AMERICAN COLLEGE OF EMERGENCY PHYSICIANS
SCIENTIFIC ASSEMBLY
1999

Dog, Cat, and Human Bites: Preventing and Treating Infections

Dogs and cats carry unusual bacteria, and their bites cause life-threatening infections that require a special approach. The results of the most comprehensive study of dog and cat bite infections, conducted from a national group of emergency departments, will be presented. Antimicrobial prophylaxis, human bites, wound care, and the risk of transmission of HIV, hepatitis C, and tetanus will also be addressed.

- Discuss the current literature related to the management of dog and cat bites.
- Describe the evaluation and treatment of human bites.
- Review the diseases that can be transmitted by dog, cat, and human bites and the prophylaxis protocol for each.

MO-03
Monday, October 11, 1999
8:00 AM - 8:55 AM
Room # N212
Las Vegas Convention Center

**Research: Bayer, Viropharma,Lilly, Ortho-McNeil*

FACULTY

*David A Talan, MD, FACEP

Professor, Medicine, UCLA School of Medicine, Los Angeles; Chair, Department of Emergency Medicine; Faculty, Division of Infectious Diseases, Olive View-UCLA, Sylmar, California

JUN 25 1999

Bite Infections

David A. Talan, MD, FACEP. FIDSA
Professor and Chair
UCLA School of Medicine
Olive View-UCLA Dept. of Emergency Medicine
and Division of Infectious Diseases

Dog Bite Consequences

Annually.

- Total 3.73 million bites
- 757,000 medical visits
- 5,300 ED hospital admits
- 20deaths

Sacks JJ. *JAMA* 1989;262:1489.
Weiss HB. *JAMA* 1998;279:51.

Annual ED Visits for Injuries

	Estimated Annual ED Visits
Baseball	494,364
Dog Bites	333,687
Playground	266,810
All terrain vehicles	125,136
Volleyball	75.994
Horseback riding	71.162
Baby walkers	28,000
Skateboards	25,486

US Consumer Product Safety Commission, 1992 & 1994

Animal Bites: *EMERGE*ncy ID NET 1996-8

	(%)
Dog	1629 (83)
Cat	269 (14)
Rat/mouse	34 (1.7)
Squirrel	14 (0.07)
Raccoon	10 (0.05)
Bat	5 (0.025)

Dog and Cat Bites: Incidence of Infection

. Dog bites - 3% to 18%

. Cat bites - 28% to 80%

Dog and Cat Bacterial Flora

	Dogs (%)	Cats (%)
Pasteurella sp.	50-66	70-87
Staphylococci	50-100	
S. aureus	31-72	
	10	
S. intermedius	39	
E. coli	28-39 90	
EF-4	a2	
OF-2	8	18

Bacteriology of Uninfected Dog Bites

	n (%)
Streptococci	11 (58)
Staph. epidermidis	8 (42)
Pasteurella sp.	7 (37)
Staph. aureus	4 (21)
Moraxella sp.	4 (21)

Goldstein EJC. *Ann Emerg Med 1980;9:508.*

31 Infected Dog and Cat Bite Study: Inclusion Criteria

- Temp > 38ºC (11%),
- Abscess (16%),
- Lymphangitis (25%), or
- Fouroffive (48%)

✓ Erythema > 3 cm
✓ Tenderness
✓ Swelling
✓ Purulent drainage
✓ WBC count > 12,000

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Wound Infections: Demographics

	Dog Bites (n=50)	Cat Bites (n=57)
Median Age (yrs)	28	39
IQR	(15-40)	(28-51)
% Female	38%	72%

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: Wound Characteristics

	Dog Bites (n=50)	Cat Bites (n=57)
Puncture(s) only	60%	65%
Laceration(s) only	10%	3%
Both	30%	12%

Talan DA. Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*: 1999:340:85.

Things People Use for Dog and Cal Bites Before Seeing a Doctor

Soap & water	73%
Peroxide	46%
Isopropyl alcohol	15%
Iodine	10%
Sterile saline	5%
Misc. (e.g.. garlic. mouthwash)	21%

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Location of Dog and Cat Bite Infections

Cat		Dog	
Head	2%	16%	Head
Arm	23%	12%	Arm
Hand	63%	50%	Hand
Trunk	0%	2%	Trunk
Leg	9%	16%	Leg
Foot	3%	4%	Foot

Talan DA. *NEJM* 1999;340:85.

