

# MAULED

A surgeon's role in bear attacks

James Verlanic, MD

## CASE PRESENTATION- PRE-HOSPITAL

- 38 year-old male who lives in a remote area of northeast New Mexico.
- A black bear was seen running through his yard and his dogs (bear hunting hounds) chased the bear putting the bear at bay.
- Upon the patient's arrival to the dogs and the bear, the bear attacked him, biting and clawing the patient's legs.
- The bear drug the patient down a hillside by the leg.
- The patient was armed with a 10mm handgun and shot the bear several times while it was still biting his leg.
- This killed the bear, BUT because of the hillside and the bear's weight, in addition to trismus of the bear's jaw, the bear could not be removed from the patient's leg.
- Extraction by the response team took nearly 3 hours and included cutting off the bear's head with a reciprocating saw.

## OBJECTIVES

- At the conclusion of this presentation, participants will be able to:
- Describe the epidemiology and geographical influence of bear attacks
- Identify the microbiology associated with bear bites
- Demonstrate a general surgeon's role in managing bear maulings
- Demonstrate preventative measures in bear country and respond appropriately to a bear encounter.

## CASE PRESENTATION

- The patient arrived to the ED as a Trauma Alert Protocol with a tourniquet on the right thigh
- Was found to be A&O, HD normal and without arterial bleeding upon removal of tourniquet
- Injuries included multiple, deep lacerations, degloving, and puncture wounds of the R>L lower extremities
- Given Zosyn as prophylactic antibiotics per Sanford Guidelines
- Tetanus vaccine given
- Transported to the OR urgently for management of wounds

## CASE P



## CASE PRESENTATION- OPERATIVE MGMT

- All wounds were copiously irrigated and appropriately debrided
- Large anterior to posterior through-and-through defect of the gastrocnemius
- Degloving of posterior knee
- No vascular injury identified
- All major ligamentous structures intact
- No identified nerve injuries
- Wounds closed primarily



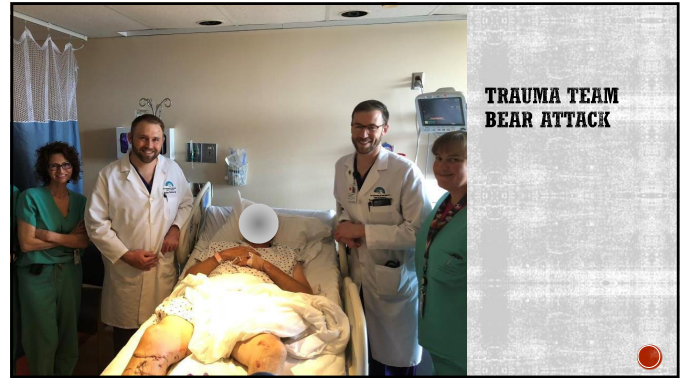
### CASE PRESENTATION- HOSPITAL COURSE

- Post operatively, patient noted to have right foot drop
- Otherwise unremarkable early hospital course
- Zosyn was discontinued POD1



## CASE PRESENTATION- HOSPITAL COURSE

- Patient developed cellulitis at the proximal thigh bite wounds evening of POD2.
  - Sutures were removed and Zosyn re-initiated
  - Vancomycin started POD3
- Resolution of cellulitis
- Patient was discharge home POD6
- Discharge home with Augmentin x 7 days



**TRAUMA TEAM  
BEAR ATTACK**



**CELLULITIS SITE**



**THE BEAR AS  
FOUND AT THE  
SCENE**



**CELLULITIS SITE**



**THE BEAR AS  
FOUND AT THE  
SCENE**



**BEAR HEAD  
REMOVED**



**EXTRICATION**



## CASE PRESENTATION- POST HOSPITAL COURSE

- Wounds all healed well and discharged from Trauma Clinic
- Followed by Orthopedic Surgery & PT/OT as an outpatient for the foot drop
- Superficial peroneal nerve allograft performed by Ortho 2 months post discharge
  - Tibial and deep peroneal nerves intact

