

Bite Wounds: More Pets, More Problems

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More Pets?

- JAVMA 2021 article
 - 32% of pet owners welcomed a new pet during the pandemic
 - No epic increase in pet population during pandemic
 - Significant increase in US pet population over the last 3-5 years (40 million?)
 - 84.6 million households have pets in the US
 - 84.9 million dogs in the US currently
- MedVet ER caseload up 25% (or more) across all regions



More Problems?

- I have no data to back this up
- Pre-pandemic
 - Bites account for ~ 10-15% trauma related veterinary ER visits
 - 4.7 million people bitten by animals in US annually
- Pandemic
 - More poorly socialized animals?
 - New pet owners?

Bite Wounds

- Dog bites
- Cat bites
- People getting bitten
 - Behavior
 - Pathophysiology of the damage
 - Bacterial populations

- Dog bites (mostly)
 - Assessment
 - Treatment
 - Pictures



Dog Bites- Behavior



- Aggressive dog to dog interactions
 - Intrahousehold interdog aggression (IDA) study *Feltes et al, JAVMA 2020*
 - 70% involved at least 1 F dog, 61% same sex
 - Resource guarding 72%
 - Aggressor acquired 2nd and is younger
 - Poor outcome: Attacks that break the skin, same sex pairs, aggression on site
 - Recommendations: Avoid same sex pairs, early behavior intervention
 - Non intrahousehold interdog aggression
 - Early desexing
 - Early positive socialization
 - Controlled introduction
 - Leashes

Dog Bites- Pathophysiology of damage

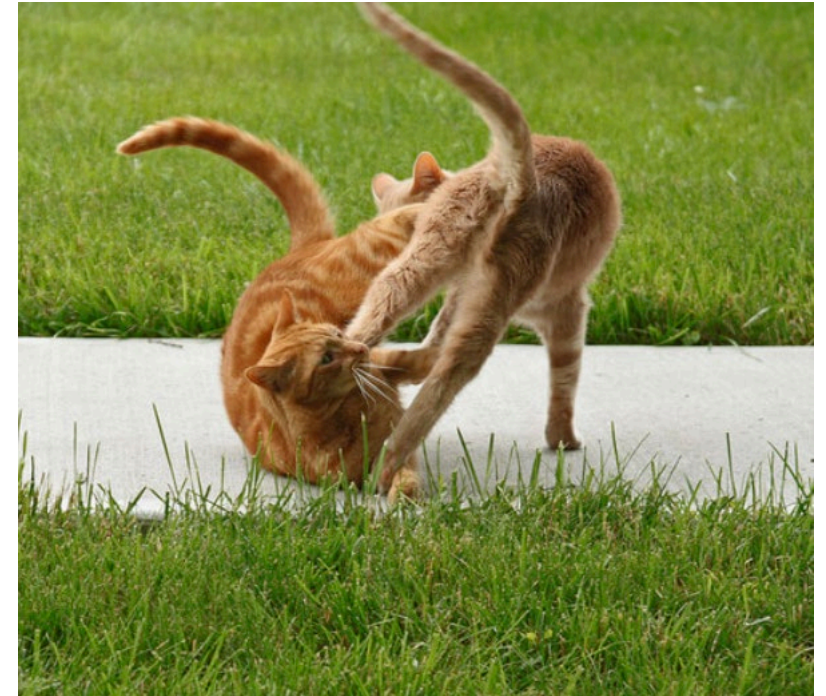
- All the damage
 - Abrasions, Lacerations, Avulsions, Crushing, Deep punctures
 - Cavity penetration
 - 31% of thoracic wounds, 79% abdominal wounds.
 - Surface damage << underlying tissue damage
 - Deep abscesses, hematogenous spread/sepsis are uncommon
 - Mortality more likely from trauma
- Location of bite depends on size of dogs involved
 - Majority of wounds are cranial to diaphragm across all dog sizes
 - Big dog/Little dog- Neck, dorsal thorax
 - Medium weight dogs more perineal & back injuries than smaller
 - Large dog/Large dog- Neck, head, forelimbs

Dog Bites- Infectious agents

- All bite wounds are contaminated
 - Oral cavity, skin, local environment
- 20% of dog:dog bite wounds become infected
 - Infection develops 8-24hours after wounding
 - Less likely if damage limited to dermis
 - Infection more likely with increase in time from wounding to presentation
- Most common isolates
 - *S. pseudointermedius* (+)
 - *Enterococcus spp* (+)
 - *Pastuerella spp* (-)
 - *Streptococci* (+)
 - *E. coli* (-)

