WHERE THERE'S SMOKE...
THE DANGER’S OF
SMOKE INHALATION IN PETS

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SMOKE TOXICITY
WHY THE HOT BOTHER?

• Smoke Toxicity/Inhalation what you should know:
  • What is smoke toxicity
  • Triage for smoke inhalation victim
  • How to care for the smoke inhalation victim
  • Forest fires what are the risks:
    • To pets
    • To horses
  • Cigarette, Marijuana, E-Cigarettes what are the risks to pets

SMOKE INHALATION
WHY SMOKE IS SO DANGEROUS:

• Important Considerations in Smoke Inhalation:
  • Type of material burned
  • Type of toxic inhalant
  • Chemical compounds in smoke
  • Closed or Open Space
  • Duration of exposure
  • Burns Present – poorer prognosis
  • Mental Status
SMOKE INHALATION
WHY SMOKE IS SO DANGEROUS:

• Smoke causes injuries to both the airways and lung parenchyma:
  • The 3 Components of smoke that can damage airways:
    • Chemical - Interferes with Oxygen transportation
    • Soot - Particulates cause direct damage
    • Thermal injuries - airway epithelia damage

SMOKE INHALATION
WHY SMOKE IS SO DANGEROUS:

• Chemical Interference:
  • Smoke produces many toxic gases
  • Carbon monoxide & hydrogen cyanide = most common toxic gases
  • O2 is carried through body by hemoglobin
  • CO 240x more affinity to hemoglobin
  • Creates carboxyhemoglobin
  • Prevents adequate O2 transportation
  • O2 that does bind has hard time breaking away from hemoglobin
  • Unable to get to tissues

SMOKE INHALATION
WHY SMOKE IS SO DANGEROUS:

• Chemical Interference:
  • Hydrogen cyanide:
    • Interferes with O2 utilization
    • Glycolytic phosphorylation process – ATP
    • Tissues must function without O2
    • Anaerobic metabolism – depletion of cells
    • Respiratory distress

Sources of Cyanide in Fire Smoke
•建設物内火災
• 固体燃料
• 有機性燃料
• 燃料油
SMOKE INHALATION
WHY SMOKE IS SO DANGEROUS:

• Three components of Smoke inhalation:
  - Soot – particulates
  - Thermal heat:
    • Thermal injury:
      - Soot heated air & steam
      - Burns to respiratory tract
      - Causes swelling and edema
      - Can cause airway obstruction

Important Inhalation characteristics:

• Size of inhaled particle – level of pathology
  - Particle size > 10 microns trapped in nasopharynx
  - Particle size < 2 microns deposited in airway
  - Particle size < 0.06 microns deposited alveoli (chemical carried into lungs)
TRIAGE OF SMOKE INHALATION PET

• Triage of House Fire Victim:
  • Have first responders give O2 at scene if possible
  • O2 decreases half life of CO
  • If owners are driving pet have them turn on air conditioning
  • Do not hold pet:
    • May constrict respirations
  • Take pet to the back for assessment upon arrival

TRIAGE OF SMOKE INHALATION PET

• Need to use gentle handling techniques:
  • Fear free/low stress handling

BE PREPARED – Respiratory Emergency

• Have Oxygen ready (multiple sized masks, cages)
• Endotracheal tubes multiple sizes
• Laryngoscopes
• Tracheostomy tubes
• Pain medication
• IV catheters
• Fluids
• Suction equipment

SMOKE INHALATION CLINICAL PRESENTATION:

• Diagnosis of Smoke Inhalation is based on History and Clinical Signs:
• How to tell if a Pet has been exposed to smoke:
  • Smokey odor
  • Soot on fur
  • Singed whiskers, fur, paw-pads
  • Burns
  • Drooling (phytalmia)
SMOKE INHALATION

CLINICAL PRESENTATION:

