk of nitrate poisoning in animals.

Pyrrolizidine alkaloids: Pyrrolizidine alkaloid (PA) poisoning is of great economic importance as a cause of progressive liver disease in livestock animals. The disease has been reported from most areas of North America and is mostly caused by plants from the genus *Senecio*, but other plant genera such as *Amsinckia* and *Cynoglossum* spp. also contain the toxic alkaloids. Many of the groundsels and ragworts (*Senecio* spp.) contain PAs. *Senecio vulgaris* (common groundsel) is a common weed in hayfields in California and is also widely distributed along the East Coast and Canada. New plantings of alfalfa and alfalfa weakened by heavy weevil infestations are more susceptible to competition by common groundsel. PAs are hepatotoxic, causing irreversible liver damage. Horses and cattle are the major livestock species poisoned by PAs. Sheep, goats and small herbivores (e.g. rabbits, guinea pigs, hamsters) are resistant to PA toxicity due to detoxification processes in the liver. Clinical signs of chronic PA poisoning may often not appear for 2-8 months after the first ingestion of PA containing plants. Affected animals lose condition, and develop icterus. Cattle may also develop photosensitization. Neurological signs are commonly seen in horses, and the condition is called “walking disease”. After the onset of clinical signs, the prognosis is poor. The presumptive diagnosis is based on clinical signs, and gross as well as histologic lesions. Identification of PA-containing weeds in alfalfa and detection of PAs in forage are important to establish an accurate diagnosis. However, due to the prolonged delay in onset of clinical signs the affected hay that was eaten weeks or months before may no longer be available for evaluation. While there is some degradation of PAs in silage, the PA content of hay remains constant over many months. Silage contaminated with more than 5% *Senecio* spp. is considered unsafe for cattle or horse feeding.

Bristlegrass: In the past years, the Toxicology laboratory of CAHFS diagnosed several cases of disease related to the exposure of horses to *Setaria* spp., also known as bristlegrass or bristly foxtail. The affected horses had a history of blisters and lesions in the mouth and ulcerations on the tongue and lips. Alfalfa hay fed to these horses contained large amounts of two different species of bristlegrass: *Setaria viridis* (green foxtail) and *Setaria glauca* (yellow foxtail, yellow bristlegrass, bristly foxtail). Both species have sharp and barbed bristles, particularly *S. glauca*. The bristles are capable of penetrating the mucous membranes and causing serious erosions of the mouth. Problems usually occur when the grass is cut late and a substantial number of panicles are present. The mechanical injury is a particularly serious problem in horses, but has also been reported in cattle. The lesions in the mouth will cause pain, resulting in a reluctance to eat and a loss of weight. The bristles can cause deep ulcerations of the tongue, gums and cheeks, which may result in abscesses. The bristles may be present in the wounds and need to be

removed, if possible. If alfalfa hay is contaminated with bristlegrass, it should not be fed to livestock animals.

Oleander: The potential for exposure of animals to oleander is high. Oleander (*Nerium oleander*) is an ornamental, evergreen shrub that is very drought tolerant and often able to survive unattended in pasture lands where livestock graze. However, ingestion from clippings or dried leaves is the most common cause of oleander poisoning in animals. Modern agricultural practices, like crimping of hay can create a greater risk for oleander contamination from leaves blowing into the fields before harvest. Oleander is commonly found in the southern United States and most of California. The toxicity of oleander results from cardiac glycosides, with oleandrin being the most prominent one. Cardiac glycosides inhibit the Na^+/K^+ ATPase, ultimately resulting in cardiac arrhythmias. Death is typically due to ventricular fibrillation. The toxic cardenolides are present in all parts of oleander, and toxicity is retained with drying. The leaves and flowers have the highest concentrations of toxic cardenolides. 10 –20 medium-sized leaves can be lethal to a horse, while as few as 8 leaves can cause death in a cow. Clinical signs of oleander poisoning include diarrhea, excess salivation, depression, and anorexia. As the disease progresses, the animals develop a variety of cardiac signs, including bradycardia and arrhythmias. At this stage of the disease, the animals may also show tremors and difficulty breathing. However, often the disease progresses so rapidly that the animal is found dead and clinical signs are not observed. Oleander leaves may be present in the gastrointestinal contents, but identification may not always be possible. Every effort should be made in a suspect oleander poisoning case to reach an accurate diagnosis so that adequate therapeutic measures can be initiated. In addition, the source of oleander has to be identified and removed from animals. Diagnosis of oleander poisoning has improved significantly since the development of several specific analytical methods. Confirmation of the toxic glycoside oleandrin in biological samples, such as serum, urine and gastrointestinal contents provides invaluable information to the clinician in directing the clinical course and initiating adequate treatment in confirmed, non-fatal poisoning cases. Suspect contaminated plant material can also be analyzed for oleandrin to prevent fatal oleander poisoning in livestock.