Dog and Cat Bites: Wound Infection Characteristics

	Dog Bites (n=50)	Cat Bites (n=57)
Abscess	12%	19%
Purulent wound	58%	39%
Non-purulent wound	30%	42%
Lymphangitis	22%	28%

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Wound Infection: Types of Microorganisms

	Dog Bites (n=50)	Cat Bites (n=57)
Aerobic/anaerobic	48%	63%
Aerobes only	42%	32%
Anaerobes only	1%	0%
No growth	8%	5%

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: Aerobes

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
Pasteurella sp.	25 (50)	43 (75)
Streptococci	23 (46)	26 (46)
Staphylococci	23 (46)	20 (35)
Neisseria sp.	8 (16)	11 (19)
Corynebact. sp.	6 (12)	16 (28)
Moraxella sp.	5 (10)	20 (35)
EF-4b	5 (10)	9 (16)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: *Pasteurella* species

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
P. canis	13 (26)	1 (2)
P. multocida ssp. *multo.*	6 (12)	31 (54)
P. stomatis	6 (12)	2 (4)
P. multocida ssp. *septica*	5 (lo)	16 (28)
P. dagmatis	2 (4)	4 (7)
Other	1 (2)	0 (0)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85

Dog and Cat Bite Infections: Streptococci

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
S. mitis	11 (22)	13 (23)
S. mutans	6 (12)	6 (11)
S. pyogenes	6 (12)	0 (0)
S. saguis II	4 (8)	7 (12)
S. intermedius	3 (6)	2 (4)
S. constellatus	2 (4)	2 (4)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: Staphylococci

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
S. aureus	10 (20)	2 (4)
S. epidermidis	9 (18)	10 (18)
S. warneri	3 (6)	6 (11)
S. intermedius	1 (2)	1 (2)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: Anaerobes

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
Fusobacterium sp.	16 (32)	19 (33)
Bacteroides sp.	15 (30)	16 (28)
Porphyromonas sp.	14 (28)	17 (30)
Prevotella sp.	14 (28)	11 (19)
Proprionibacterium sp.	10 (20)	10 (18)
Peptostreptococcus sp.	8 (16)	3 (5)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: Notorious Pathogens

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
Capnocytophaga(DF-2)	1 (2)	4 0
Weeksella zoohelcum (IIj)	2 (4)	4 (7)
Eikenella corrodens	1 (2)	1 (2)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Infections: What's Not There

	Dog Bites (50) [n(%)]	Cat Bites (57) [n(%)]
Pseudo. aeruginosa	1 (2)	0 (0)
E. coli	3 (6)	0 (0)
Klebsiella sp.	2 (4)	1 (2)
Proteus mirabilis	2 (4)	0 (0)
Clostridium tetani	0 (0)	0 (0)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Animal Bite Bacteriologic Associations

Pasteurella - abscesses (83%)

Anaerobes -abscesses (77%)

Streptococci - lymphangitis (60%)

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Wound Infections: Time to Presentation

	Dog Bite (n=50)	Cat Bite (n=57)
Median Bite to Presentation Time	36 hours (11 hrs - 17 days)	23 hours* (8 hrs - 9 days)

*p = 0.04

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*: 1999:340:85

Dog and Cat Bite Wound Infections: Time to Infection

	Dog Bite (n=50)	Cat Bite (n=57)
Median Time (hrs) (IQR)	24 (12 - 48)	12' (7-18)

*p = < *0.001*

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Dog and Cat Bite Wound Infections: Onset by Organism

	Pasteurella	Strep	Staph
Median Bite to infection Time (hours)	12	15	18

Talan DA, Citron DM, Abrahamian FM, Moran GM, Goldstein EJC. *NEJM*; 1999;340:85.

Pasteurella Susceptibility: What Works

	MIC $_{90}$ (ug/ml)
Pen G	0.006-0.25
Amoxicillin	0.25
Ciprofloxacin	0.008-0.03
Trovafloxacin	0.03
Cefuroxime	0.06
Azithromycin	0.125-0.5

Goldstein EJC. *Antimicrob Agents Chemother* 1998;41:391.

