

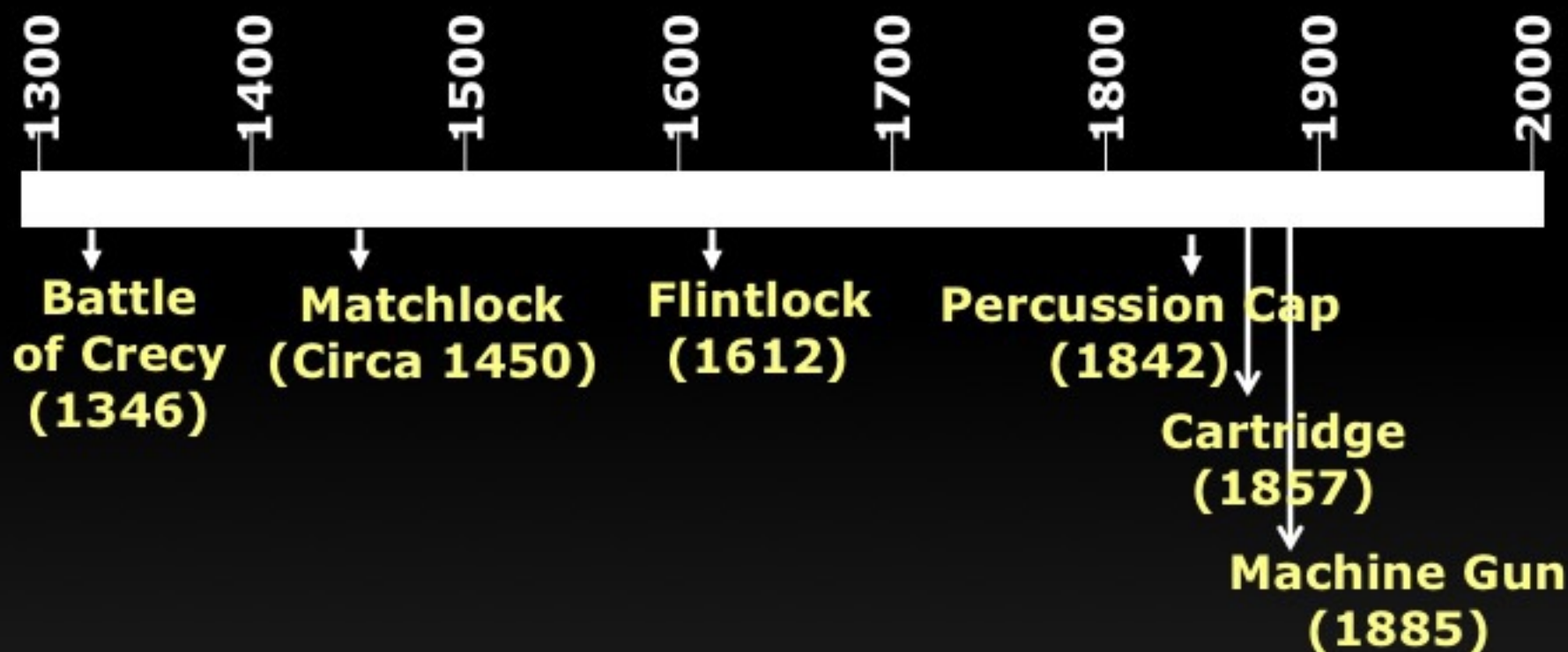
NON-LETHAL WEAPONS

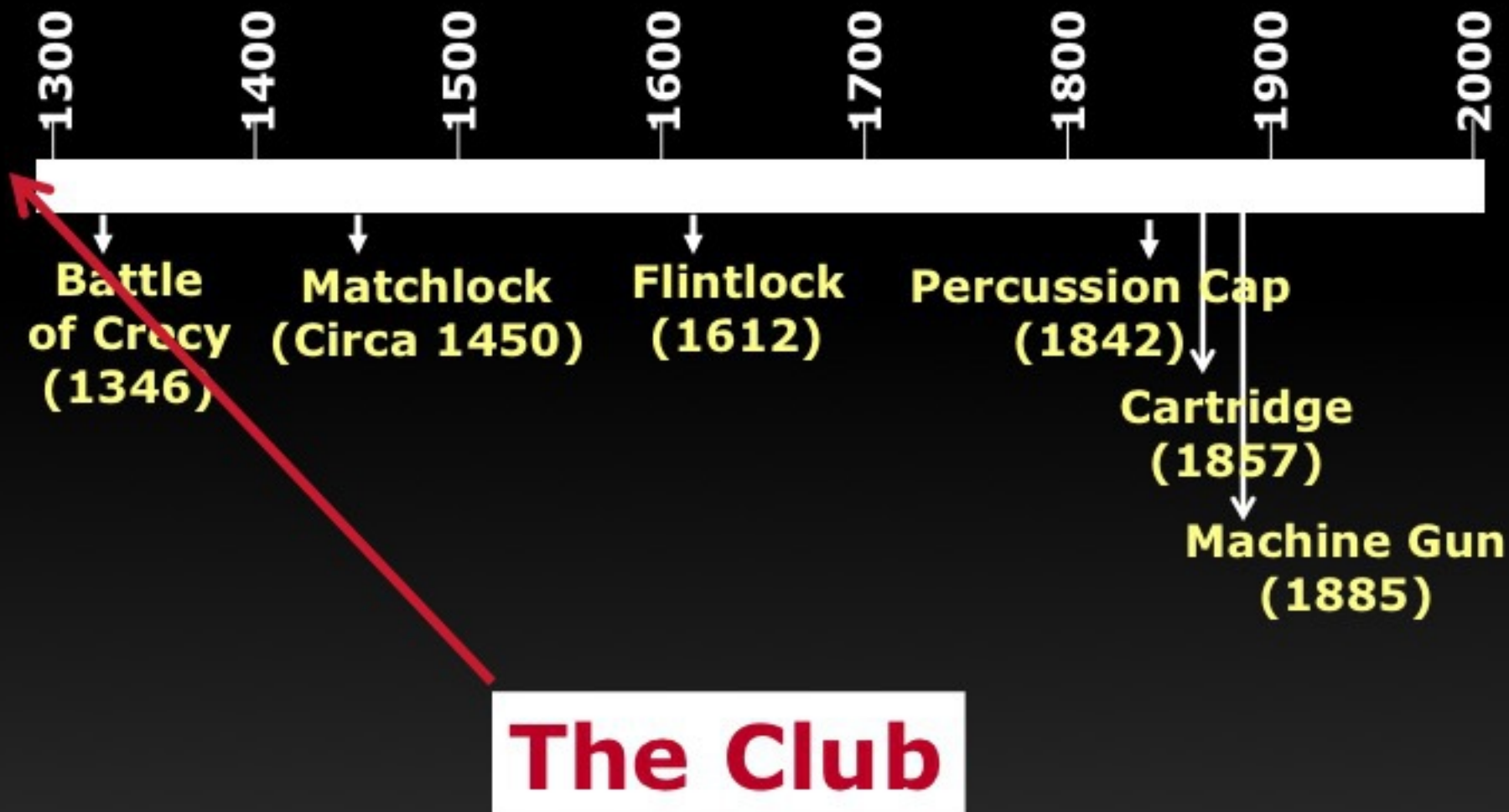