Suggested Reading Material and References:

- A Guide to Plant Poisoning of Animals in North America by AP Knight and RG Walter. 2001; Teton New Media.
- Toxic Plants of North America by GE Burrows and RJ Tyrl. 2001; Iowa State University Press.
- Natural Toxicants in Feeds, Forages and Poisonous Plants by PR Cheeke. 1998; Interstate Publishers, Inc.
- <http://cal.vet.upenn.edu/poison/> Univ. Penn Poisonous plants. Excellent pictures and descriptions.
- <http://www.pprl.usu.edu/> USDA Poisonous plants Pictures and information on distribution of plants in the US.
- http://www.cbif.gc.ca/pls/pp/poison?p_x=px Canadian Poisonous Plants
- <http://www.google.com/> Image search for plant pictures

Amaranthus retroflexus – Redroot Pigweed

One of the most common weeds!



Characteristics:

- Annual weed growing up to 1 meter
- Leaves are long-stalked with prominent whitish veins
- Flowers are inconspicuous green, borne in spike-like clusters in leaf axils and at the stem ends
- One single plant can produce over 100,000 seeds
- Taproot is pinkish to red

Poisonous Parts: all parts

Toxin: nitrate

Species Affected: ruminants

Target organs: whole body

MOTA: nitrite results in methemoglobinemia

Treatment: methylene blue

Amsinckia intermedia – Fiddleneck

Weed in dry cultivated soils and waste grounds

Mainly in the Western US, but continues to spread eastward



Characteristics:

- Erect, sparsely branching annual weed covered with numerous white hairs
- Leaves are hairy, lanceolate and alternate
- Small orange to yellow flowers are terminally on a characteristic fiddleneck-shaped raceme
- Flowers are all on one side of the axis

Poisonous Parts: all parts of the plant, especially the flowers

Toxin: pyrrolizidine alkaloids

Species Affected: cattle, horses >>> sheep, goats

Target Organs: Liver and secondary skin

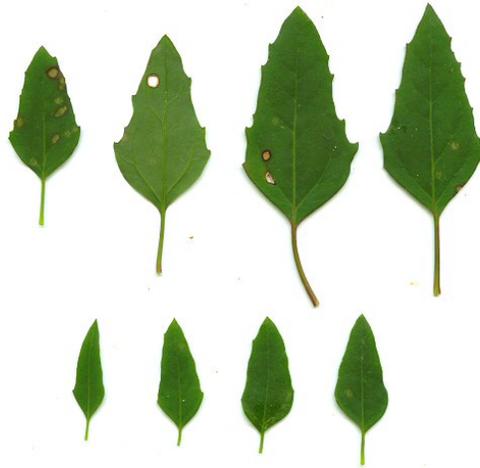
MOTA: toxic pyrroles result in hepatic damage

Clinical Signs: related to liver disease, photosensitization

Treatment: often useless! Supportive care

Chenopodium spp. – Lambsquarters

One of the most common agricultural weeds!
Invasive weed. Can contaminate hay!



