What’s the plan?
- Define veterinary forensics
- The Link between animal abuse and interpersonal violence
- What are the categories of animal abuse?
  - Physical abuse
    - Blunt Force Trauma
    - Sharp Force Trauma
    - Gunshot wounds
  - Poisoning
  - Asphyxiation and drowning
  - Burns
  - Munchausen syndrome by proxy

What’s the plan?
- Sexual Abuse
- Neglect and abandonment
  - Hoarding
  - Organized fighting
  - Ritualistic abuse
- Red flags
- Chain of Custody
- Working together
  - Law enforcement
  - Prosecutors
  - Veterinarians
  - Other Professionals

What is forensics?
- Forensics: the application of scientific principles to questions of law
- Many different sciences are utilized, for example:
  - bloodstain pattern analysis
  - ballistics analysis
  - tool-mark analysis
  - computer forensics
Veterinary Forensics: An Overview

The application of veterinary medicine to answer legal questions
May include:
- Investigation and documentation of animal abuse
- Necropsy to determine cause of death, whether or not abuse is suspected
- Documentation regarding the health or temperament of a pet
  - Health certificate
  - Pre-purchase exam
- Investigating an attack on a human by a wild animal
- Investigating an attack on a wild animal by a human

Why does animal abuse matter?
- Society wants animal abuse to be taken seriously
  - the basic laws are there
  - animal abuse may predict other crimes
- Crimes against animals may also involve other criminal activity
  - e.g. organized fighting, drugs, guns
- The Link – the connection between animal abuse and interpersonal violence

Duluth Power Wheel

Why report? The Link: Spot Abuse PSA

What does a forensics veterinarian do?
- Always, first and foremost, take care of the animal.
- Aid law enforcement in identifying aspects of a scene that may be evidence of abuse.
- Examine the animal, dead or alive, and document the case.
- Testify in court, as needed.

On scene
- Triage the animals
  - may be multiple species involved
  - need to rapidly divide animals into those that are critical and those that can wait
    - often will do an on-scene brief exam and a more in-depth exam at the shelter
- Document
  - Photos
  - Videos
Identifying evidence:
- anything that proves or disproves a fact

Identifying evidence
- Situational evidence: weather, temperature, ammonia levels
- Physical evidence
  - Could be materials at the scene
    - animal drugs, controlled or not
    - human drugs being used in animals
    - materials used in organized fighting
    - bones
    - identifying how the environment affects the animals
- The live animal
  - Wounds or injuries
  - Signs of illness or neglect
  - Identifying the need for further diagnostics
- The deceased animal
  - Identifying species
  - Necropsy
  - Cause of death: the events that lead to the death of the animal
  - Manner of death
    - natural
    - accidental
    - non-accidental
    - unknown

What is animal abuse?
Animal abuse is a legal definition defined in California by Penal Code 597. It includes malicious and intentional harm to an animal as well as a failure to provide proper food, drink, and shelter for an animal or cause needless suffering.

Animal abuse is painful
- On a continuum comfort -> discomfort -> distress -> pain

Suffering
- Pain: the conscious perception of a noxious stimulus
  - the stimulus is something that activates the neuroreceptor and transmits the information to the brain
- pain can vary in duration, intensity, and character (e.g. throbbing, sharp, stinging)
- pain may come from a variety of locations within the body

**Pain scoring systems**
- Colorado State University pain score systems
- Mouse grimace scale
  - (partial photo of the scale)
  - Langford, et al. 2010
- Horse grimace scale
  - (partial photo of the scale)

**Types of animal abuse**
- Physical abuse
- Sexual abuse
- Emotional abuse
- Neglect and Abandonment
- Organized Fighting
- Ritualistic abuse

**Types of Animal Abuse: Physical Abuse**

**Non-accidental injury  NAI**
- Blunt force trauma
- Sharp force trauma
- Gunshot wounds
- Poisoning
- Asphyxiation and drowning
- Burns
- Munchausen syndrome by proxy