## A CULTURAL ICON



## BEARS IN NORTH AMERICA

- 3 species -
  - Black Bears
  - Brown (grizzly) Bears
  - Polar Bear

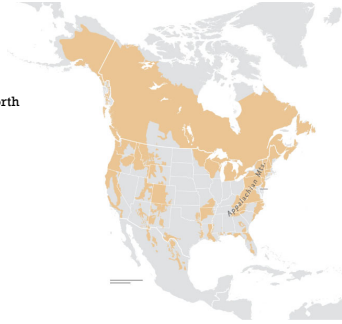


## INTRODUCTION TO BEARS

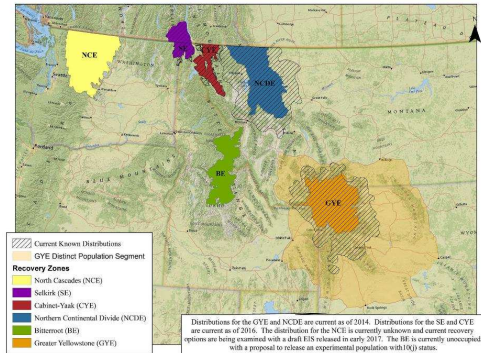


## BLACK BEARS

- Estimated 800,000 black bears in North America
- Population is increasing
  - Esp. Eastern and Southern states
  - Restoration of habitat, "re-wilding"
- Inhabit mixed forest landscapes
- Omnivorous diet
- Can climb trees
- Less aggressive
- 125-550lbs, 4-6ft in length



Grizzly Bear Recovery Zones, Distributions, and Distinct Population Segments

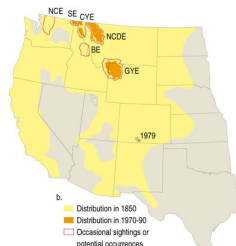
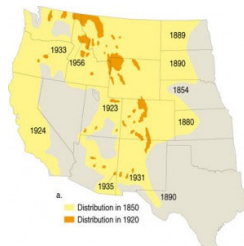
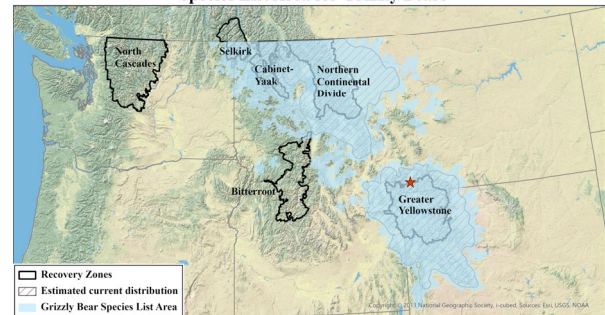


## GRIZZLY BEARS

- Ursus arctos horribilis*
- 55,000 bears in NA, 30,000 in AK
- The name comes from Lewis and Clark's account of "grised" appearing bears on the great plains
  - "silver-tip"
- Adapted to open landscapes
- Large claws and humped shoulders used for digging, can generally not climb trees
- Very aggressive
- Omnivorous
  - Access to protein (salmon) usually determines size
- 300-1,000+lbs, 6-10+ft



Species List Area for Grizzly Bears



## CURRENT STATUS

- Black bears:
  - Stable to increasing populations through their range.
  - Hunted in most areas they occur
  - New Jersey- Gov
  - Florida
- Grizzly bears:
  - Stable populations throughout AK and Canada
  - British Columbia
  - Population and range continues to increase in Lower 48 (over 2,200)
  - Population restoration has been much more controversial
  - GYE population met pre-determined population goals in early 2000's
  - Proposal to remove from ESA multiple times
    - First attempt- 2006- whitebark pine study
  - Removed from ESA protections briefly
    - Judge Dana Christensen placed a restraining order to end proposed hunting in Idaho & Wyoming
  - Now proposals to remove both GYE and NCD populations