Pasteurella Susceptibility: What Doesn't Work

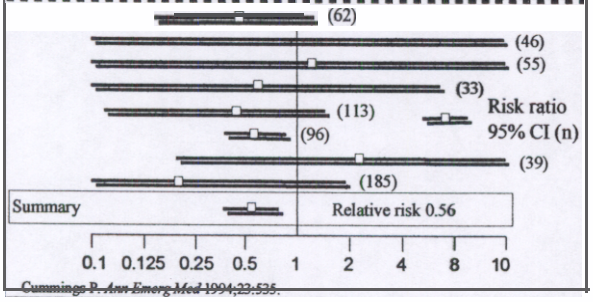
	MIC $_{90}$ (ug/ml)
Cephalexin	I-16
Erythromycin	4-8
Clarithromycin	1-4
Dicloxacillin	S-16
Nafcillin	4
Clindamycin	32
Gentamicin	2

Goldstein EJC. *Antimicrob Agents Chemother* 1997;41:1552.

Dog and Cat Bite Infections: Empiric Antimicrobials

	Pasteurella	Staph	Anaerobes
Amoxicillin/clav.	◇	◇	◇
Ampicillin/sulbac.	◇	◇	◇
Cefotetan/cefoxitin	◇	◇	◇
Azithromycin	◇	◇	◇
Trovafloxacin	◇	◇	◇
Pen/cephalexin	◇	◇	◇
Clindamycin/cipro	◇	◇	◇

"Prophylactic" Antimicrobials for Dog Bites



Cummings P. *Ann Emerg Med* 1994;23:535.

Antimicrobial "Prophylaxis" of Dog Bite Wounds to the Hand

	Abx n (%)	Placebo n (%)	Rel .risk 95% CI
Callaham	1/6 (17)	3/6 (50)	0.33 (.05-2.4)
Jones	0/23 (0)	4/20 (20)	0.00 (---)
Skurka	1/5 (20)	1/4 (25)	0.80 (.07-9.2)
Summary	2/34 (6)	7/30 (23)	0.23 (.05-.95)

Cunmmings P. *Ann Emerg Med* 1994;23:535.

Cat Scratch Disease

. Etiology: *Bartonella henselae*
. 40% of cats with bacteremia
. Fleas may transmit
. Dx: serology
. Rx: azithro/erythro/doxy 10-14 d

Spach DH. *Infect Dis Clin N Am* 1998;12:137.

Cat Scratch Disease

. Incubation: 3-10 days
. Primary lesion: papule/vesicle
. Regional LA 2 wks later
. 30% febrile, 20% IA > 6 months
. Encephalitis/FUO

Spach DH. *Infect Dis Clin N Am* 1998;12:137.

Rabies: Epidemiology

. Since 1980 - 36 human cases
  - 58% bat variants
  - 33% acquired outside US
. Developing countries - dogs
. 2 cases/year indigenous dogs

MMWR 1999;48: No. RR-1

Rabies Post-Exposure Rx

. Raccoons, skunks, and bats (> 85%) - test, or treat in not available
. Dogs, cats, ferrets -observe, or rx based on endemicity in terrestrials and circumstances
. Rodents, rabbits - almost never require rx

MMWR1999;48:NO.RR-1

Rabies Post-Exposure Rx

. Clean wound with soap and water/iodine
. RIG (20 IU/kg) full dose around wound
. Vaccine (Iml) in deltoid days 0,3,7,14,28
. cost ~ $1,500

MMWR 1999;48: No. RR-1

Monkey Bites and Herpes B Virus

. Macaca monkeys (rhesus)
. immediate cleaning soap/iodine/bleach
. Culture/bleed monkey and bitten person
. B virus encephalitis progressive/fatal
. Acyclovir-deep bites/symptomatic animals

Animal Bites: Epidemiology

NYC Dept. of Health:

Dog	89.1%
Cat	4.6%
Human	3.6%
Rodent	2.2%
Other	0.5%

Marr JS. *Public Health Reports* 1979;94:514.