Characteristics:

- Annual growing up to 1 m
- Alternate, light green, rounded, triangular, 1 1/4 to 10 inches long and on a long petiole
- Stems are erect, hairless, ridged, branching and light green with red coloration in varying degrees.
- **Flowers are** small and clustered into panicles at tips of branches and upper leaf axils. Flowers are green, inconspicuous, without petals and occur from June to September

Poisonous Parts: all parts

Toxin: nitrate

Species Affected: ruminants

Target organs: whole body

MOTA: nitrite results in methemoglobinemia

Treatment: methylene blue

Conium maculatum – Poison Hemlock

Maculatum means spotted, refers to purple spots on stem

Finely divided leaf helps distinguish poison hemlock from water hemlock



Poison Hemlock



Water hemlock



Characteristics:

- hollow stems, purple spots, tap root
- leaves are coarsely toothed, fernlike appearance
- flowers in compound umbels, small and white
- strong pungent odor

Poisonous Parts: roots, young plants, seeds (most toxic because they concentrate coniine)

Toxin: coniine and related alkaloids

Species Affected: cows, pigs, horses, sheep, wildlife, humans

Toxicity: 5 g/kg body weight of plant (fresh plant most toxic)

Target Organs: CNS (also teratogenic)

MOTA: Alkaloids mimic the action of ACh

Clinical Signs: neurotoxic and teratogenic

Treatment: evacuate stomach contents, anticonvulsants

Heteromeles arbutifolia – Toyon, Tollon, Christmas berry

One of CA's most popular native shrubs

Planted as an ornamental and used at Christmas for decoration



Characteristics:

- Shrub or small tree; evergreen → risk of ingestion in the winter and spring when not much else is available
- Leaves are simple, alternate, thick, leathery.
- Leaf blades are elliptic to oblong, upper surfaces are shiny dark green, margins are serrated
- Inflorescence large panicles, terminal
- Fruit is bright red, ovoid. Pulp is mealy. Fruit resembles miniature apples. Like true apples, the freshly-cut fruit readily becomes oxidized and turns yellowish-brown in the air.

Poisonous Parts: leaves have highest levels

Toxin: cyanogenic glycosides which form cyanide

Species Affected: livestock

Toxicity: 1.5-6% of body wt. is lethal

Target Organs: All cells

MOTA: cyanide inhibits cytochrome oxidase

Clinical Signs: tremors, dyspnea, convulsions, often found dead

Gross Lesions: bright red blood and mucous membranes

Diagnosis: clinical signs, plant material in stomach, demonstrate cyanide in stomach contents

Treatment: Sodium nitrite and sodium thiosulfate

Hordeum jubatum – Foxtail Barley

Also known as Foxtail, Skunk grass, Skunktail, Squirreltail, Wild barley



Characteristics:

- Bunch grass 20 -60 cm high
- Inflorescence (seed head) is a dense, unbranched, barley-like spike with finely barbed, long, green or purplish awns that turn yellowish when mature and breaking apart into seed-bearing units
- Each unit has a very sharp point and 7 long awns that are blown by the wind or carried in animal fur and clothing.

Poisonous Parts: No toxin – Mechanical Damage

Toxin: NA

Species Affected: All, but especially dogs

Target organs: skin, throat, ears, nose, others

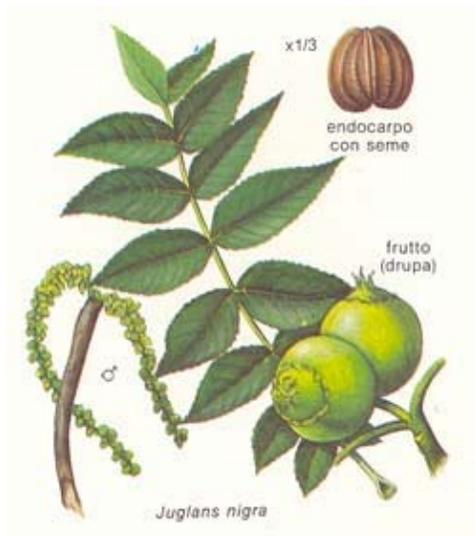
MOTA: bristles have tiny, forward pointing barbs only slide in one direction → skin irritation, abscesses, infections