Cat Bites- Behavior

- Mostly aggressive interactions with other cats
- More common in free roaming, indoor/outdoor cats
- Locations
 - Bites on forelimbs, lateral aspect of face, tail base
 - Scratches on bridge of nose, pinna, inguinal areas



Cat Bites- Pathophysiology of damage

- Deep puncture wounds
 - Sharp, thin incisors
 - Deep abscesses common
 - The puncture wounds seal over relatively quickly
 - Surface visible damage << underlying
 - Sepsis, shock uncommon
 - Mortality more likely from trauma
 - Delayed detection
 - Commonly present for lethargy, then abscess or cellulitis found on PE
- Scratches
 - Lick their paws, hiss during interaction
 - Contaminates scratches similarly to bites

Cat Bites- Infectious agents

- Introduction of oral cavity flora to deep tissues
 - Polymicrobial infections more common than in dog bites
 - Anaerobes more common than in dog bites
 - 36 closed cat bite abscesses, 168 bacterial strains *Love et al JMedMicro 1979*
 - 72% obligate anaerobes, 28% facultative anaerobes
 - *Pastuerella multocida* most common facultative anaerobe
 - *Porphyromonas, Bacteroides, Prevotella, Peptostreptococcus, Fusobacterium*

Animal bites to humans

- Animal bites account for 1% of all human ER visits
 - 4.7 million animal bites/year
 - <1/2 reported
 - ~18% seek medical attention



Dog bites to humans- Behavior

- Dog bites account for 70-80% of human ER visits due to animal bites
 - Male victim 62%
 - Younger men <20 years old predominate
 - 'Many bites occur in children, especially boys aged 5-9 years'
 - 49% bites by dogs <5 years old, 70-79% bites by male dog, intact> neutered
- Victim is usually family member or acquaintance of owner
- Dog owners more likely to be bitten than non
 - 30% family's dog
 - 50% neighbor's dog
- 'Unusually high incidence of bites by chained dogs restrained on their own property'
- Dominance, possessive, fear related, territorial, pain-elicited

Dog bites to humans- Behavior & Veterinarians

- During their career
 - 92% of veterinarians sustained dog bite
 - 81% cat bite
 - 72% cat scratches
- 65% veterinarians have had a major animal related injury
 - Bites 34%, Scratches 3.4%
 - Dogs 34%, Cats 10%
- Veterinary field victims more likely to be bitten while interacting with an older dog

Dog bites to Humans- Behavior

- National Dog Bite Prevention Week – April
- JAVMA great dog bite prevention member toolkit

HOME ▶ EVENTS ▶ NATIONAL DOG BITE PREVENTION WEEK

National Dog Bite Prevention Week

Nearly 85 million nice dogs...but any dog can bite

National Dog Bite Prevention Week® takes place during the second full week of April each year, and focuses on educating people about preventing dog bites. The dates in 2021 are April 11-17.

With an estimated population of nearly 85 million dogs living in U.S. households, millions of people—most of them children—are bitten by dogs every year. The majority of these bites, if not all, are preventable.

- The Insurance Information Institute reported that in 2020, insurance companies paid \$853.7 million for 16,991 dog bite and injury claims.
- While the number of dog-related injury claims decreased 4.6% compared

AVMA Member Toolkit

Get ready-to-use materials to celebrate National Dog Bite Prevention Week® in your clinic.

[View toolkit](#)

Dogs bites to humans- Pathophysiology

- Predominantly punctures & tears
 - 76% to extremities
 - 15% face
 - Upper extremities & trunk in adults
 - Face, head & neck in children
- Fatalities uncommon
 - 70% in children < 9 years
 - Highest fatality rate in neonates (<1mo), then babies 1-11 mo

Dog bites to humans- Infectious agents

- All bites contaminated
- 4-20% infection rate
 - Increases to 40% for crush, puncture, wounds in areas of edema, hand injuries
 - Typically normal animal oral flora
 - Median 5 isolates/wound, avg 3 aerobes to 2 anaerobes
 - Anaerobes in 70% of wounds
 - *Pasteurella spp* in 50% wounds, *canis* most common
 - *Streptococcus mitis*, & *pyogenes*, *Corynebacterium spp*, *Neisseria spp*
 - *Staph aureus* in 20% wounds (*S. pseudintermedius* rare)
 - Amoxicillin clavulanate/Augmentin
 - Systemic illness
 - *Pastuerella spp* , *Capnocytophagia canimorsus*, Eugonic fermenter-4a