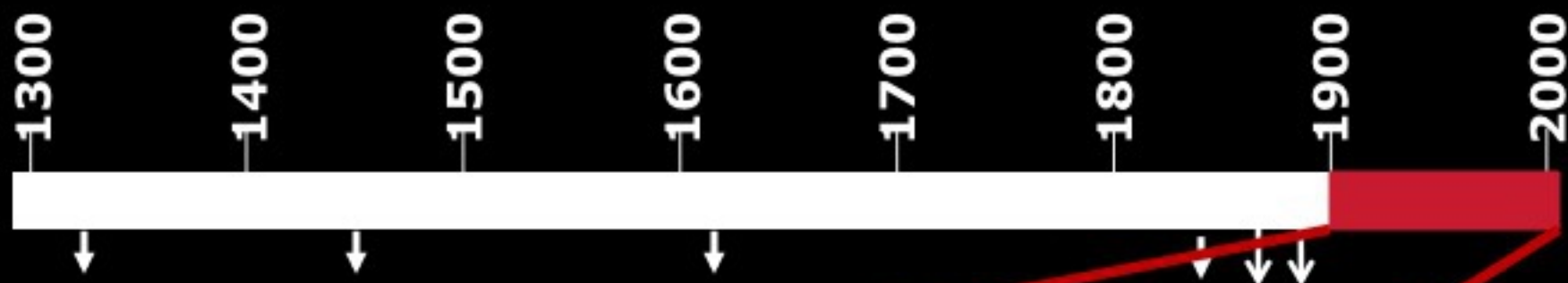
K. Inaba, MD FRCSC FACS
Division of Trauma Surgery & Critical Care
LAC+USC Medical Center