Treatment: remove foreign body, general care

Juglans nigra – Black walnut

Specific toxicant resulting in laminitis remains to be identified

Fallen walnuts can become moldy and may contain penitrem A (a neurotoxic mycotoxin)



Characteristics:

- Large tree
- Rough, dark bark
- Pinnate leaves with 11 to 23 leaflets
- Fruits are ovoid, single hard-shelled nuts containing the edible fruit

Poisonous Parts: mainly wood shaving, leaves and pollen

Toxin: unknown

Species Affected: horses

Target organs: Laminitis - within 24 hours of exposure to shavings

MOTA: unknown

Treatment: wash legs and feet, GI detoxification, pain meds

Lupinus spp. – Lupines

Varieties with little or no toxin have been developed for forage crops

Both wild and ornamental species may be toxic



Characteristics:

- Perennial plants up to 3 feet
- Alternate, palmately compound leaves, each with 5 to 17 leaflets
- Inflorescence is a terminal raceme of compact white, blue-purple, red or yellow pea-shaped flowers

Poisonous Parts: All parts of the plant

Toxin: lupanine, anagyrine, and related alkaloids

Species Affected: sheep>>cattle

Toxicity: less than 1% of body weight

Target Organs: CNS (also teratogenic)

MOTA: Alkaloids mimic the action of ACh

Clinical Signs: neurotoxic and teratogenic

Treatment: evacuate stomach contents, anticonvulsants

Nerium oleander– Oleander

10 – 20 leaves can kill a cow or a horse

All parts of the plant are toxic whether fresh or dried. Even the fumes if burned are toxic!



Prominent midrib and pinnate veins



Opposite or whorled leaf arrangement



Characteristics:

- Perennial, evergreen shrub
- Leaves are simple in whorls of 3 or 4, lanceolate, sharply pointed. Leaves are dark green above and pale green below with prominent midrib and secondary, parallel veins.
- Inflorescences are dense compound cymes with showy white, pink or red flowers.
- Fruit pods are elongated with many seeds.

Poisonous Parts: all parts

Toxin: cardiac glycosides, e.g. oleandrin

Species Affected: all animal species and humans

Target organs: cardiovascular, digestive

MOTA: Inhibition of Na/K-ATPase

Treatment: GI decontamination, treat cardiac abnormalities

Nicotiana glauca– Tree tobacco

Other *Nicotiana* spp. also contain toxic alkaloids.

Lobelia spp. contain similar alkaloids and are found in the eastern US and Canada



Characteristics:

- Shrub or tree
- Bluish green, alternate leaves
- Leaves lanceolate to ovate with whitish powder that rubs off; leaf margins are entire or undulate
- Tubular, yellow flowers are produced on leafless branches at the end of the stems

Poisonous Parts: all parts of the plant

Toxin: anabasine, nicotine and related alkaloids

Species Affected: cows, pigs, horses, sheep, goats

Toxicity: 1% of body weight of plant (dried and fresh)

Target Organs: CNS (also teratogenic)

MOTA: Alkaloids mimic the action of ACh

Clinical Signs: neurotoxic and teratogenic

Treatment: evacuate stomach contents, anticonvulsants

Prunus virginiana – Chokecherry



Characteristics:

- Shrub or small tree
- Leaves are ovate to obovate, sharply pointed, serrated margins
- Leaves are simple, alternate
- Inflorescence is a cylindrical with showy, fragrant white flowers
- Fruit is a dark purple drupe

Poisonous Parts: leaves, twigs, bark, cherry pits

Toxin: cyanogenic glycosides which form cyanide

Species Affected: livestock

Toxicity: 0.5 – 3.0 mg/kg body wt. is lethal

Target Organs: All cells

MOTA: cyanide inhibits cytochrome oxidase, halts electron transport and cellular respiration