**Blunt Force Trauma**
- Use of a blunt object to inflict injury
  - examples: kicking, hitting, or beating with an object
- May include
  - contusions (a.k.a. bruises)
  - may occur at points away from the point of contact
harder to see on animals due to thickness of the epidermis, hair protecting the skin, and pigmentation
may be more evident on the underside of the skin
may take time to become evident (e.g. pulmonary contusions) therefore may need to look more than once (e.g. repeat x-rays)

Blunt Force Trauma cont’d
- abrasions
  - occur at the point of contact
  - may be patterned
  - postmortem insect feeding may mimic antemortem abrasions
- lacerations
  - occur over hard surfaces like bone
  - in general, a narrow object will cause a long laceration, a flat object will cause a Y-shaped or irregular laceration

<table>
<thead>
<tr>
<th>Laceration</th>
<th>Incision</th>
</tr>
</thead>
<tbody>
<tr>
<td>irregular margin</td>
<td>defined margin</td>
</tr>
<tr>
<td>often has bruising</td>
<td>minimal-to-no bruising</td>
</tr>
<tr>
<td>bridging of tissues</td>
<td>cleanly divided</td>
</tr>
<tr>
<td>frequently has debris</td>
<td>rarely has debris</td>
</tr>
<tr>
<td>slight hemorrhage</td>
<td>brisk hemorrhage</td>
</tr>
</tbody>
</table>

- fractures
  - occur according to forces applied
  - force = mass x acceleration

Fractures cont’d
- Skull fractures
  - When two or more skull fractures intersect, the fracture lines from the second injury will stop when it hits a fracture line from the first injury
  - similar to gunshot fracture lines

Fractures lines

Fractures cont’d
- Rib fractures
  - ribs are fairly pliable and difficult to fracture, especially in puppies and kittens
  - common finding in abuse cases of dogs and cats
uncommon finding in HBC
often occur in a group (e.g. two or more adjacent ribs)
rib fractures on both sides of the body indicate two different applications of force
fractures on both sides or fractures in different states of healing are most likely due to abuse

Fractures cont’d
Rib fractures cont’d
- study of 33 cats with rib fractures
- none of the cats were believed to have rib fractures due to abuse
- younger cats (median age 3 yr.) tended to have traumatic rib fractures due to HBC
- older cats (median age 13 yr.) tended to have non-traumatic rib fractures, believed to be secondary to disease (respiratory, cardiac, renal disease, and neoplasia)
  - tended to be in the caudally (88% in ribs 9-13)

Sharp Force Trauma
- Use of a pointed or sharp-edged object to inflict injury
- Includes
  - Stab wounds
  - Incised wounds
  - Chop wounds
  - Can have characteristics of more than one

Sharp Force Trauma cont’d
- The shape and size of the wound will depend on multiple factors:
  - the size and shape of the instrument
  - sharpness of the instrument
  - movement of the blade within the wound or of the animal
  - the angle of the thrust
  - tension (or not) of the skin
  - tension lines of the skin
  - whether or not the instrument is inserted to its full length

Sharp Force Trauma cont’d
- Points to remember
Without a piece of the instrument being left behind in the animal, one can only say if it an instrument could or could not have caused the injuries seen.

One slash with a blade may cause multiple wounds if the skin is wrinkled.

A dull blade may cause a wound more consistent with crushing or abrasion than incising.

Postmortem stab wounds are usually yellowish to tan due to a lack of circulation (may also happen with perimortem wounds if low blood pressure).

**Gunshot**

- Each gun will leave characteristic marks on the bullet as it travels through the barrel.

- Therefore, when collecting ballistic evidence, do not use metal tools. Use gloved hands or plastic or rubber-tipped forceps for collection.