Cat bites to humans- Behavior & Pathophys

- Victims more likely 25-34 yro, 59% female
- Cat more likely stray (57%) and female (67%)
- Bite more commonly in warmer weather
- Punctures & scratches
 - Owned cats have bitten necks, faces, multiple areas
 - Strays bite hands
 - Older people bitten on the hand more than younger

Cat bites to humans- Infectious agents

- 20-50% of bites become infected
 - Scratches similar
 - Similar organism population to dog bites
 - *Pasturella* > *C. Canimorsus*, *S. aureus* rare in cat bites
- Mechanism is different due to route of inoculation
- Dog bites cause more mechanical damage, cat bites cause more infection related destruction
 - Cats more likely to cause septic arthritis
- Amoxicillin clavulanate/Augmentin

Bites to humans- Serious complications

- Sepsis is rare - Immunocompromised patients particularly
 - Older patients
 - Chronic alcoholism, cirrhosis
 - Splenectomy
 - Fever, myalgia, LN, purpura, petechia

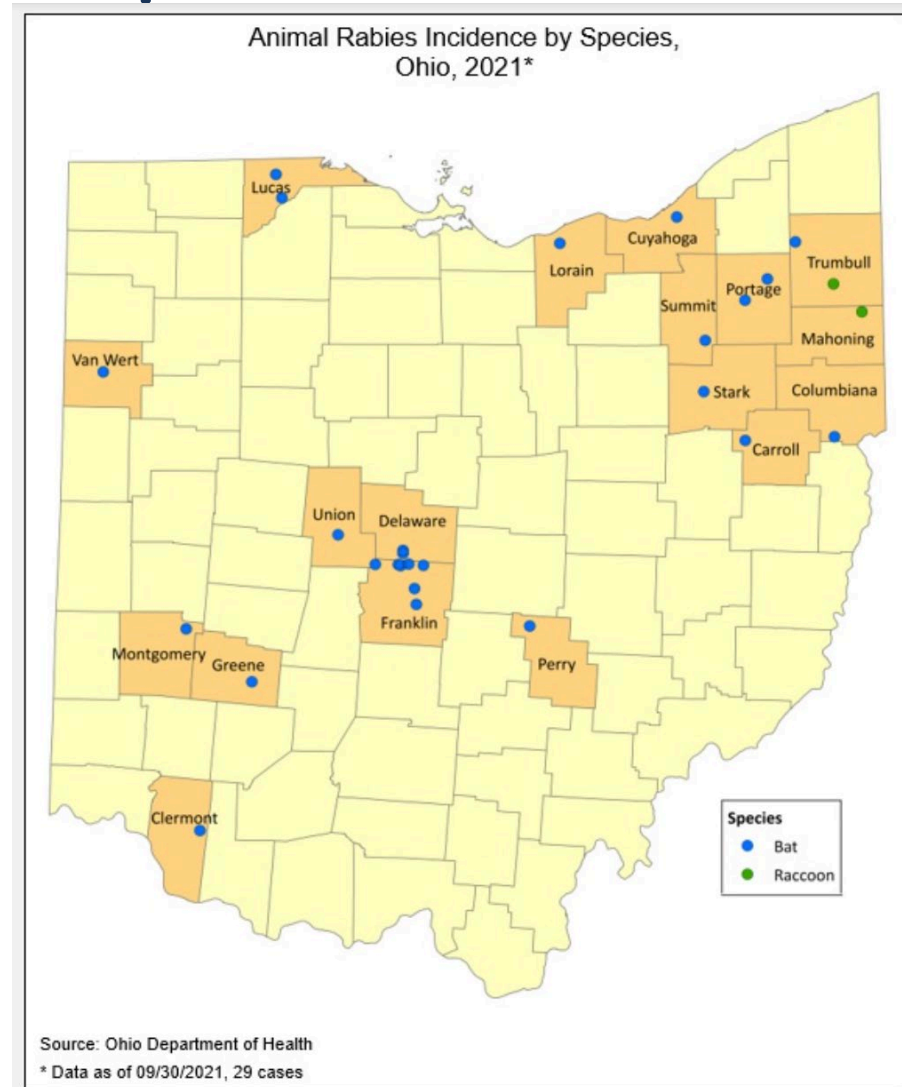
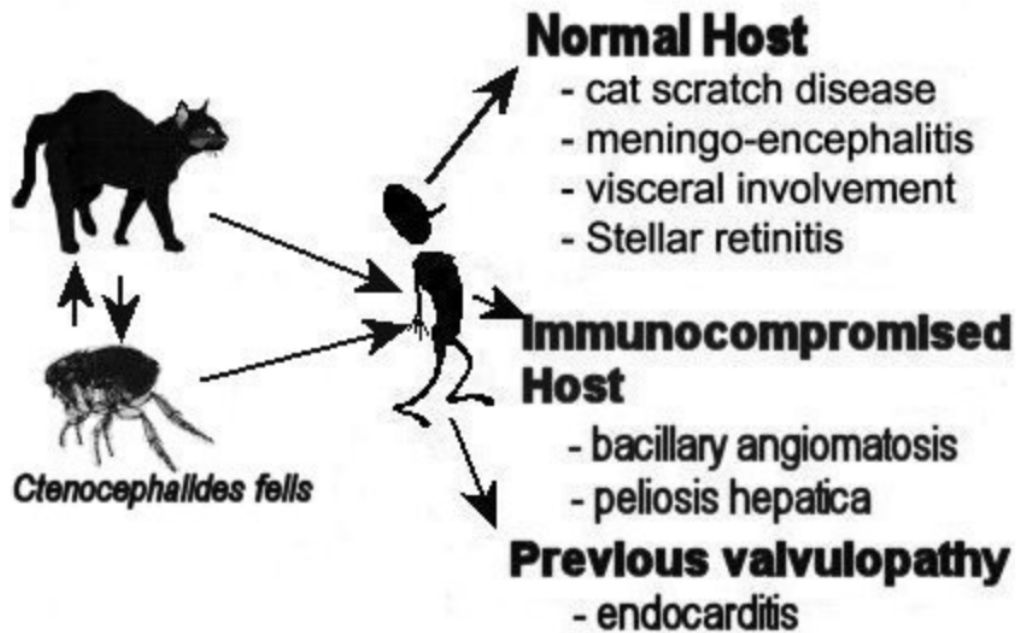