DISCLOSURES

✓ None

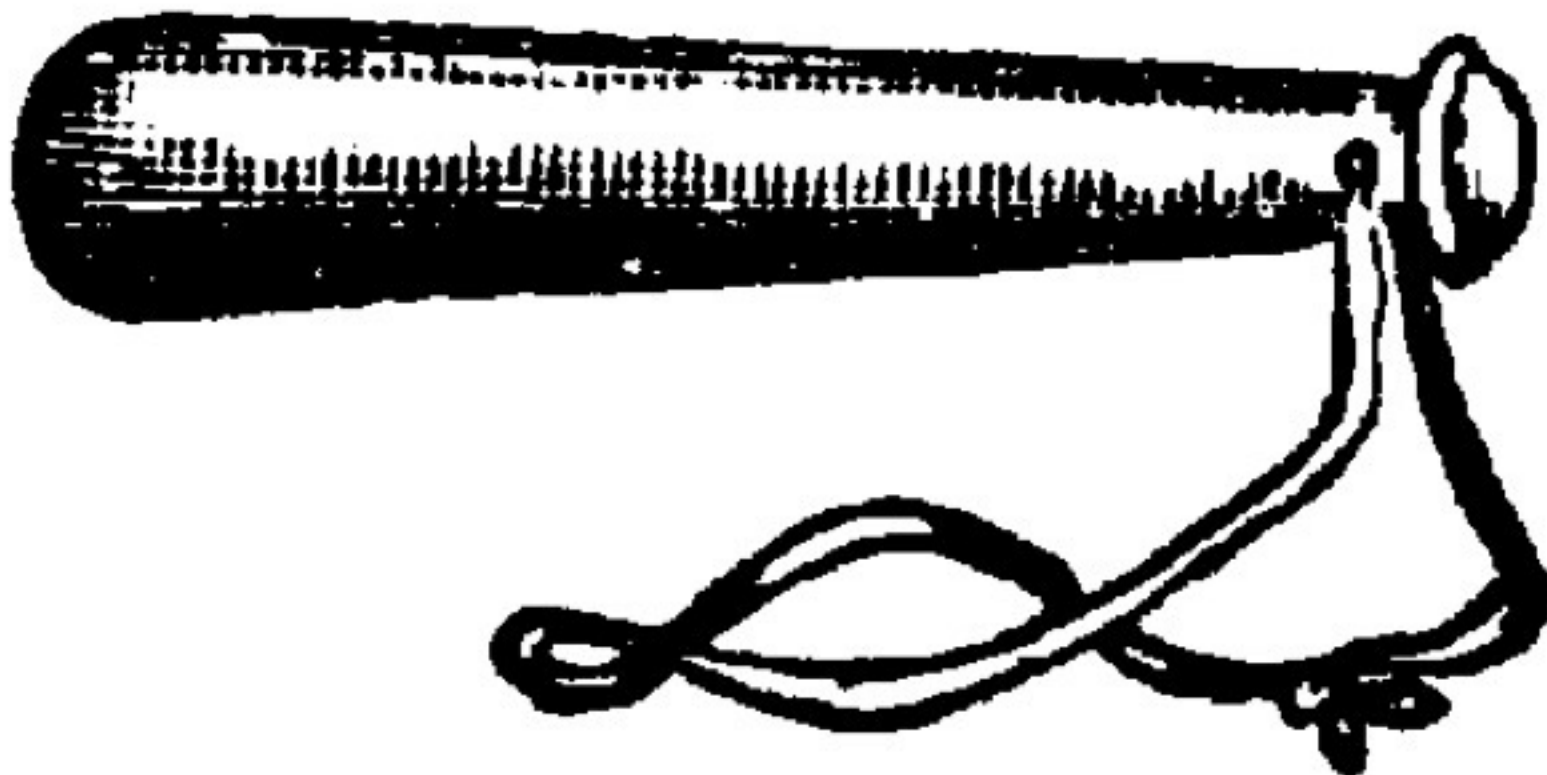






- ✓ "Kneeknockers" circa 1880
- ✓ Tear Gas (CN) 1912
- ✓ Flashbangs 1976
- ✓ Pepper Spray (OC) 1987
- ✓ "Beanbags" 1994
- ✓ M-26 TASER 1991

The Club



Non-Lethal Weapon Types

- ✓ Chemical Agents
- ✓ Impact Munitions
- ✓ Vivi-Systems
- ✓ Directed Energy
- ✓ Mechanical
- ✓ Electrical



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Impact Munitions

- ✓ Most commonly
 - 'Pepperball'
 - 'Beanbag'

Impact Munitions

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Pepper-ball

- ✓ Multiple impacts
- ✓ Distance dependent
- ✓ Treat as for any blunt force trauma
- ✓ Rare to see significant underlying damage, especially clothed
- ✓ Eye, face, hands...