## COMPARISON OF GRIZZLY AND BLACK BEARS

### Grizzly Bears

- Blonde to black
- Shoulder hump
- Rump below shoulder
- Concave face (dished)
- Short rounded ears
- Long, slightly curved claws

### Black Bears

- Blonde to black
- No shoulder hump
- Rump above shoulder
- Pointed face profile (Roman Nose)
- Tall pointed ears
- Short, curved claws

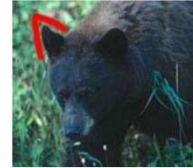
Least reliable  
distinguishing  
characteristic

## BEAR ID

### Grizzly Bear



### Black Bear



## BEAR ID

### Grizzly Bear



### Black Bear



## BEAR ID

### Grizzly Bear



### Black Bear



## WHY IT MATTERS

- Behavior differ greatly
- Strategies before and during an attack
- Severity of injuries

## INCIDENCE OF BEAR ATTACKS

- Tracking **non-fatal** bear attack statistics can be challenging to compile, because cases can either be incomplete, or go unreported.
- However, **fatal** bear attacks are reported, covered and tracked far more frequently, by society.

## BEAR ATTACKS



## INCIDENCE OF BEAR ATTACKS

- General consensus notes an **increasing** frequency of bear attacks per year.
- Regardless, bear attacks remain a **RARE** event.
- Old data suggest an average 10 injuries/year, 1 death/year
- 79 fatalities in 74 attacks since 2000
  - Grizzly- 42
  - Black- 34
  - Polar- 3
- Middaugh- Reviewed injuries from bear attacks in Alaska 1900-'85
  - 105 cases of injury or death by bear
  - 18.1% black bear (21% fatal); 81% grizzly (18% fatal)

## TYPES OF ATTACKS

- **Defensive**
  - Startled
  - Defending food
  - Defending young
    - Reported up to 70% of fatal attacks
- **Predatory**

## NATIONAL PARK DATA

- Canadian study - Over a five year period
  - Banff NP: 4 million visits/bear-related injury
  - Jasper NP: 2.8 million visits/bear-related injury
  - Waterton NP: 1 million visits/bear-related injury
- "Human Injury from Bear Attacks in Alaska" Middaugh
  - Data from Denali NP
  - 3.5 injuries/1 million visits
  - Death rate 1/30 million visits

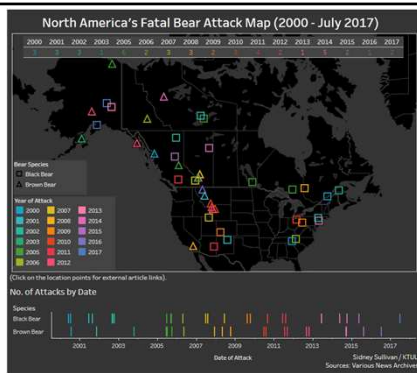
## YELLOWSTONE

- Since 1980:
    - 100 million visitors
    - 38 injuries
  - Remain in developed areas: 1 in 25.1 million visits
  - Roadside campgrounds: 1 in 22.8 million overnight stays
  - Camp in the backcountry: 1 in 1.4 million overnight stays
  - Travel in the backcountry: 1 in 232,000 person travel days
  - All park activities combined: 1 in 2.7 million visits
- 17 x  
6 x
- Injuries:
    - 1/year 1930s through the 1950s
    - 4/year during the 1960s
    - 0.5/year during the 1970s
    - Since 1980, 1/year
  - Fatalities: 8



## MANAGEMENT OF ATTACKS

### Injury and Infection



## MICROBIOLOGY

- Sources to consider:
  - The mouth flora of the bear
  - The skin flora of the human
  - Any possible transmissible zoonotic pathogens
  - Pathogens on the claws
  - Pathogens from the environment where the encounter took place
- 44% infection rate after bear bites

COMMUNITY > THIS WEEK IN FISH AND WILDLIFE

# "This is it": mauled US hiker recalls mome

## Hiker killed in apparent bear attack in Glacier Park

Daniel Crag with bear a Brother Yellow Hikers airlifted

If confirmed, the death of the Florida man would be the first fatal bear attack in Glacier National Park since 1998.