Bites to humans- Serious complications

- *Pasteurella*
 - Gram - bipolar staining bacilli
 - Bites, licking, case report of dialysis catheter tubing bite by cat, otitis from licking
 - Cat scratches- hissing, licking paws
- *Capnocytophaga canimorsus*
 - Capnophilic facultative anaerobic, filamentous Gram - rod
 - Related to *Bacteroides*, *Fusobacterium*
 - Normal oral bacteria in dogs & cats
 - DVM corneal infections from tooth fragments – FACE SHIELDS
 - Can rapidly progress to sepsis with a 25-31% mortality rate
 - 56% cases involve dog bite, 10% cases are from a wound licked by dogs
 - Difficult and slow to grow, so clinical suspicion more than culture results
- Respond well to β lactam/ β lactamase inhibitor combos

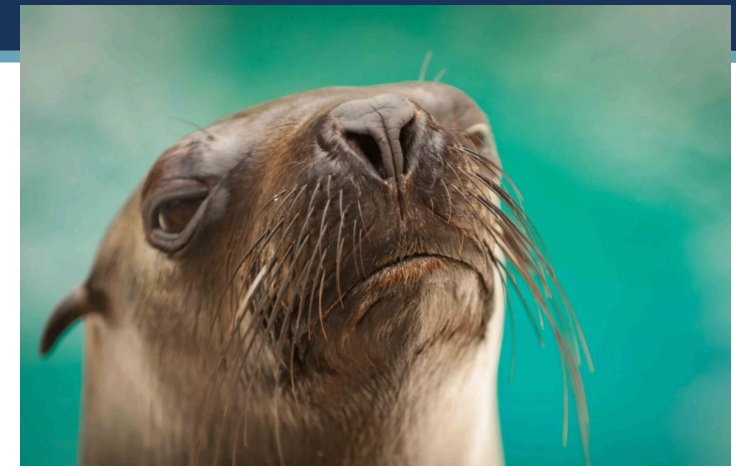
Bites to humans- Zoonotic potential

- Rabies
- Tularemia
- Bartonella



Other bites to humans

- Arthropods, spiders, snakes, etc
- Seals
 - Impressive body of research about pinniped bites & abrasions
 - 'Seal finger'
 - *Mycoplasma spp* normal pinniped oral flora
 - Common from bites, abrasions, handling of pelts and meat
 - Seal hunters, veterinarians, marine biologists, scuba divers, open water swimmers
 - Swelling, pain, joint stiffness
 - Not responsive to penicillins, β lactam/ β lactamase inhibitor combos
 - Tetracycline!