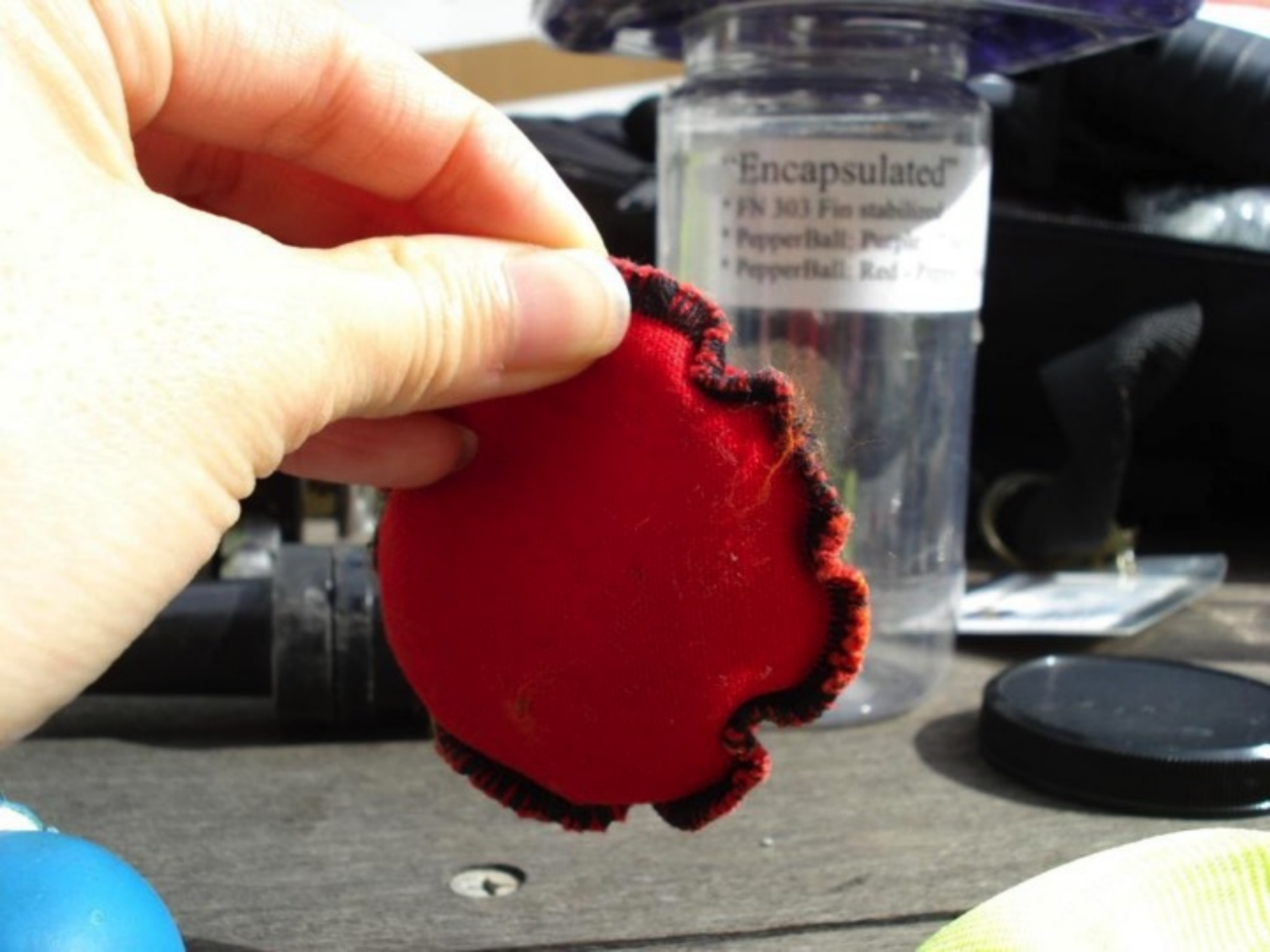
Impact Munitions

- ✓ Most commonly
 - 'Pepperball'
 - 'Beanbag'







