

Wildfires, Smoke and Livestock

John Madigan, David Wilson, and Carolyn Stull
School of Veterinary Medicine, University of California, Davis



Figure 1. Sheep with mild burns and sore feet from wildfire.

Severe wildfires expose humans and animals to injuries both from burns and inhalation of unhealthy air containing smoke and particulates. These particulates can build up in the respiratory system, causing a number of health problems including burning eyes, runny noses and illnesses such as bronchitis. Smoke can also aggravate heart and lung diseases such as congestive heart failure, chronic obstructive pulmonary disease, emphysema and asthma.

Livestock that are burned by wildfires may experience shock, pain, and systemic complications. Because little information is available to livestock producers or even veterinarians on the effects of fire and smoke on livestock, the following suggestions are offered to serve as a general guide.

What's In Smoke? Smoke is made up of carbon dioxide, carbon monoxide, particulate matter, soot, hydrocarbons and other organic substances including nitrogen oxides and trace minerals. The composition of smoke depends on what was burned; different types of wood, vegetation, plastics, house materials, and other combustibles all produce different compounds when burned. Carbon monoxide, a colorless, odorless gas that is produced in the greatest quantity during the smoldering stages of the fire, can be fatal in high doses. In general, particulate matter is the major pollutant of concern in the smoke of wildfires. Particulate is a general term used for a mixture of solid particles and liquid droplets found in the air. Particulates from smoke tend to be very small (less than one micron in diameter), which allows these to reach the deepest airways within the lung. Consequently, particulates in smoke are more of a health concern than coarser particles that typically make up road dust.

How Does Smoke Affect Livestock? The effects of smoke are similar for humans and livestock: irritation of the eyes and respiratory tract, aggravation of chronic lung diseases, and reduced lung function. High concentrations of particulates can cause persistent cough, increased nasal discharge, wheezing and increased physical effort in breathing. Particulates can also alter the immune system and reduce the ability of the lungs to remove foreign materials, such as pollen and bacteria, to which livestock are normally exposed.



Figure 2. Initial burns cause swelling of the face and eyes.

Protecting and Treatment of Livestock from Smoke Particulates:

Limit exercise when smoke is visible. Don't force livestock to perform activities or increase exercise that increase the airflow in and out of the lungs. This can trigger bronchoconstriction (narrowing of the small airways in the lungs).



Figure 3. Water supplied to livestock by local fire crews.

Provide plenty of fresh water located near feeding areas. The consumption of easily accessible water keeps the airways moist and facilitates clearance of inhaled particulate matter. This allows the windpipe (trachea), large airways (bronchi), and small airways (bronchioles) to remove inhaled particulate material in smoke. Dry airways make particulate matter remain in the lung and air passages.

Limit dust exposure by feeding low or dust-free feeds and sprinkling or misting the livestock holding area. This reduces the particles in dust such as mold, fungi, pollens and bacteria that may have difficulty being cleared from the lungs.

If livestock is coughing or having difficulty breathing, contact a livestock veterinarian. A veterinarian can help determine the difference between a reactive airway from smoke and dust versus a bacterial infection and bronchitis or pneumonia. If livestock has experienced coughing over a long period of time, there is a greater risk of secondary problems such as bacterial pneumonia.

Give livestock ample time to recover from smoke-induced airway insult. Airway damage resulting from wildfire smoke takes 4 to 6 weeks to heal. Therefore, plan on giving livestock 4 to 6 weeks to recuperate after the air quality returns to normal. Attempting to handle, move, or transport livestock may aggravate the condition, delay the healing process, and compromise the performance of livestock for many weeks or months.



Figure 4. Sheep with varying degrees of burns and smoke inhalation from wildfire.

If your livestock continues to experience primary or secondary problems with smoke-induced respiratory injury, you should contact a livestock veterinarian.

Veterinarians can prescribe specific treatments such as intravenous fluids, bronchodilator drugs, systemic antibiotics, or other measures to facilitate hydration and health of the airway passages. Blood tests or other tests may be recommended to determine whether a secondary bacterial infection has arisen and is contributing to the current respiratory problem.

How to Evaluate and Treat Livestock Burned by Wildfire? Initial assessment of a



Figure 5. Burned legs of sheep with compromised hoof walls.

burned animal is challenging because the depth/severity of the burn may be difficult to ascertain and the animal may not appear distressed or painful. The burned area may have destroyed the nerve endings and no pain behavior is observed despite severe tissue damage. Vital signs such as heart rate also may be deceptively low. For example, burned sheep from a fire in Zamora, CA in 2006 were walking normally, but their burned legs were without hoof walls which exposed the bone. The animals with burns that are more painful to touch may not be as severely compromised in the long-term. Daily reassessment of all burned animals is necessary.

Triage for Livestock with Burns from Wildfires:

Severely burned animals that are in shock and have a great percentage of the body skin damaged are obvious candidates for euthanasia to prevent suffering.

Emergency euthanasia for livestock (depending on species) include captive bolt gun, gunshot by firearm (regulations and laws may apply), barbiturate overdose (licensed veterinarian), and in some extreme cases, exsanguination and electrocution. (Euthanasia guidelines see: <http://www.vetmed.ucdavis.edu/vetext/animalwelfare/>).

Burn shock is treated by a veterinarian with intravenous fluids, balanced electrolytes, or possibly plasma for valuable animals.

If there is history of smoke inhalation plus/minus cough and labored breathing, there is a tendency for pulmonary edema (fluid in the lungs). Livestock that have inhaled hot gases may have a cough with a frothy material discharging from the nose.

Topical treatment of silver sulfadiazine (1 lb. jar) is appropriate for burned areas of the eyes and skin. If none is available, Desitin® ointment provides some protection.

Approved medications for pain relief in livestock species may be obtained through a licensed veterinarian.



Figure 6. Exudate in nostrils should be removed to assist with breathing.



Figure 7. Sheep with burns on their back; also check the condition of their feet.

For deep burns with or without contamination, antibiotic treatment may be beneficial. Consult a livestock veterinarian for appropriate medications.

No initial debridement or trimming damaged skin of burn wounds is possible with large numbers of animals and lack of a sterile hospital setting. Keep the wounds as clean as possible with as minimal contact as possible.

Initial burn injuries will continue to progress and may worsen for 6 weeks following the initial injury. Debride (cut back) dead tissue, treat, and protect exposed areas during healing. Protect the wounds from fly strike with appropriate repellants.

Lack of appetite and inability to chew along with impaction or other disorders of the gastrointestinal tract can be seen when the head and face are burned. Soaking feed with water allows for easier eating.



Figure 8. Fly strike in a wound of a sheep at 11-days post burn.



Figure 9. Leather-like skin 10-days post burn.

Reassess, reassess, reassess on a daily basis. The severity of the burn and the compromise in the health of the animals will become apparent. It is difficult to judge burned animals initially, but the burned areas of skin become leather-like and slough in 5-14 days, while systemic signs may worsen. Animals which go "off" feed require careful examination for complications. Ability and desire to eat and drink are good indicators but can change up to 6 weeks following injuries caused by the burns and smoke inhalation of wildfires.