Humans biting humans....

- *Fernando et al Pediatrics Review 2018*
 - 250,000 human bites/year
 - 10% infection rate
 - Polymicrobial mix of aerobes & anaerobes
 - *Pasteurella spp* predominate
- *Lindsey et al J Trauma 1987*
 - Institutional disabled resident treatment groups
 - 434 bites wounds, 17.7% infx
 - 803 lacerations from bites, 13.4% infx
 - Infection rate is higher than previously reported, antibiotics early did not prevent infection

Assessment & Treatment

Back to the dogs & cats!

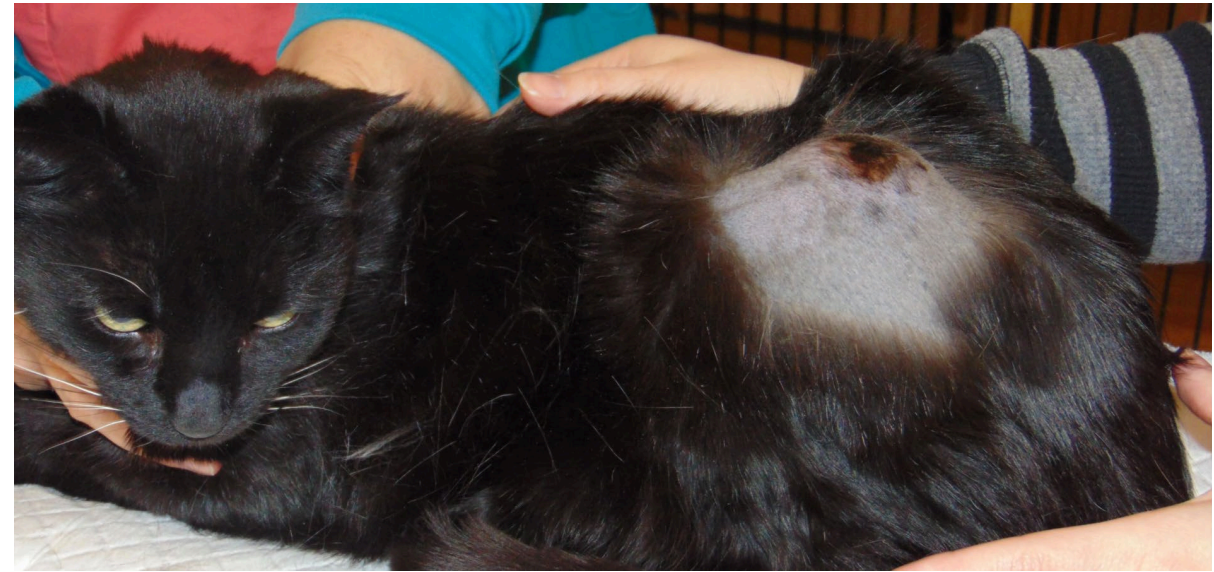
Cat bites- Assessment

- Cat vs cat
 - Present differently than dog vs dog
 - Lethargic, painful, hiding, ruptured abscess
 - FELV/FIV test any cat with bite wounds
 - Repeat test 2 months later
- Dog vs cat
 - Often fatal
 - Potentially far more damage
 - Blunt force, puncture, avulsion
 - Evaluate thoroughly for trauma, not just wounds



Cat bites- Treatment

- Never wrong to culture!
 - Exit culture after lavage, debridement
- Culture not typically done
 - *Pastuerella multocida*
 - Antibiotic response very predictable
 - Amoxicillin/Clavulanic acid
 - Convenia
- Uncomplicated cat bite abscesses
 - Respond very well to drainage, debridement, drain (cover)
- Culture indicated
 - Complicated wound, pyothorax, bone
 - Inguinal or axillary wounds
 - *Mycoplasma*
 - Any wound not healing as expected



Dog bites- Assessment

- Full history
 - Type of interaction
 - Relationship, provoked vs not, cause vs aggression on site
 - Vaccination status of all participants
 - When
 - Where