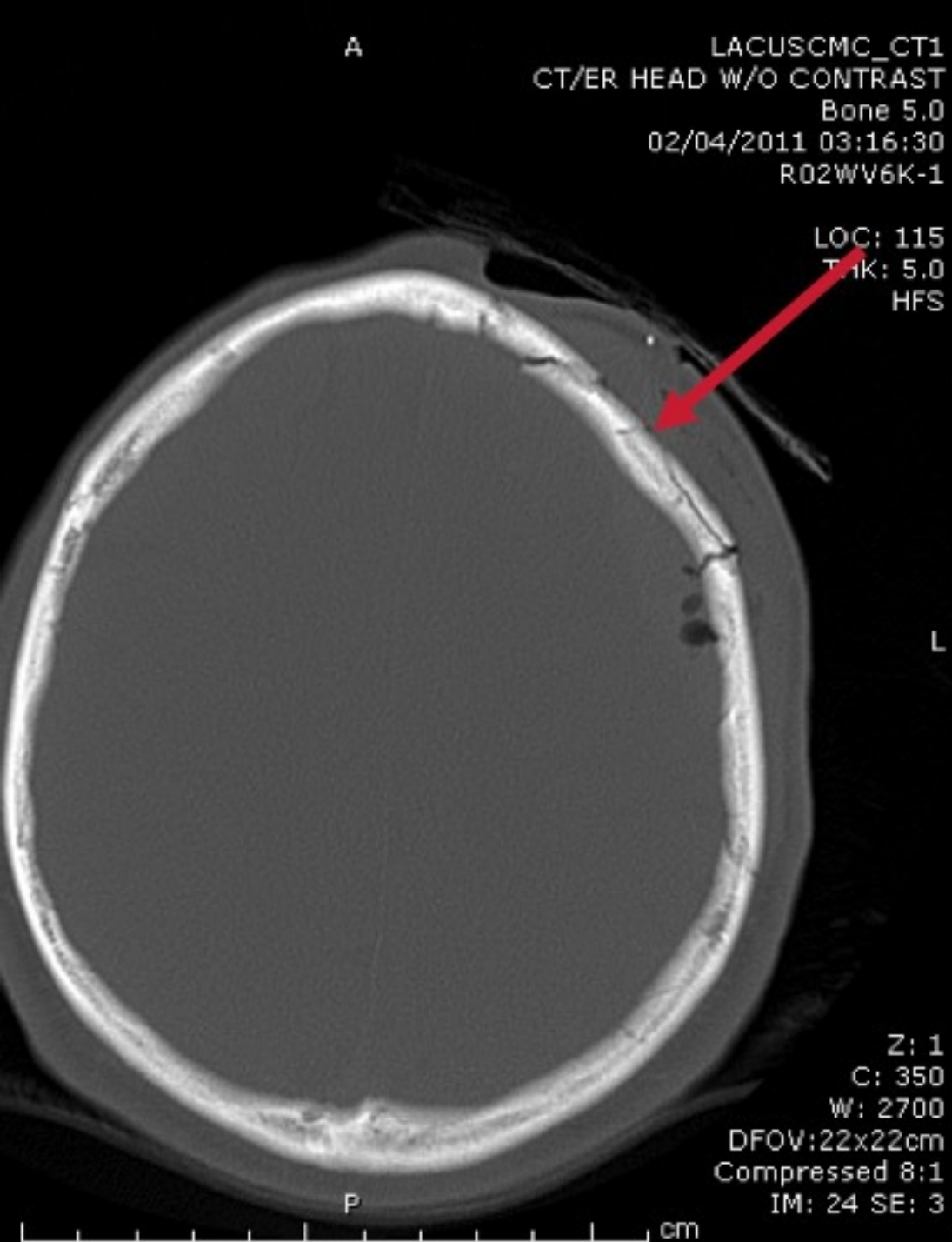


Encapsulated

- FN 303 Fin stabilizer
- PepperBall: Purple
- PepperBall: Red - Purple

Beanbag

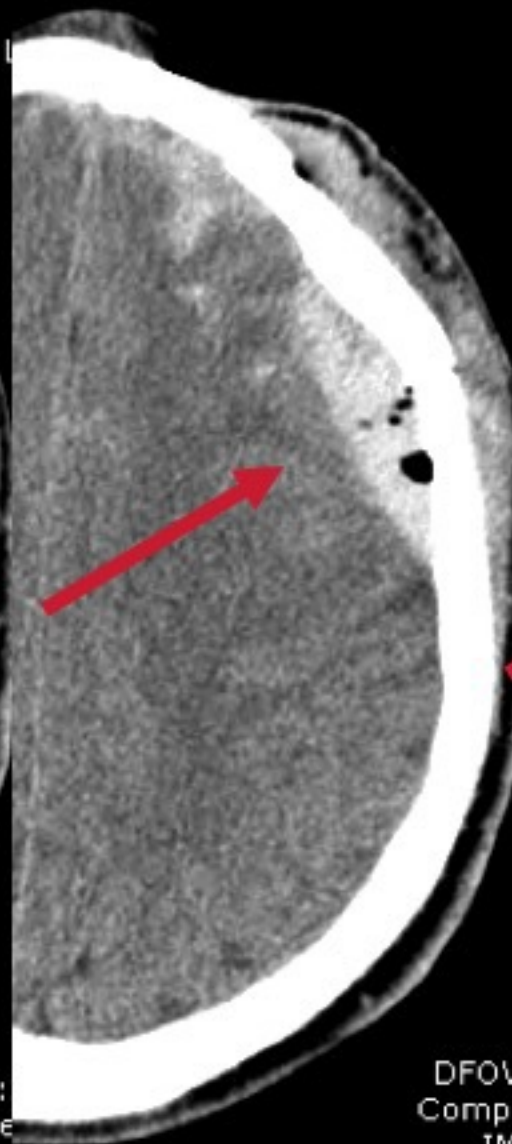
- ✓ Usually single impact
- ✓ Distance dependent
- ✓ Much more significant energy transfer, even through clothing
- ✓ Warrants examination, imaging and observation



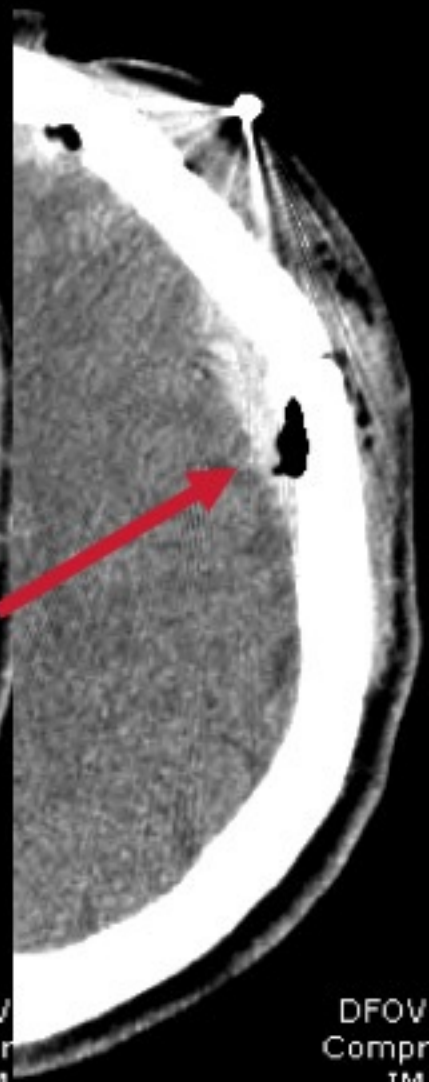
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Beanbag