Clinical Signs: tremors, dyspnea, convulsions, but usually found dead

Gross Lesions: bright red blood and mucous membranes

Diagnosis: clinical signs, plant material in stomach, demonstrate cyanide in stomach contents

Treatment: Sodium nitrite and sodium thiosulfate

Quercus spp. - Oak

Oak is not toxic to goats or deer



Characteristics:

- Shrub or large tree;
- Leaves are simple, alternate, toothed or lobed dark green glossy
- Flowers singly or in small clusters
- Fruit = acorn!
- Inflorescence large panicles, terminal

Poisonous Parts: acorns and leaves, esp. young shoots

Toxin: tannins

Species Affected: cattle>>sheep and horses

Toxicity: Large amounts required to be toxic

Target Organs: intestine and kidney

MOTA: tannins bind and precipitate proteins

Clinical Signs: anorexia, dullness, rumen atony, constipation followed by icterus, hematuria, polyuria

Diagnosis: urinalysis, lesions

Treatment: detoxification, calcium hydroxide to precipitate tannins

Ricinus communis – Castor bean

Castor oil is derived from the beans and contains ricinoleic acid (a GI irritant)

Properly detoxified castor bean meal is a useful protein source for cattle



Characteristics:

- Erect, branching shrub
- Leaves alternate, palmately lobed, serrate
- Flowers numerous in long inflorescences, with male flowers at the base and female flowers at the tips
- Fruit is a capsule 2.5 cm in diameter, on an elongated pedicel, usually spiny, green turning brown on ripening; with 3 seeds
- Seeds ovoid (tick-like), mottled with brown, black and gray

Poisonous Parts: all parts, but especially seeds

Toxin: ricin (a lectin)

Species Affected: all species

Toxicity: highly toxic

Target Organs: GI tract

MOTA: inhibition of protein synthesis

Clinical Signs: diarrhea, weakness, depression, colic, convulsions

Gross Lesions: gastroenteritis

Diagnosis: clinical signs

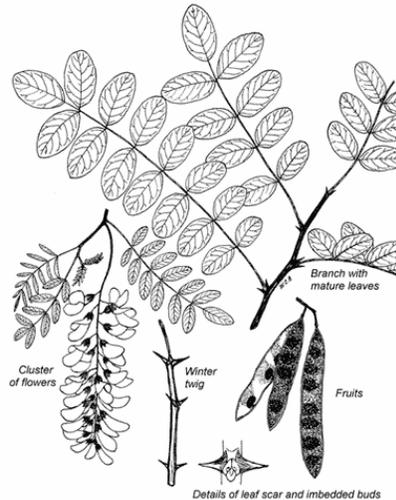
Treatment: detoxification and supportive care

Robinia pseudoacacia – Black locust

You can find one in Davis in the arboretum (east of the equestrian center) or close to Plainfield Station



Twigs bear short thorns. *acacia* is from Greek word for a sharp point.



Characteristics:

- Small tree with straight, slender trunk
- Branches are spiny when young
- Leaves alternate, pinnately compound with entire, elliptical leaflets in 3 to 10 pairs.
- Flowers are white, pealike and form droopy clusters
- Fruit is straight, flat brown legume pod

Poisonous Parts: bark, seeds, leaves.

Toxin: robin (a lectin)

Species Affected: horses > cattle

Toxicity: horses – as little as 0.04% of body weight
cattle – 0.5% of body weight

Target Organs: GI tract

MOTA: inhibition of protein synthesis

Clinical Signs: diarrhea, weakness, dyspnea, depression, renal failure

Gross Lesions: gastroenteritis

Diagnosis: clinical signs

Treatment: detoxification and supportive care

Rumex crispus – Curly Dock, Sorrel

Common plant of gravelly soils of pastures and plans throughout the US

Many other species of *Rumex* exist. May contain high nitrate!