Dog bites- Assessment

- Muzzle or Ecollar
 - Pain, aggressive behavior
- Cover wounds
- Full PE
 - Mentation
 - Ambulatory status
 - SQ emphysema
- Initial stabilization
 - Treat for shock PRN



Dog bites- Assessment

- Depending on patient stability
 - Blood work
 - CBC/Chemistry
 - Radiographs
 - Cervical, thoracic, abdomen
 - Spine, pelvis
 - Limbs
- Abdominal and/or thoracic exploratory

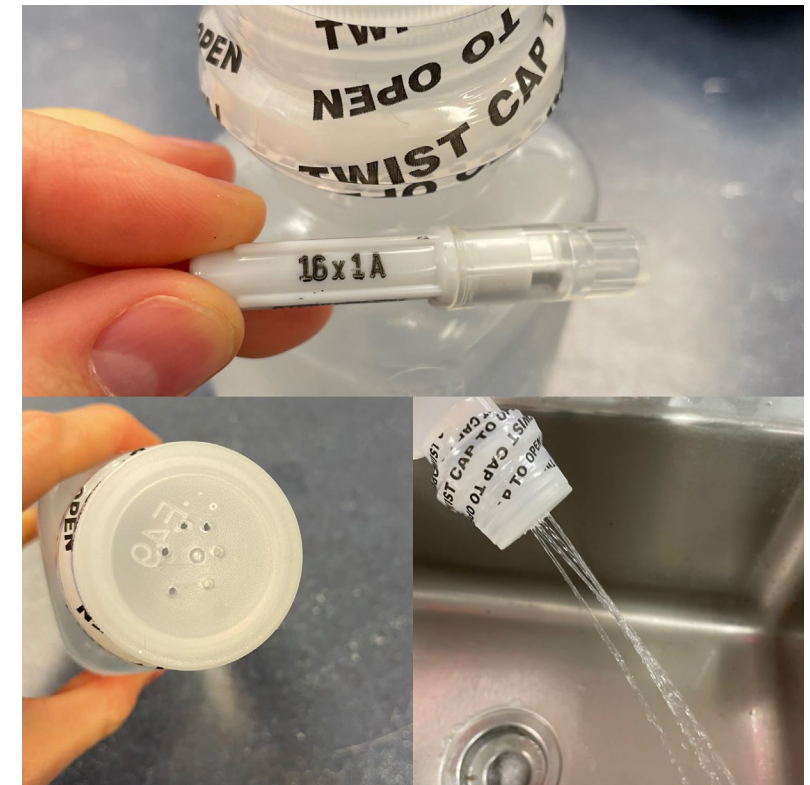


Dog bites- Treatment

- Analgesia & sedation/GA for clip/clean
 - Treatment & assessment
 - Opioid & Benzo, Opioid & $\alpha 2$, or + GA
 - Appropriate heat support, monitoring, continued stabilization
- Wide clip
 - Just keeping clipping....
- Cleaning & Lavage

Dog bites- Treatment

- Cleaning & Lavage
 - Be cognizant of how much of patient is exposed & wet & for how long
 - Clean surrounding skin
 - Avoid detergents in open wounds- sterile lube, solutions
 - No chlorhexidine near eye
 - Chlorhexidine or povidine iodine
 - Lavage
 - Saline, LRS
 - Tap water in large wounds
 - Dilute chlorhex or povidine?



Dog bites- Treatment



Dog bites- Treatment

- Wound characterization & explore
 - Appropriate sedation, analgesia, monitoring, support
 - Client education & expectation management
 - Due to the crush injury and damage to the blood supply, the extent of damage is not fully realized for 3-7 days sometimes.
 - You cannot accurately predict how this will go
 - Beautiful closure of future dead tissue?