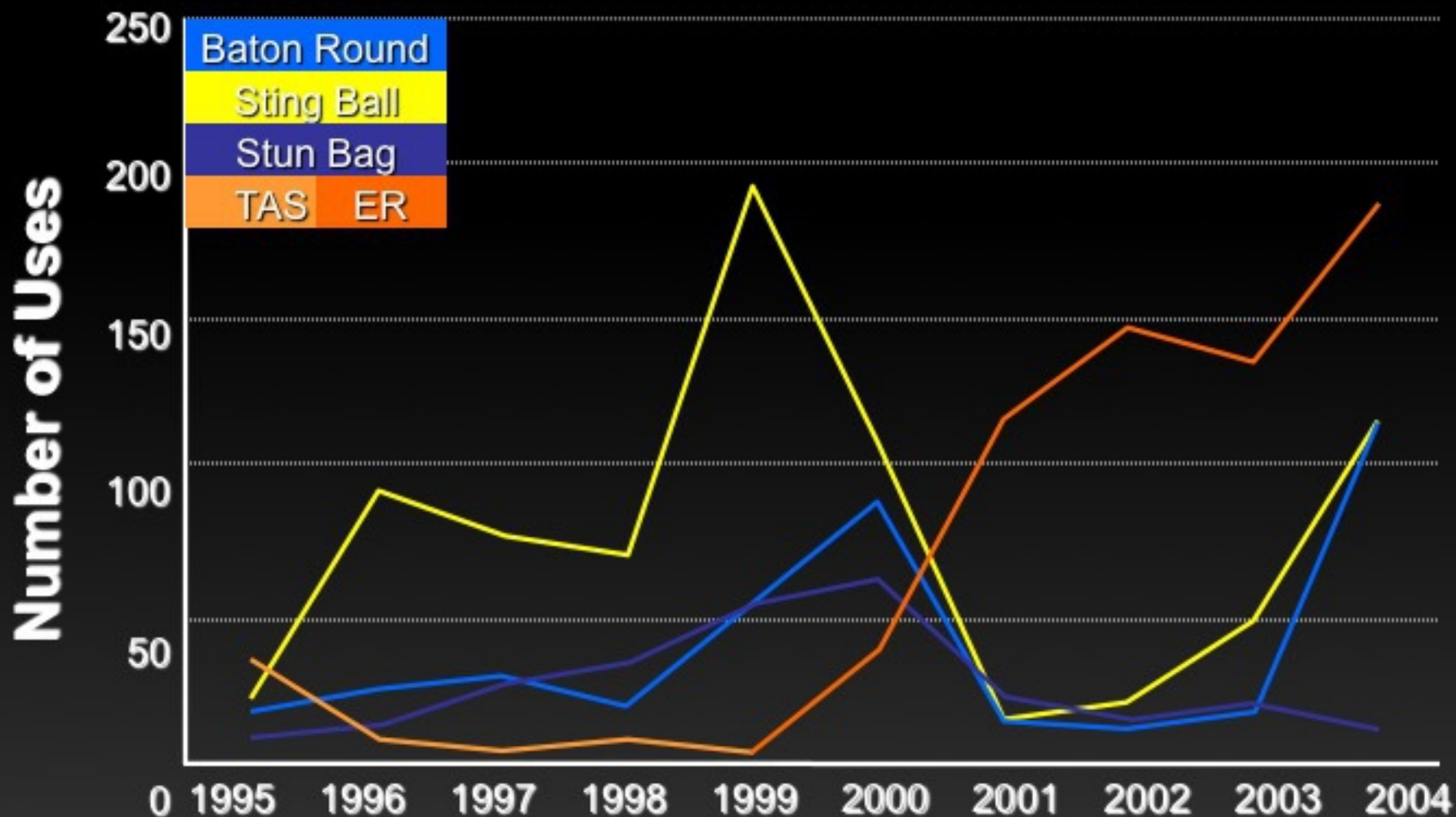
- ✓ Significant energy transfer, even through clothing
- ✓ Warrants examination \pm imaging and observation