By Christina Macintosh

by Justin Franz 85.86.2026

David Murray Great Falls Tribune

Published 4:44 p.m. MT May 3, 2024 | Updated 5:45 p.m. MT May 5, 2024

Journal of Wilderness Medicine 1, 47-49 (1990)

### Normal oral flora in black bears: guidelines for antimicrobial prophylaxis following bear attacks

T. FLOYD<sup>1</sup>\*, A.M., MANVILLE, II<sup>2</sup> and S.P. FRENCH<sup>3</sup>

Table 1. Flora found in 12 black bears from lower peninsula of Michigan.

| Genus/species                     | Number positive cultures (%) |
|-----------------------------------|------------------------------|
| <i>Micrococcus</i> species        | 10 (82%)                     |
| <i>Staphylococcus aureus</i>      | 4 (85)                       |
| <i>Staphylococcus epidermidis</i> | 2 (16%)                      |
| <i>Streptococcus</i>              |                              |
| α-hemolytic                       | 6 (50%)                      |
| β-hemolytic                       | 2 (16%)                      |
| nonhemolytic                      | 1 (8%)                       |
| <i>Bacillus</i> species           | 1 (8%)                       |
| <i>Enterobacter</i> species       | 1 (8%)                       |
| <i>Klebsiella pneumoniae</i>      | 1 (8%)                       |
| <i>Proteus mirabilis</i>          | 1 (8%)                       |
| <i>Proteus</i> species            | 1 (8%)                       |
| <i>Acinetobacter</i> species      | 2 (16%)                      |
| <i>Actinomyces</i> species        | 1 (8%)                       |

- 12 bears captured in culvert traps in MI
- Swabs of periodontal tissue
- No anaerobic spp
- Recommended 1<sup>st</sup> gen cephalosporins or penicillins as prophylaxis

Clinical microbiology

### Anaerobic oral flora in the North American Black bear (*Ursus americanus*) in eastern North Carolina

Elsburgh O. Clarke III <sup>a, b, A</sup>, Michael K. Stoskopf <sup>a, b</sup>, Larry J. Minter <sup>a</sup>, Elizabeth M. Stringer <sup>a</sup>

- Oral swabs from 22 hunter killed black bears in NC
- Multiple anaerobic species identified
- 16 anaerobic bacterial species, representing 9 genera were identified

## OVERVIEW OF ALL PUBLISHED BEAR BITE INFECTIONS

### Bacterium isolated from bear bite wounds

*Aeromonas hydrophila*  
*Bacillus cereus*  
*Citrobacter diversus*  
*Enterococcus durans*  
*Escherichia coli*  
*Mycobacterium fortuitum*  
*Neisseria sicca*  
*Proteus vulgaris*  
*Serratia fonticola*  
*Serratia marcescens*  
*Staphylococcus aureus*  
*Staphylococcus epidermidis*  
*Streptococcus sanguis*

Journal of  
Clinical Microbiology<sup>®</sup>

J Clin Microbiol 2004 Jul; 42(7): 3374-3376  
 doi: 10.1128/JCM.42.7.3374-3376.2004

PMCID: PMC448265  
 PMID: 15243122

### Bacteriology of a Bear Bite Wound to a Human: Case Report

Dennis Kunimoto<sup>1</sup>, Robert Reinos<sup>2</sup>, Diana M. Cline<sup>3</sup>, and Elise J. C. Goddard<sup>1,4\*</sup>

- Hunter east of Banff, Alberta
- Attacked by grizzly bear
- Received Ancel/Flagyl 12 hrs prior to culture
- Developed polymicrobial wound infection to scalp
  - MultiSerratia fonticola, Serratia marcescens, Aeromonas hydrophila, Bacillus cereus, and Enterococcus
  - No anaerobes
- Treated with 7 days Zosyn, rabies IG (stopped after brain eval), and 2 weeks of augmentin

## WHAT ABOUT RABIES?

- CDC recommends treatment of all people bite by a wild carnivore (most common in skunks, bats, raccoons, and foxes)
- Rabies is uncommon in bears
- There are NO reports of transmission of rabies from bear to human.