Characteristics:

- Perennial weed
- Flower stems may reach 6 to 7 feet without any branches
- Leaves are alternate, oblong to lanceolate with wavy margins
- Flowers are terminal racemes or panicles
- Inflorescence turns dark brown when dry

Poisonous Parts: all parts of the plant

Toxin: Soluble oxalates (Na, K)

Species Affected: mainly ruminants, occasionally horses

Target Organs: Kidney, hypocalcemia

MOTA: Oxalates bind with Ca to form C-oxalate crystals

Clinical Signs: weakness, tremors, collapse

Treatment: calcium i.v. and supportive care



Senecio vulgaris– Common groundsel

More than 100 species of *Senecio* are known to be poisonous.
Found worldwide

Senecio vulgaris is most common west of the Cascade Mountains. It is a noxious weed in many crops, including forages, cereals, berries, and vegetable gardens. *Senecio vulgaris* grows wild in fields and along roadsides in temperate and subtropical climates.



Characteristics: DIFFICULT TO IDENTIFY!

- Erect, 10 – 30 cm tall, typically branching plant
- Leaves simple, alternate, lanceolate, deeply pinnately lobed
- Composite flower heads in terminal corymbs (flattened terminal clusters) with showy, yellow flowers
- Presence of a single layer of touching, but not overlapping, greenish bracts surrounding the flower
- Common plant to be confused with: Sowthistle (non-toxic)

Poisonous Parts: all parts of the plant, especially the flowers

Toxin: pyrrolizidine alkaloids

Species Affected: cattle, horses >>> sheep, goats

Target Organs: Liver and secondary skin

MOTA: toxic pyrroles result in hepatic damage

Clinical Signs: related to liver disease, photosensitization

Treatment: often useless! Supportive care

Setaria species – Bristly Foxtail

Found in Alfalfa Hay
– mainly risk for



Characteristics:

- Bunch type grass up to 4 feet tall
- Leaves are flat, smooth and appear near the base
- Seedhead is a cylindrical bristly panicle, reaching 6 inches in length. It is green, yellow or purple.
- Spikelets are approximately 3 mm long and each spikelet has several bristles. The bristles have barbs.

Poisonous Parts: No toxin – Mechanical Damage

Toxin: NA

Species Affected: All livestock animals, mainly horses

Target organs: oral cavity, GI tract

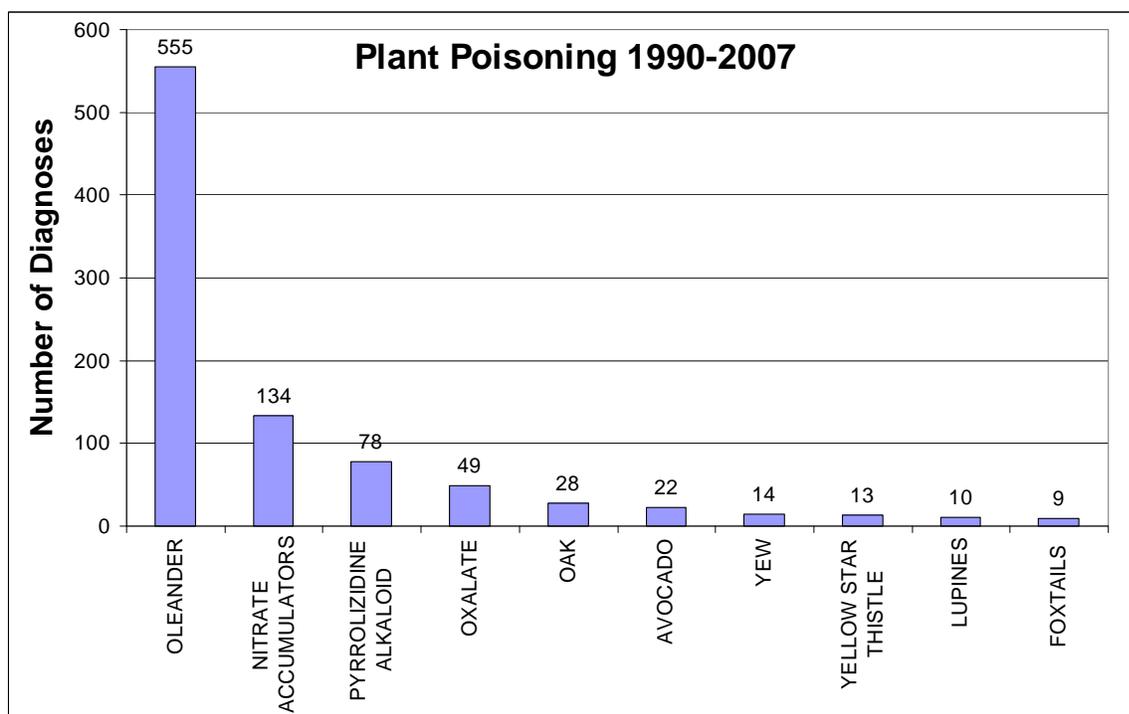
MOTA: barbs on bristles cause irritation of mucous membranes, possibly abscesses, infections and anorexia