- The wound created by the bullet will depend on:
  - the location on the body which is hit
  - the velocity of the bullet
  - the angle at which the bullet hit
  - the characteristics of the bullet
  - the distance from the gun to the target

**Gunshot cont’d**

- Entrance wounds: usually are surrounded by a red or reddish-brown area of abraded skin
  - this is regardless of the distance between the gun and the target
  - this is due to the scraping of the skin as the bullet enters
  - hair may be pulled into the entrance wound
  - when opposing the edges, there is usually a center of missing skin where the bullet punched through

**Gunshot wounds cont’d**

- Exit wounds
  - usually are more irregular and larger than entrance wounds and lack any abrasion at the margins
  - when the edges of the wound are opposed, they usually come together completely
  - exception to the rule: a shored exit wound
    - when the exit wound is supported by a firm surface such as a wall, there may be abrasion of the exit-wound skin against that surface

**Asphyxiation and Drowning**

- Asphyxia: lack of oxygen
- Very difficult to diagnose
Veterinary Forensics: An Overview

Jennifer Woolf, DVM

Woolf Veterinary Forensics Consulting, Inc.

- signs that may be consistent with asphyxiation
  - cyanosis
  - visceral congestion
  - petechiae
  - fluidity of the blood

- In animals that are hung, the fur may protect against ligature marks on the neck

Asphyxia and Drowning cont’d

- Point to remember: not all bodies pulled from the water were drowned
- No pathognomonic signs of drowning
- Usually a diagnosis of exclusion
- At necropsy, may find
  - completely wet body
  - edema and emphysema of the lungs
  - water, mud, plant material in the stomach if swallowed water
  - white or hemorrhagic froth in the mouth, nostrils, and trachea

Poisoning

- More often than not, this is not malicious
- When intentional, perpetrators often choose pesticides and insecticides that are easily available and known to be highly toxic
- Generally need to know what toxin you are looking for when submitting samples (there is no “tox screen” available)
- When submitting samples:
  - antemortem: blood, urine, vomit/gastric contents, feces, hair
  - postmortem: liver, kidney, fat, brain, lung, bile

Burns

- Biggest question to consider: does the story fit the pattern of burn?
- Different categories of burns
  - flame: direct contact with a flame
  - contact: direct contact with a hot object
  - radiant: contact with heat waves
  - chemical: produced by a strong acid or alkaline agent
  - scalding: contact with a hot liquid
    - accidental contact tends to be irregular and have a short contact time
    - forced immersion burns have lines of demarcation
    - splash or spill burns: may be difficult to determine accident from intentional,
tend to look alike
- microwave: being placed in a microwave
- May not be possible to determine antemortem vs. postmortem burns
- If alive at time of a fire, expect inhaled soot in respiratory system

Maunchausen syndrome by proxy
- Munchausen syndrome by proxy is a mental illness and a form of child abuse. The caretaker of a child, usually a mother, either makes up fake symptoms or causes real symptoms to make it look like the child is sick. (NIH, http://www.nlm.nih.gov/medlineplus)
- An animal may serve as the proxy.
- Clinical signs can be almost anything
  - May not correlate with the history
  - Disease course may be convoluted and atypical
- Possible red flags: an owner who is not reassured by normal test results or who does not appear anxious in the face of a pet who is critical
- Difficult to diagnose
- If suspected, try separating the animal from the owner to see if the clinical signs clear, and then return when back with the owner.
  - realize this may be due to an environmental issue, e.g. carbon monoxide poisoning, toxin or medication in the home

Is it NAI or Munchausen Syndrome by Proxy?
“An Elizabethtown woman was arrested at a veterinarian's office after they suspected she hurt her dog to get its pain medications for herself. … It's a crime that veterinarians said has opened their eyes to a whole new level of animal abuse. … the third time the dog had been to the clinic… Things didn't add up as far as the frequency of the dog's injuries, the cleanliness of the cuts… she had also done the same at a [another] animal clinic… [had] told vets she needed more painkillers for the dog because her child had flushed them down the toilet. Pereira doesn't have any children.”

From: wlky.com

Sexual Abuse
- Any contact with an animal’s genitalia or anus, or using an animal for sexual contact and arousal in a person
- This term is preferred over bestiality and zoophilia in part because those terms limit the interaction that is involved. The other reason is because the term “sexual abuse” puts the focus on the act done to the animal and off of the human.
- May or may not cause physical harm to the animal
- In children who are sexually abused, it is normal to not find any physical evidence of
abuse.