Non-Lethal Weapon Types

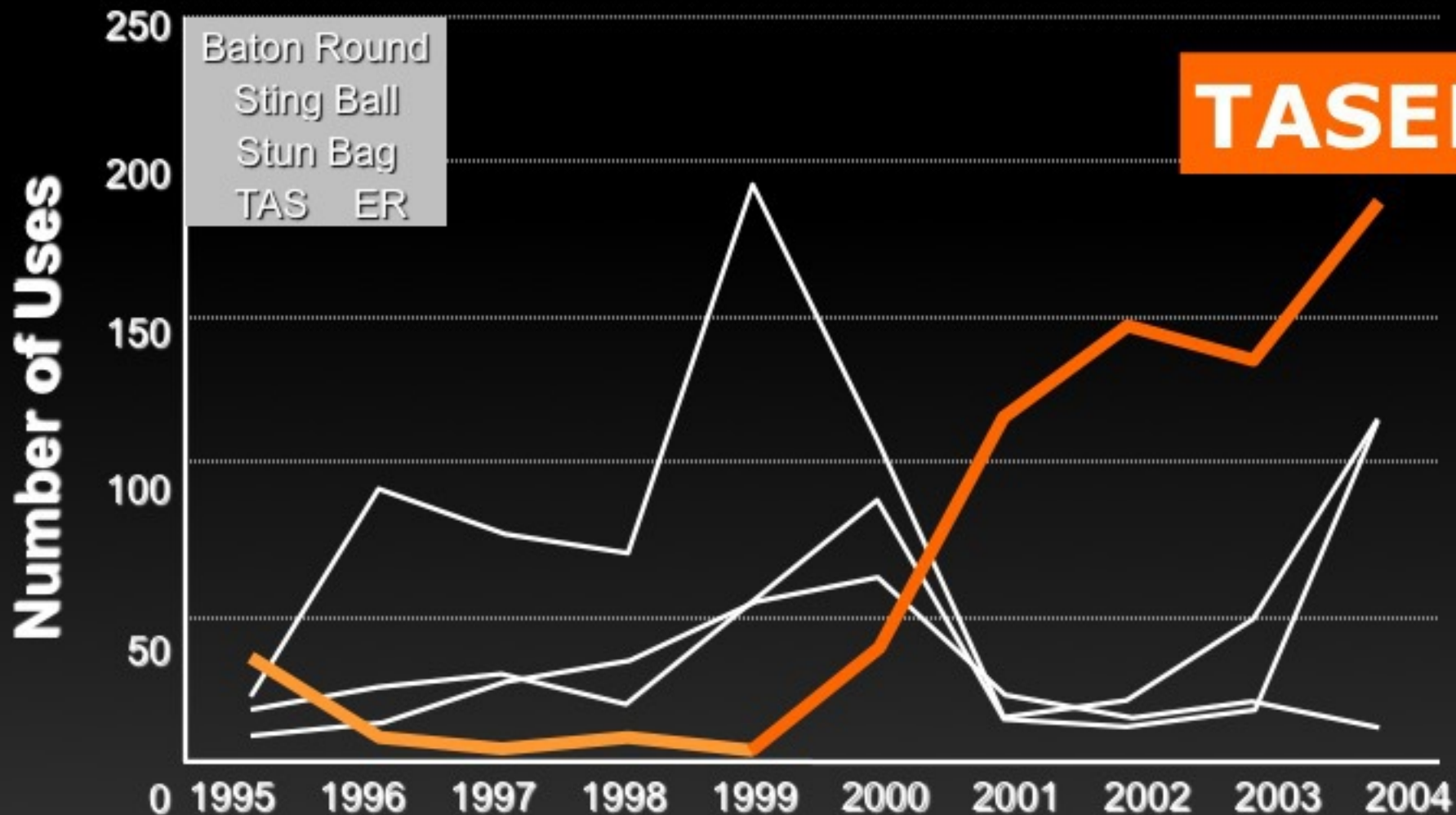
- ✓ Chemical Agents
- ✓ Impact Munitions
- ✓ Vivi-Systems
- ✓ Directed Energy
- ✓ Mechanical
- ✓ Electrical



LASD Non-lethal Use



LASD Non-lethal Use



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TASER X26C SALE!

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Taser C2 Black Pearl



Taser C2 Metallic Pink



Taser C2 Electric Blue



Taser C2 Titanium Silver



Taser C2 Red Hot



Taser C2 Leopard Print



Taser C2 Hunter Green



Taser C2 Desert Sand

Current Distribution

- ✓ >16,200 law enforcement agencies, 44 countries
- ✓ >543,000 devices
- ✓ 2010, 86.9M USD revenue, 79%US
- ✓ Civilian purchase, all but 7 states
- ✓ >136,000 devices
- ✓ >1.3 million documented discharges

New Zealand police to routinely carry Tasers

TOM HUNT

Last updated 15:44, July 31 2015



dominion po

- Winston to boost NZ
- Truck tips on Desert
- Snapper ripped off o
- No, it's not a UFO
- Tokakece big weapo
- Rivals in grand final
- Duncan Garner: Kee
- Bentley picks positiv
- Crossword solutions
- Stopbank residents i
- Myers has numbers
- A good day's a dull d
- Big Sugar blames pa
- Upper Cut ready to l
- Prison inquiry into an



Mike Bush
Commissioner of Police

ASHTEN MACDONALD/Stuff.co.nz

All frontline New Zealand police are to be armed with taser.

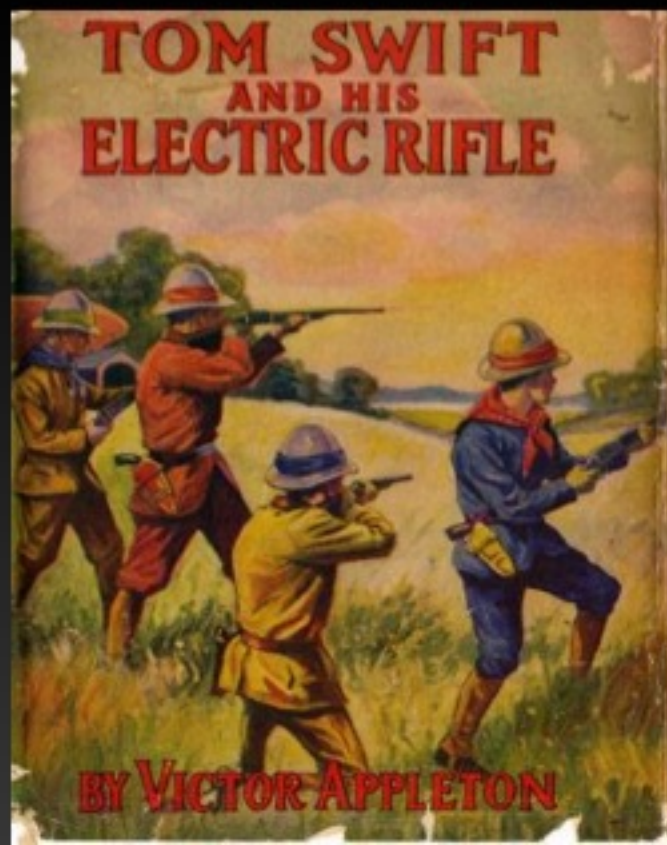
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Taser History