Journal of  
Clinical Microbiology<sup>®</sup>

J Clin Microbiol 2005 Feb; 43(2): 1059  
 doi: 10.1128/JCM.43.2.1059.2005

PMCID: PMC548072  
 PMID: 15695738

### *Mycobacterium fortuitum* Infection after a Brown Bear Bite

- 56M in Finland was attacked by a brown bear with severe left thigh soft tissue injuries.
- Empiric Zosyn and Augmentin course given
- Developed wound infection
  - Streptococcus sanguis
  - Neisseria sicca
  - Bacillus spp
  - ***Mycobacterium fortuitum* – Multi-drug resistant**
    - Atypical mycobacterium
    - Found in sewage and natural water
    - Associated with rare immunosuppressed infections
    - Treated for 6 months – Clarithromycin/Cipro
- Required 3 debridements and STSG

## OUR EXPERIENCE

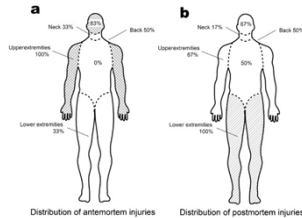
- Initially placed on Zosyn alone
  - Sanford guide to antimicrobial therapy
- Development of cellulitis at proximal thigh puncture wounds
  - Resolved with:
    - Removal of sutures
    - Addition of vancomycin
  - Discussed with surgeon in Montana
    - Has treated many bear attacks
    - Prefers Zosyn/Vancomycin from anecdotal evidence
  - No rabies treatment as the bear was provoked, and the brain was available for analysis (found to be negative)



## Injury patterns of fatal bear attacks in Japan: A description of seven cases

Toru Oshima, Maki Ohtani and Sohtaro Mimasaka  
Forensic Science International, 2018-05-01, Volume 286, Pages e14-e19, Copyright © 2018 Elsevier B.V.

- Review of injury patterns of 7 fatal bear attacks in Japan
- 6 of 7 died secondary to hemorrhage from head, neck, and upper extremity lacerations and vascular injuries
- 1 of 7 died due to cervical spine injury



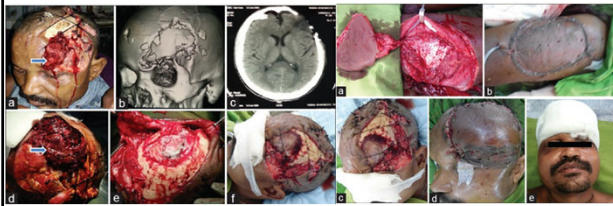
## SURGERY ROLE

- As with any other major trauma,
  - Initial resuscitation and evaluation
- Operative management of injuries
  - Hemorrhage control
  - Debridement
  - Soft tissue repair
  - Neck/thoracic/abdominal injuries
- Coordination of multi-system trauma with multiple specialties
- Management of anti-microbials, both prophylaxis and infection
- General Surgery is more likely to be available in areas that bear attacks happen than other sub-specialties.

## Evisceration of Brain: An Unusual Case Report of Bear Mauling from Eastern India

Bikash Ranjan Behera, Sanjib Mishra, Deepak Das, and Rajesh Gantayat<sup>1</sup>

- 40M presented 3 days after sloth bear attack while saving a child.
- Resuscitated, debrided, and reconstructed with a ALT free flap



## PREVENTION AND ENCOUNTERS



## Multifaceted Treatment for a Black Bear Attack

Authors: Spencer, Stephen; Safcsak, Karen; Ibrahim, Joseph A.  
Source: The American Surgeon, Volume 83, Number 8, August 2017, pp. e326-e328(3)  
Publisher: Southeastern Surgical Congress