Human Bites in Adults: Activities

Aggressive	Fights	60%
	Police arrest	8%
	Mugging	4%
Non-aggressive	Playing	12%
	School adivity	5%
	Medical treatment	3%
	Sexual	0.4%

Marr JS. *Pub Health Rep* 1979;94:514.

Human Bites in Adults: Epidemiology

- Young adults
  - . Men > women
  - . Saturday night
  - . Indoors
  - . Hands/closed-fist injuries

Marr JS. *Pub Health Rep* 1979;94:514.

Human Bites in Children: Activities

Fights	61%
Play	26%
Lovemaking	7%
sports	5%
Abuse	1%

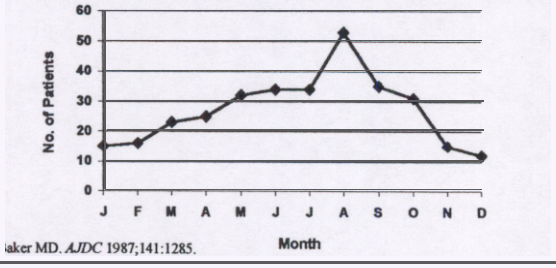
Baker MD. *AJDC* 1987;141:1285.

Human Bites in Children: Epidemiology

. Older children and teens
. Girls > boys
. Afternoon and evening
. Abrasions/upper extr./face-neck
. Infection - lacerations/punctures

Baker MD. *AJDC* 1987;141:1285.

Human Bites in Children: Seasonality



aker MD. *AJDC* 1987;141:1285.

Human Bite Infections: Bacteriology

streptococci	30-80%
Group A *B*-hemolytic	1630%
Staphylococci	40-50%
s. aureus	40-50%
Eikenella corrodens	0-16%
Haemophilus sp.	10%
Peptostreptococci	*40%*
Bacteroides sp.	10-33%
Fusobacterium sp.	33%

Brook I. *Pediatr Infect Dis J*;1987;6:29./Goldstein EJC. *JCM* 1978;8:667.

Human Bite Infections: Empiric Antimicrobials

	Staph	Anerobes	Eikenella
Amoxicillin/clav.		0	0
Ampicillin/sulbac.		0	
Azithromycin			
foxitin			
Trovafloxacin	8		
Pen/cephalexin			
Clindamycin/cipro	8	8	

Human Bites: Prophylacitc Antimicrobials

Infection Rate

Placebo (n=15)	Cephalothin (n=17)	Cefaclor (n=16)
47%	0%	0%

p = < 0.05

Zubowicz VN. *Plastic Reconstruc Surg*; 1991;88;111.

Delayed Primary Closure: History

. First described by Depage in treatment of wounds in World War I

	Success Rate
Immediate Suture	85.1% (882/1036)
Delayed Primary Closure	92.7% (241/260)
Secondary Intention	87.5% (920/1051)

Depage A. *Ann Surg* 1919;69:575-588

DPC: Experimental Studies

. Wound strength equivalent DPC (at 4 days) to primarily closed wounds day 7 post-wounding

. Re-incised wounds heal faster than freshly incised wounds

Plast Reconstr Surg 1971;48:358-361
N Engl J Med 1954;250:1062-1065

Delayed Primary Closure

. Retrospective study of 150 heavily contaminated wounds

	Infection Rate
Primary closure (n=118)	27%
Delayed PC (n=32)	3%

Smilanich RP. *Am Surg* 1995;61:427-430

Possible HIV From Human Bites

1986 - older brother of 5 yo HIV +

1987 - bitten during fight with HIV+ sister whose mouth was bleeding

1996 - AIDS patient with seizure, tongue bitten, protecting airway

J Acq Immunno Def Synd 1993;6:402 *Lancet* 196;347 1782.

Bite Transmitted HIV: Why Not?

. Saliva inhibits HIV infectivity
. HIV infrequently in saliva
. 0 of >500,000 reported AIDS cases
. No transmission with kissing
. 1/20 risk of needlestick (0.3%)

CDC. *MMWR* 1997;46:621.

Relative Risk Bite Transmitted HIV HBV, and HCV

For percutaneous exposures...

. HBV 2-40%
. HCV 3-10%
. HIV 0.2-0.5%