• How to tell if a Pet has been exposed to smoke:
  • Cherry red or cyanotic mucous membranes
  • Respiratory signs can range from:
    • Normal
    • Stridor
    • Soft moist cough
    • Tachypnea
    • Dyspnea
  • Nasal and/or ocular discharge maybe present
  • Always perform Fluorescein stain & Corneal exam

TREATMENT:

• Diagnostic Procedures:
  • Thoracic Radiographs:
    • Initial TXR may be normal
    • 24 hours +/- progress to Peribronchial infiltrate pattern
    • 48 to 72 hours +/- progress to Alveolar pattern with air bronchograms (Pneumonia)
  • Arterial blood gases
  • Metabolic acidosis
  • Hypoxemia

• Blood Chemistry
  • Check organ systems
  • Pulse oximetry
    • Unreliable - (normal readings) - reads hemoglobin
    • Co-oximeter - reads carboxyhemoglobin
  • ECG/EKG
    • Evaluate rhythm
    • Possible damage from reduced O2
SMOKE INHALATION TREATMENT:

- **100% OXYGEN**
  - At the scene if possible
  - Otherwise AEAP
  - CO half-life reduced from 4 hours on room air to 30 minutes on 100% O₂
  - Humidification

- IV Fluids – crystalloids
  - Monitor for overhydration – increased risk due to pulmonary vascular permeability
  - Avoid colloids – greater risk of influx into lungs
  - Goal: balance perfusion of tissues
  - Hypoventilation – prevent severe pulmonary edema from fluid overload

Bronchodilators may be beneficial:
- Terbutaline 0.01 mg/kg SQ TID-QID
- Albuterol 0.02-0.04 mg/kg PO BID – TID

Corticosteroids should be avoided

Severe upper respiratory edema 1 anti-inflammatory dose can be given

Avoid prophylactic use of antibiotics
- If suspicion of bacterial pneumonia:
  - Collect sample perform culture and sensitivity if possible
  - Broad spectrum antibiotic coverage if unable

Adequate pain management
- Dictated by patient’s respiratory health

Vitamin C
- 14.2 mg/kg/hour IV for 24 hours within first 24-48 hours of smoke inhalation/burn
- Decreased overall fluid needs
- Decreased inflammation
- Improved albumin levels

Gently wipe soot from fur
SMOKE INHALATION TREATMENT:

- Hyperbaric Oxygen Therapy:
  - Treatment of smoke inhalation:
    - Thermal burns
    - Pulmonary edema
    - Pneumonitis
    - Carbon monoxide poisoning
    - Cyanide poisoning
    - Cerebral edema
    - Refractory hypoxemia

- Avoid Diuretics:
  - Pulmonary edema non-cardiogenic
  - Cause dehydration
  - Decreased ability to cough up secretions

- Nebulization/Coughage/Walk:
  - Keep airways moist
  - Facilitate clearing of secretions
  - Coughing is good

SUMMARY:

- SI patients usually get worse over initial 24 – 48 hours
- Then gradual improvement
- Or develop ARDS in those that die
- Patients with burns have worse prognosis
- High PaO2 at admittance can be a poor prognostic indicator
- Early Oxygen administration is vital
- Most SI patients do well
**SMOKE INHALATION DANGERS OF WILDFIRES:**

- Smoke from wildfires and targeted burning makes up a large component of air pollution.
- Wildfire season in California is expanding.
- New EPA Studies show: type of wood may determine health risks posed by smoke from wildfires.
  - Pine = mutations in bacteria – may lead to increased risk of cancer.
  - Eucalyptus causes increased toxicity to lung tissue.
- More research is currently being done.
- Important for first responders and rescue workers.

**Pet owners are often concerned about their pets during wildfire season:**

- Ways pet owners can reduce smoke exposure for themselves and their pets:
  - Have an evacuation plan.
  - Stay inside.
  - Run air conditioner with high-efficiency filters and use a portable air cleaner.
  - Have a “clean room.”
  - Air-out your home on good days.