Treatment: remove foreign body, general care for abscesses

Occurrence of Animal Plant Poisonings in California

Birgit Puschner, Bob Poppenga, Art Craigmill, and Glenn Nader

The California Animal Health and Food Safety (CAHFS) Laboratory System Toxicology Laboratory has investigated numerous cases of suspected plant poisoning from 1990-2007. The CAHFS veterinary toxicologists have diagnosed plants as the cause of toxicosis in more than 600 submitted cases, most of these in livestock. The largest numbers of submissions were for cattle, followed by horses, pigs, goats and sheep. Figure 1 shows the numbers of confirmed cases for the ten most frequent diagnoses.



These data show that the most commonly diagnosed plant poisoning is that of the ornamental oleander, a non-native species. The data from CAHFS are from samples submitted for diagnosis, thus they do not necessarily represent the actual occurrence of plant poisonings in California.

Table 1 shows the five most commonly diagnosed plant intoxications for cattle, horses, sheep, and goats:

CATTLE	HORSES	SHEEP	GOATS
OLEANDER	OLEANDER	OLEANDER	AVOCADO
NITRATE/NITRITE	PYRROLIZIDINE ALKALOIDS	OXALATE	NITRATE/NITRITE
OXALATE	YELLOW STAR THISTLE	NITRATE/NITRITE	OXALATE
PYRROLIZIDINE ALKALOIDS	DOGBANE (<i>Apocynum</i>)	LUPINUS SP.	LUPINUS SP.
TANNIC ACID - OAK	SETARIA SP. (Foxtails)	PERENNIAL RYEGRASS	CYANIDE

These toxic compounds are contained in the following plants:

NITRATE/NITRITE - Sorghums - like Johnson Grass and Sudan grasses, Oat hay, other grass hays, Lambs quarters (*Chenopodium*), Pigweed (*Amarathus*).

PYRROLIZIDINE ALKALOIDS - fiddleneck, tansy ragwort, groundsel.

OXALATE - Greasewood (*Sarcobatus*), Sorrels (*Oxalis*), and Dock (*Rumex* spp), Pigweed, and Lambs Quarters.

Landscape plants have also become a bigger risk of plants poisonous to livestock animals. Some are due to planting of poisonous ornamentals in or near the pasture or livestock facilities while other poisonings are caused by yard trimmings that are offered to livestock by unknowing neighbors.

The UC Sierra Foothill Research & Extension Center

Website Information

Dustin K. Flavell & Sandy Mecham

You can find us at <http://ucanr.org/sfrec>

From the main page you can learn more about the Center by clicking “About Sierra” on the left main margin. Here you will find useful information such as our history of development, natural resources at the Center and a virtual walk along the Nature Trail.



To learn more about the type of research projects the Center supports open the “Active Research” on the left margin from the main page. Projects are broken down by focus area and then a short abstract is provided describing each project.

Project: 057 Artificial Regeneration of Native Oaks in California

Project Leader: [Douglas D. McCreary](#), Natural Resources Specialist, Environmental Science, Policy & Management, UC Berkeley

Objective: To develop practical, low cost methods for successfully restocking native oaks on hardwood rangelands in California.