- Case Report: 54F in Florida who was attacked by a black bear in a gated suburb while walking her dog.
- Sustained multiple full thickness lacerations and avulsion injuries to face and head
- Initial evaluation and resuscitation by trauma surgery
- Operative treatment by plastic surgery
- Treated with Zosyn until POD4 and then Augmentin x 3 days
- Psych- Pt developed insomnia and anxiety



## PREVENTION

- Hiking
  - Noisy- talk loudly, bell
  - Travel in groups
- Food
  - Do NOT allow bears access to your food
  - Hang food or use bear proof containers
  - 10'x4' rule
  - Separate your sleeping area from food storage and cooking.
- Hunters
  - Pack meat out as soon as possible
  - Separate carcass from gut pile ~100 yds if possible
  - Return to site carefully



## WHAT TO DO IN AN ENCOUNTER

- Identify yourself- talking calmly can let the bear know you are a human, not prey
- Stay calm
  - Never scream or make sudden movements
- Stay in a group
- Keep your backpack on
- Move slowly and side-ways
  - Do NOT run away- triggers predatory instincts
- Leave the area, take a detour, or let the bear leave
- NEVER get between a mother and her cubs



## Efficacy of Bear Deterrent Spray in Alaska

TOM S. SMITH,<sup>1</sup> Wildlife Sciences Program, Faculty of Plant and Wildlife Sciences, Brigham Young University, 451 WEDR, Provo, UT 84602, USA  
STEPHEN HERRERO,<sup>2</sup> Environmental Science Program, Faculty of Environmental Design, University of Calgary, Calgary, AB T2N 1N4, Canada  
TERRY D. DEBRUNN,<sup>3</sup> United States National Park Service, Alaska Support Office, 240 W 5th Avenue, Anchorage, AK 99501, USA  
JAMES M. WILDER,<sup>4</sup> Minerals Management Service, 3801 Centurion Drive, Suite 500, Anchorage, AK 99503-5823, USA

- Analyzed 83 bear encounters involving bear spray in Alaska from 1985 to 2006
- Stopped bears in 92% (grizzly), 90% (black), and 100% (polar)
- Overall, 98% of close encounters resulted in no injuries when bear spray was used.
- All injuries associated (3/83) involving bear spray had minor injuries (no hospital)
- 7% wind affected use
- 14% users experienced negative effects



## WHAT TO DO IF ATTACKED

- **Brown/Grizzly Bears:**
  - Leave your pack on
  - **PLAY DEAD**
    - Lay flat on your stomach with your hands clasped behind your neck.
    - Spread your legs to make it harder for the bear to turn you over.
    - Remain still until the bear leaves the area.
    - Fighting back usually increases the intensity of such attacks.
    - If the attack persists, fight back vigorously. Use whatever you have at hand to hit the bear in the face.
- **Black Bears:**
  - **DO NOT PLAY DEAD.**
    - Appear intimidating. Look big, yell loudly.
    - Escape or fight back. Concentrate your kicks and blows on the bear's face and muzzle.
- **Predatory attacks- Any species**
  - Attacks you in your tent or stalks you
  - **DO NOT play dead—fight back!**
    - This kind of attack is very rare, but can be serious because it often means the bear is looking for food and sees you as prey.



## QUESTIONS?



## BEAR SPRAY VS FIREARMS



- GSWs may incite worse injuries before and if bear dies.
- Bear spray consider more effective overall
- Bear spray fires 30 ft with a 4 foot cloud. Guns have to be fired in precise targets.
- Don't kill the bear with bear spray
- Bear spray may be less effective in the wind/rain
- US FWS data – Grizzly bear interactions
  - Firearms used – ~50% injury rate
    - Bear Spray – Almost no injuries. Reported injuries were less severe.
- Herrero: a person's chance of incurring serious injury from a charging grizzly doubles when bullets are fired versus when bear spray is used.