- Limit exercise when air quality is unhealthy or the odor of smoke can be smelled.
- Short “potty” walks.
- Play inside.
- Training.
- Mental stimulation/puzzle games.

- Check air quality (airnow.gov or aqicn.org/map/california).
SMOKE INHALATION DANGERS OF WILDFIRES:

- Protecting Horses from Smoke Toxicity:
  - Limit exercise when smoke present or AQI bad (orange)
  - Increased air flow can trigger bronchoconstriction
  - Provide plenty of water close to feeding area
  - Horses drink most water within 2 hours of eating
  - Limit dust exposure – feed dust free hay or soak before feeding

- Horses and Smoke:
  - Horses face the same dangers from smoke as other pets:
  - Particulates build up in respiratory system
  - Complicates underlying health issues
  - Monitor for:
    - Squinting
    - Nasal discharge
    - Coughing

- Treating Horses with possible Smoke toxicity:
  - Contact veterinarian right away if cough starts:
  - Determine cause
  - Treatment may include:
    - IV fluids
    - Bronchodilators
    - Nebulization
    - Give time to recover before return to full activity

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According to the CDC, smoking is the leading cause of preventable death, disease, and disability in the USA.

Approximately 58 million non-smokers are exposed to secondhand and thirdhand smoke.

Secondhand smoke is exhaled smoke from a lit product.

Thirdhand smoke is the residue that is left on skin, clothes, furniture, carpets, including fur and feathers.

How many pets do these cats exposed?

Cigarettes can contain almost 600 ingredients and when burned they release over 7000 chemicals.

Some of the chemicals include:
- Ammonia
- Arsenic
- Nitrogen
- Carbon monoxide
- Hydrogen cyanate
- Lead
- Meccury
- Nicotine

Secondhand smoke worsens symptoms of lung diseases in pets that have underlying diseases:
- Feline Asthma
- Cardiac, Lung Disease, in dogs
- Dog nose length, determine effect
- Long nosed breeds
  - Double risk of Nasal Cancer
- Short and medium nose breeds
  - Increased risk of Lung Cancer
CIGARETTE SMOKE
THE DANGER TO PETS

- Thirdhand Smoke
  - Why would this be especially harmful to pets?
  - Toxic chemicals get into dust
  - Stick on floors, carpets, furniture, clothes, and their fur
  - Pets (especially cats) groom themselves and ingest these toxins
  - Increased risk of cancer for pets that live with cigarette smokers
  - GI Lymphoma in cats
    - 100% increase after 1 year
    - 300% increase after 5 years

MARIJUANA SMOKE
THE DANGER TO PETS

- Dangers of Marijuana Smoke on pets:
  - Increased legalization has meant more pets exposed
  - Secondhand smoke effects on pets:
    - Depression
    - Disorientation
    - Wobbly
    - Incontinent
    - Decreased heart rate and temperature
    - Effects can last up to 72 hours

MARIJUANA SMOKE
THE DANGER TO PETS

- Dangers of Marijuana Smoke on pets:
  - Increased potency of Marijuana risk of:
    - Increased excitability
    - High fever
    - Tremors
    - Seizures
    - Coma, Death
  - One minute of exposure:
    - Alters blood vessel lining functioning for 90 minutes
    - Unknown long-term cardiovascular risk
E-CIGARETTES/VAPING
THE DANGER TO PETS:

• Risks are reduced but not eliminated
  • Second- and third-hand smoke still present at lower level
  • Nicotine much lower level
  • Vape smoke
    • Oxidative stress
    • Increased free radicals
    • Disrupts immune system
    • Increases risk of viral and bacterial infections

SUMMARY:

• Smoke is toxic to pets:
  • Give Oxygen
  • Owners should have an evacuation plan
  • Reduce pet exposure when AQI is unhealthy
  • Hydration is important for horses during poor AQI
  • Serious health issues due to second- and third-hand smoke
  • Best solution is to Quit Smoking
  • Educate clients of the risks

QUESTIONS?