You can also search publications on research done at the Center by opening the “Publications” page on the left margin of the main page. A summary of the publication is provided along author(s) and project title. The full publication can be viewed by visiting the Center’s library in the Main office.

Project: First calf heifer management

Project Leader: [Connor, J.M.](#)

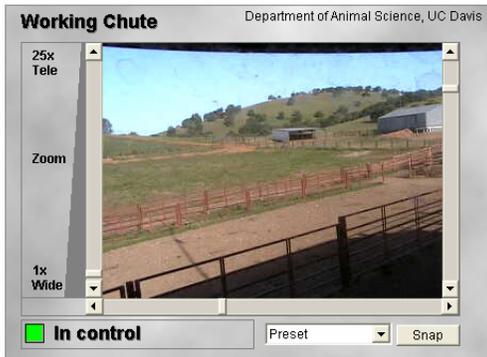
Summary: 1992. Proc., UC Sierra Foothill Range Field Station Beef and Range Field Day: pp. 11-16. This presentation discusses several management methods for first-calf heifers which were evaluated at the Sierra Field Station over several years. Bulls were selected from several herds representing each breed. Births of heifer calves resulted in a significantly lower dystocia score and required assistance less than as frequently as did births of bull calves. Calf birth weights varied among sire breeds, thus calving success measures also varied among years in this study.

You can also view all past “SFREC Field Day” proceedings in their entirety by opening the “Field Day Proceedings” link in the left hand margin of the main page.

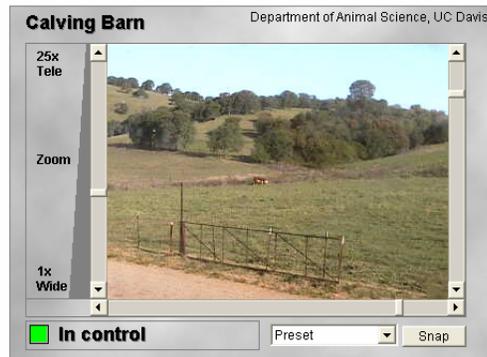
If you are interested in learning more about the animal health plans that the Center's Animal Use Committee have developed open the page "SFREC Animal Health Plans" from the left hand margin on the main page. Health plans are categorized by animal age and type.

If you are a more visual web user you can "see" what we are up too by clicking the "Web Cameras" link in the left hand margin on the main page. This link will take you to the UC Davis Department of Animal Science web cameras installed at the HQ working area and the Center's calving barn.

Sierra Web Camera
Working Chute Webcam



Sierra Web Camera
Calving Barn Webcam



You will need a password to access these cameras
Username: **SierraVisitor** Password: **cowboy** (case sensitive)

A schedule of animal activities are provided if you want to see the cowboys and students in action or you can just login (with the information above) and browse around to check out the facilities or the pristine surrounding landscape.

A couple of questions we often get around Field Day time are "How much grass we growin' this year"? & "How we doing on Rain this year"? Well if you can wait to hear those answers at the "Field Day" follow the "About Sierra" link to the "Natural Resources" link from the left hand margin of the main page. On this page there are links in the main body of the page under weather and forage that will not only answer that question for the current year, but also show a historical prospective to see how we are stacking up this year to years past. Here you can also check out the different plant and wildlife species found at the Center.

In the left hand margin you can open the "Links" page from the main page. Here you will find links to other UC Agriculture & Natural Resource Research Centers. Here you can also link to Cooperative Extension Outreach offices by County and University of California Campuses and their respective programs supporting Agriculture & Natural Resources.



Special thanks goes out to Webmaster and Web Designer Sandy Mecham for developing this website. Sandy works hard to maintain this website with the most current information we have to date. If you have an idea for our website or if you want to just drop here a line to tell her what a wonderful job she has done please feel free to do so at slmecham@ucdavis.edu. Sandy can also assist you in finding publications information found on our website at the Center's library.