- A sexual assault kit used for humans (“rape kit”) may also be utilized for animals
- An alternative light source may help in detecting semen and saliva (a Wood’s lamp is not effective; need to differentiate from medications, creams, ointments, etc.)
- Common injuries may include a fractured tail, injuries to the ears, as well as injuries to the genitalia or anus

**It is highly important that sexual abuse be thought of early in the exam.**

- Evidence needs to be collected prior to any cleaning
- Use of a lubricant (for instance, on a thermometer or a glove) may interfere with evidence
- Contamination of potential DNA evidence is higher with the more people handling the animal

**Emotional Abuse**

- Would include taunting, teasing, annoying, bullying, etc.
- Currently not a part of most animal abuse laws, including CA

**Neglect and Abandonment**

- Generally implies an *act of omission* rather than commission (CA Penal Code 597b)
- A failure to provide the basics for the animal resulting in needless suffering

**The most common form of abuse**

- Abandonment (CA Penal Code 597s)
- Includes animal hoarding and puppy mills
- Five Freedoms very helpful in determining neglect

**Typical Signs of Neglect**

- Lack of edible food
  - Starvation
- Lack of potable water
  - Dehydration
- Untreated injuries or disease
- Lack of preventative care
- Severe grooming issues (e.g. matting, ingrown nails)
- Unsanitary environment
- Overcrowded housing
- Improper housing
Neglect
Photo: http://nationalcatgroomers.com/persian-rug

Know Your Rescue Groups
- More and more, rescue groups are becoming hoarders
- Pet-abuse.com (as of 6 Feb 2015) 112 cases of hoarding where the person convicted is involved with animal welfare
- Recent examples (convicted):
  - Craig Grant, Caboodle Ranch in FL, 700 cats
  - Alan and Sheree Napier, Log Cabin Horse and Animal Sanctuary in FL, 300 animals
  - Bill Hutchison, interim director at Manatee Co. Animal Services: “…we have certainly modified our transfer agreement with all our rescues, including things such as inspections -- the right to inspect.”

Starvation
- Weight alone does not determine who is “too thin”. Need Body Condition Score (BCS).
  - Purina 1-9
  - Tufts 1-5
- Life stage is also important
- There is not a timeframe for starvation; too many variables.
- Bone marrow fat analysis (Michigan State University, Diagnostic Center for Population and Animal Health: 1-517-353-1683)
- Collect representative samples of the food (if any) that is available to the animal
  - Remember that it is not just the quantity of food available but also the quality of that food.
- Food must be fresh, palatable, free from contamination and of sufficient nutritional value to meet the normal daily requirements to allow an animal to attain maximum development, maintain normal body weight, and rear healthy offspring. (From the ASV Guidelines for Standards of Care in Animal Shelters)
- This is a diagnosis of exclusion
- Starvation ≠ Emaciation
  - Emaciation is wasting secondary to disease and occurs in the face of adequate food quality and quantity
  - The disease process makes it impossible for the animal to properly digest, absorb,
or utilize the nutrients being provided

- neoplasia
- severe parasitism
- severe dental disease
- inflammatory bowel disease
- pancreatic insufficiency

The animal will utilize body fat in a known sequence

- subcutaneous fat
- intrabdominal and intrathoracic fat
- deep organ fat
- bone marrow fat

Animals who are starved may exhibit pica and cannibalism

- Pica: eating abnormal things, e.g. rocks, dirt, trash
- In cannibalism, typically the extremities are consumed first
- neonates are also commonly consumed, although this can be a normal behavior

Organized Fighting

- The so-called “Blood Sports”
- Dog fighting
- Cock fighting
- May include interspecies fights such as dog-hog fights
- Often seen in conjunction with other criminal activity such as drugs and guns

<table>
<thead>
<tr>
<th>Organized fight</th>
<th>Two dogs got in a fight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wounds to face, chest, and legs</td>
<td>Wounds to back of the neck, shoulders, and hocks</td>
</tr>
<tr>
<td>new wounds and old</td>
<td>new wounds only</td>
</tr>
<tr>
<td>characteristic ring lesions</td>
<td>no ring lesions</td>
</tr>
<tr>
<td>typically pit-bull types</td>
<td>any breed</td>
</tr>
<tr>
<td>do not exhibit submissive behavior</td>
<td>exhibit normal dog behavior including submissiveness</td>
</tr>
</tbody>
</table>

Babesia gibsoni

- DNA swabs for Canine CODIS (Combined DNA Index System)
  - through the University of California Davis’s Veterinary Genetics Laboratory 530-752-2211
  - “DNA will be used to identify relationships between dogs and thereby allow
investigators to expand their investigations to those who breed and train dogs for fighting.”