Dog bites- Treatment

- Depends on age, size, extent of wound
 - Contaminated, <6-8 hours “golden” period
 - Proper cleaning & debridement biggest impact on progression to infection
 - Debridement & primary closure may be possible in dog bites depending on size, damage
 - If bite relatively small, isolated to the dermis
 - Clip & clean
 - If larger, more extensive, deep
 - Not actively infected but large, deep, extensive
 - Open further, place drains, cover/bandage
 - Infected, >8 hours
 - Treat as an open wound
 - Open further, place drains, cover/bandage
- Manage client expectations

Dog bites- Treatment



Dog bites- Treatment

- Culture never wrong
- Often empiric antibiotic chosen initially
 - Depends on your bacteria- *MRSP*?
- Most common isolates
 - *S. pseudointermedius* (+)
 - *Enterococcus spp* (+)
 - *Pastuerella spp* (-)
 - *Streptococci* (+)
 - *E. coli* (-)

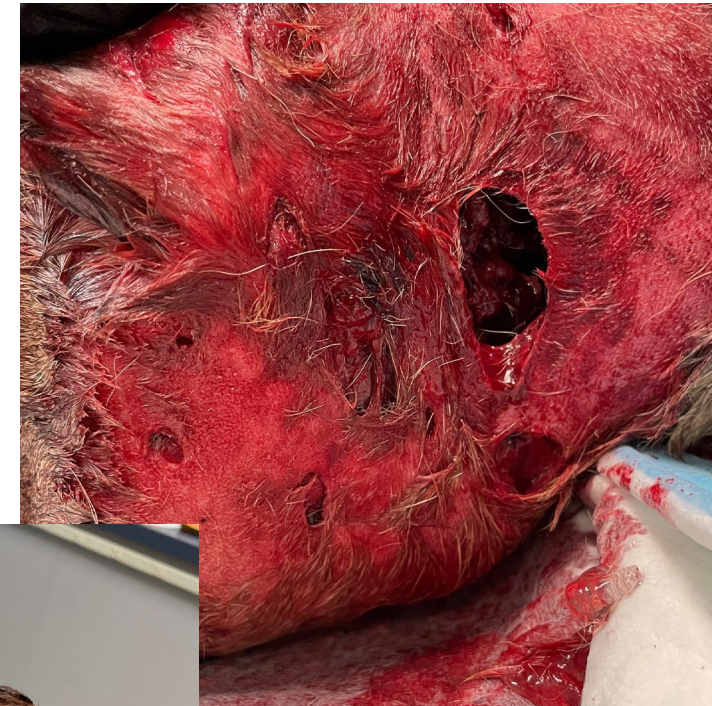
Dog bites- Treatment

- Do you need antibiotics every time?
 - Not really
 - Contaminated, not yet infected wounds limited to the dermis
 - No evidence that antibiotics prevent infection in these scenarios
 - But a lot of the time
 - Deep punctures, large, dirty, contaminated
 - Empiric choice
 - Amoxicillin clavulanic acid



Dog bites- Treatment

- Severely infected wounds, sick patients
 - Culture, treat empirically pending results
 - Broad spectrum parenteral antibiotics
 - Aerobes Gram -, Gram + and Anaerobes
 - If MRSP *Staphylococci* prevalent
 - Ampicillin-Sulbactam + aminoglycoside
 - Ampicillin + metronidazole + aminoglycoside
 - If MRSP not prevalent
 - Ampicillin-Sulbactam + flouoroquinolone
 - Ampicillin + metronidazole + flouoroquinolone
 - Ineffective
 - Monotherapy with 1st generation cephalosporins, clindamycin



Dog bites- Cases- Oscar



Dog bites- Cases- Oscar



Dog bites- Cases- Oscar



Dog bites- Treatment

- Open wound primary layer options
 - Hypertonic saline- very exudative, dirty
 - Use 1-2x
 - Calcium alginate- moderate
 - Hydrocolloid- less
- Open wound bandage options
 - Wrap
 - Tie over bandage



Dog bites- Cases- Jack



Dog bites- Cases- Lamar



Dog bites- Cases- Tiny



Dog bites- Cases- Tiny





Questions?

Thank you for your time!

Special thanks to Michelle, Jenn, Meg, and all my ER colleagues for the pictures- I appreciate your time & patience!

References

- Greens Infectious Disease, Bite wounds
- Sykes et al Infectious Disease, chapter 57, Bite and Scratch Wound infections
- Feltes et al JAVMA 2020 IDA

Primary Contact Rules

Wound status	Goal	Moderate or Severe Exudate	Minimal Exudate
Severely infected or contaminated	Debridement	Hypertonic saline	NA
Moderately infected or contaminated	Debridement	Calcium alginate	Calcium alginate Hydrogel Honey
Wound clean, minimal granulation	Granulation	Calcium alginate	Calcium alginate premoistened Hydrogel Honey
Good granulation bed	Epithelialization	Hydrophilic foam	Hydrogel Telfa? Adaptic?