

A Dry Fall and a Heavy Acorn Crop: Keep an Eye out for Acorn Toxicity

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Recent observations at the UC Sierra Foothill Research and Extension Center – and elsewhere in the Sierra foothills and Sacramento Valley – suggests that 2020 was a bumper year for acorns! Blue oaks in particular seem to be producing an especially heavy crop. And as you may have noticed, we have not yet received a lot of rain on our oak woodlands. With many ranchers moving livestock onto annual rangelands for the winter, we should be aware of the signs of oak intoxication in livestock, especially if feed stays in short supply.

Grazing animals will consume acorns, oak leaves, and buds, especially when typical forages are in short supply. While typically a disease of cattle, oak intoxication can also affect sheep, and to a lesser degree goats and horses.

Our most common oak species in the foothills and Sacramento Valley are **live oak**, **blue oak**, **black oak**, and **valley oak**, which differ in the amount of toxins they harbor in their acorns (see images for examples). Deciduous blue oaks are distinguished by their lobular, bluish-green leaves and whitish bark. Interior live oaks are evergreen, with gray-black bark and thick, leathery leaves that may be smooth or toothed at the margin. Canyon live oaks are also evergreen and whiter bark than interior live oaks. Deciduous California black oaks are typically found higher in the foothills than blue oaks, and have large, deeply lobed leaves and gray-to-black bark. Deciduous valley oaks are typically the largest of Northern California's oaks, growing in broad, fertile lowlands. White oaks have thick bark with cube-like checks and broad leaves with three to five pairs of rounded lobes.

The following table shows which types and parts of oaks are more worrisome than others in terms of toxicity:

Higher in toxins	Lower in toxins
<p data-bbox="435 336 565 367">Black oaks</p>  <p data-bbox="332 703 665 735">California black oak leaves</p> <p data-bbox="332 735 665 766">Credit: James St. John, CC BY 2.0</p> <p data-bbox="227 766 771 819"><https://creativecommons.org/licenses/by/2.0/>, via Wikimedia Commons</p>	<p data-bbox="1015 304 1226 336">Blue oaks</p>  <p data-bbox="868 724 1372 756">Blue oak (left) and Live oak leaf clusters</p> <p data-bbox="820 756 1421 808">Credit: Yath, CC BY-SA 3.0 <http://creativecommons.org/licenses/by-sa/3.0/>, via Wikimedia Commons</p>
<p data-bbox="414 850 576 882">Green acorns</p> 	<p data-bbox="1047 850 1193 882">Ripe acorns</p> 
<p data-bbox="381 1129 625 1161">Buds, young leaves</p> 	<p data-bbox="1031 1129 1209 1161">mature leaves</p> 

How are grazing livestock affected by acorn toxicity?

The toxic compound in oak leaves and acorns are hydrolysable tannins, which causes irritation and damage throughout the digestive tract. These tannins are converted to gallic acid and phenols in the rumen, which are toxic to the kidneys. Cattle or sheep may seem dull, stop urinating or urinate more frequently, have constipation or bloody mucoid diarrhea, be unwilling to rise and have edema (fluid accumulation leading to a spongy, swollen appearance). If kidney function is impaired, livestock may not fully recover and lose condition. Young cattle and lambs are typically more affected than older animals and may not survive.

If only a small part of the diet consists of oak leaves or acorns, tannins do not cause disease, but they will bind protein in the rumen decreasing available nutrition. The biggest problems arise when grazing livestock have been feed restricted and are consuming oak products “on an empty stomach”. A scenario that could result in toxicity is when feed sparsity is paired with a sudden abundance of acorns or leaves due to high winds or heavy rain knocking them to the ground where hungry livestock will consume them in large quantities. Snowstorms covering up grass is another situation where livestock may seek out feed in the form of oak leaves or buds as a main source of food. However, even if forage is adequate, turning livestock into a pasture where large amounts of acorns have accumulated may tempt them to consume toxic amounts.

Goats are far more tolerant to oak toxicity for a few reasons. Tannin-binding proteins in goat saliva protect the hydrolysable tannins from being converted into gallic acid and phenols in the rumen (this is also why deer are not affected by oak toxicity). These bound proteins also stimulate the proliferation of tannin-tolerant bacteria in the rumen that produce enzymes that will metabolize unbound tannins. These processes exist in cattle and sheep but are poorly developed. That said, the rumen microbial environment is quite dynamic and may explain why some producers witness their livestock grazing acorns without adverse effects.

Treatment

A veterinarian should be consulted to determine the best treatment plan for affected cattle. Fluid therapy to restore kidney function and antibiotics to prevent secondary infections from gastrointestinal ulcers or pneumonia are the treatments of choice for cattle with oak toxicity combined with supportive care. If caught early, giving a slurry of activated charcoal via a stomach tube can help absorb some of the toxins. Make sure cattle have access to good quality hay and fresh water during recovery. Anti-inflammatories such as flunixin meglumine are **not** a good choice for this condition because they can be hard on both the digestive tract as well as the kidneys.

Prevention

Prevention is critical – if your livestock are consuming a lot of acorns, or if you anticipate a big weather event leading to a sudden increase in oak products available to your cattle, you want to provide hay or other forages to dilute the effect or until grass growth is sufficient. Protein cakes, with or without polyethylene-glycol (PEG) will increase available nutrition which will encourage livestock to utilize more dry forage and PEG is a tannin-inactivating agent. Supplementing hydrated lime (calcium hydroxide) at 10% e.g. in a pelleted feed has also been recommended to prevent toxicity. If possible, fencing off oak trees is another possibility to avoid problems related to oak toxicity.

“Acorn” calves

The term acorn calf is a misnomer since despite the name, the condition leading to these calves with shortened and deformed legs is not caused by the dam’s exposure to acorns. The exact cause of what is leading to these malformations is not entirely understood, but it is clear that malnutrition of the dam during mid gestation plays a role. Since drought years often coincide with an abundance of acorns, the birth of these calves was associated with the dam eating a lot of acorns during pregnancy.