Ritualistic Abuse

- May include:
  - Satanism
  - Santeria
  - Voodoo
  - Witchcraft
- Tends to generate a lot of concern in a community but is not common

Red flags for abuse

- A specific person is implicated
- Repetitive injuries
- Previous injury or death in another animal
  - only young animals seen
- A story that is inconsistent with the injuries seen
- A story that changes or a lack of any history
- A lack of concern for the animal and/or a delay in seeking care
- Known or suspected violence in the home
- Fractures in more than one region of the body
- Multiple fractures at different stages of healing
- Transverse fractures (Tong, 2014)
- Skull, femur, and rib fractures (Munro and Thrusfield, 2001)
- Radius, ulna, and femur fractures (Tong, 2014)

Animals at higher risk for NAI

- Pit bull-type dogs
- Male dogs
- Intact dogs
- Domestic shorthaired cats

Is it accident or abuse?

- Hit by Car
  - often have frayed nails
often have abrasions, “road rash”, shearing injuries
- High-rise Syndrome
- Osteogenesis imperfecta
- Coagulopathies
- Predation by dogs or wildlife

**Chain of Custody**
- A written or digital record of who has handled evidence, when, and where it was.
- This record stays with the evidence.
- Remember: Animals are property and evidence.
- If sending evidence out (e.g. lab tests), discuss ahead of time handling and tracking.
- ASPCA has numerous forms on their website: [www.aspcapro.org](http://www.aspcapro.org)

**Working together**
- To combat animal abuse takes a team
  - Law enforcement
  - Prosecutors
  - Veterinarians
  - Other community members (e.g. social workers, elder services, DV task forces, utility workers, etc.)

**Getting Law Enforcement On Board**
- Broken Window effect
- Enforcing Animal Cruelty laws as a tool
  - Sometimes animal cruelty is a felony when other charges are not
  - Sometimes animal cruelty is admitted readily
  - Sometimes animal cruelty is easier to determine
  - Example: Alexander Hernandez, in San Fernando Valley area, accused of shooting spree over several days, including 3 dogs. Held on $1 million bail, in part or in whole for felony animal cruelty

**Before, when ASPCA was 1st responder**  **Now, when NYPD is 1st responder**
- Call ASPCA  Call 911 if crime in progress (311 if suspect abuse)
- 17 humane enforcement agents  35,000 uniformed officers
  ***Arrests and summons for animal abuse and neglect have **doubled** in 2014
From ASPCA/NYPD experience:
  - Misdemeanor interpersonal violence
  - **Felony** animal abuse

By prosecuting animal abuse cases
  - Gain respect from the community
  - Remove some individuals before they can do the same or worse to people
  - Help to enforce *all* the laws

Getting Veterinarians On Board

- Veterinarians are mandatory reporters in some states, but the schools teach little on the subject and there is no mandatory education on animal abuse after veterinary school.
- Afraid for their businesses
  - May not be founded
  - Might help if law enforcement had their own veterinarians to investigate abuse
- Frustrated with reports going no where
- Misunderstand role in abuse cases
  - Abuse is a legal definition, not a medical one

Getting Other Professionals On Board

- Cross-report
  - those who investigate child abuse or elder abuse should also report suspicions of animal abuse
  - not currently required but “allowed” (CA Penal Code 11199)
- Ask questions about the animals
  - people may talk about the animals when they won’t talk about anything else
- Those working at DV shelters can judge the level of emergency based on the history of the abuser’s treatment of the animals

Resources - books
Resources - online
Thank you!
A huge thank you to Rachel Touroo, DVM, ASPCA, and the UF Veterinary Forensics program
Any questions?