- ✓ Jack Cover-1974 Thomas A. Swift Electric Rifle-TASER

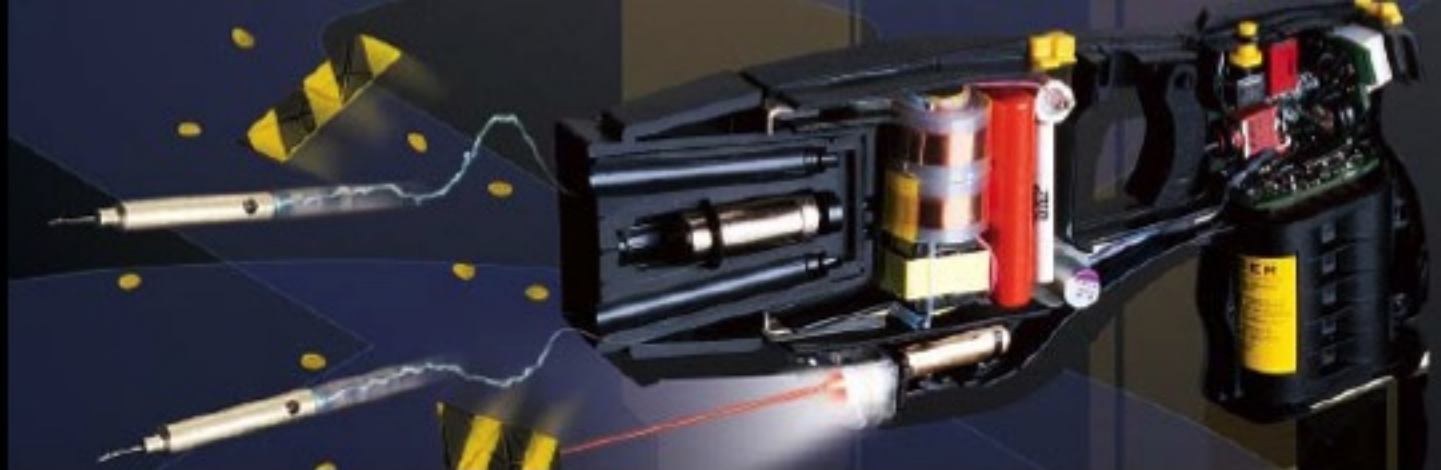


1911

X-26



X-26



- ✓ Single shot cartridge
- ✓ Nitrogen propelled
- ✓ 2 darts at 170 fps, 35 feet
- ✓ Attached by insulated wires
- ✓ Darts in skin or clothing up to 2 inches

X-26

- ✓ Battery - pulsed electricity
- ✓ 1200 V, 2.1 mA, 0.07 J/pulse
- ✓ 5 seconds per trigger pull
- ✓ Can stop, repeat or hold
- ✓ Can be used as a stun gun







For the Trauma Provider

- ✓ *Non-Lethal*
- ✓ *Less-Lethal*
- ✓ *Less-Than-Lethal...*

- ✓ Lethal weapons are defined by their **capability**
- ✓ Non-lethal weapons are defined by their **intent**

- ✓ Lethal weapons are defined by their **capability**
- ✓ Non-lethal weapons are defined by their **intent and can be lethal**

For the Trauma Provider

1. Local
2. Systemic
3. Secondary

For the Trauma Provider

1. Local
2. Systemic
3. Secondary



Conductive Electrical Devices: A Prospective, Population-Based Study of the Medical Safety of Law Enforcement Use

Alexander L. Eastman, MD, Jeffery C. Metzger, MD, Paul E. Pepe, MD, MPH, Fernando L. Benitez, MD, Sgt. James Decker, Kathy J. Rinnert, MD, MPH, Craig A. Field, PhD, MPH, and Randall S. Friesse, MD

2008

- ✓ **Prospective, 2004-06, Dallas PD**
- ✓ **426 consecutive discharges**
- ✓ **Mean exposure 8.6 ± 5.9 sec**
- ✓ **Minor bruises, abrasions, lacerations**
- ✓ **None required repair**

Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officers Against Criminal Suspects

2009

William P. Bozeman, MD
William E. Hauda II, MD
Joseph J. Heck, DO
Derrel D. Graham, Jr, MD
Brian P. Martin, MD, MS
James E. Winslow, MD, Mph



- ✓ **Prospective, 2005-08, 6 US PDs**
- ✓ **1,201 pts, 94% male, 13-80yo, 50% +EtOH/Tox**
- ✓ **99.75% mild or no injury**
- ✓ **2 - head injury from fall, d/c 48-72h**
- ✓ **1 - ck↑, d/c, no dialysis required**

Secondary

- ✓ Examination by EMS, RN or MD as per regional protocol
- ✓ Full scene history
- ✓ Physical Examination
- ✓ Treat as for blunt force trauma

Secondary

- ✓ Examination by EMS, RN or MD as per regional protocol
- ✓ Full scene history
- ✓ Physical Examination
- ✓ Treat as for blunt force trauma

For the Trauma Provider

1. Local
2. Systemic
3. Secondary



- ✓ Most fall out
- ✓ Follow regional protocol
 - leave wires intact
 - cut wires
 - pull at scene
- ✓ No further risk of harm to MD

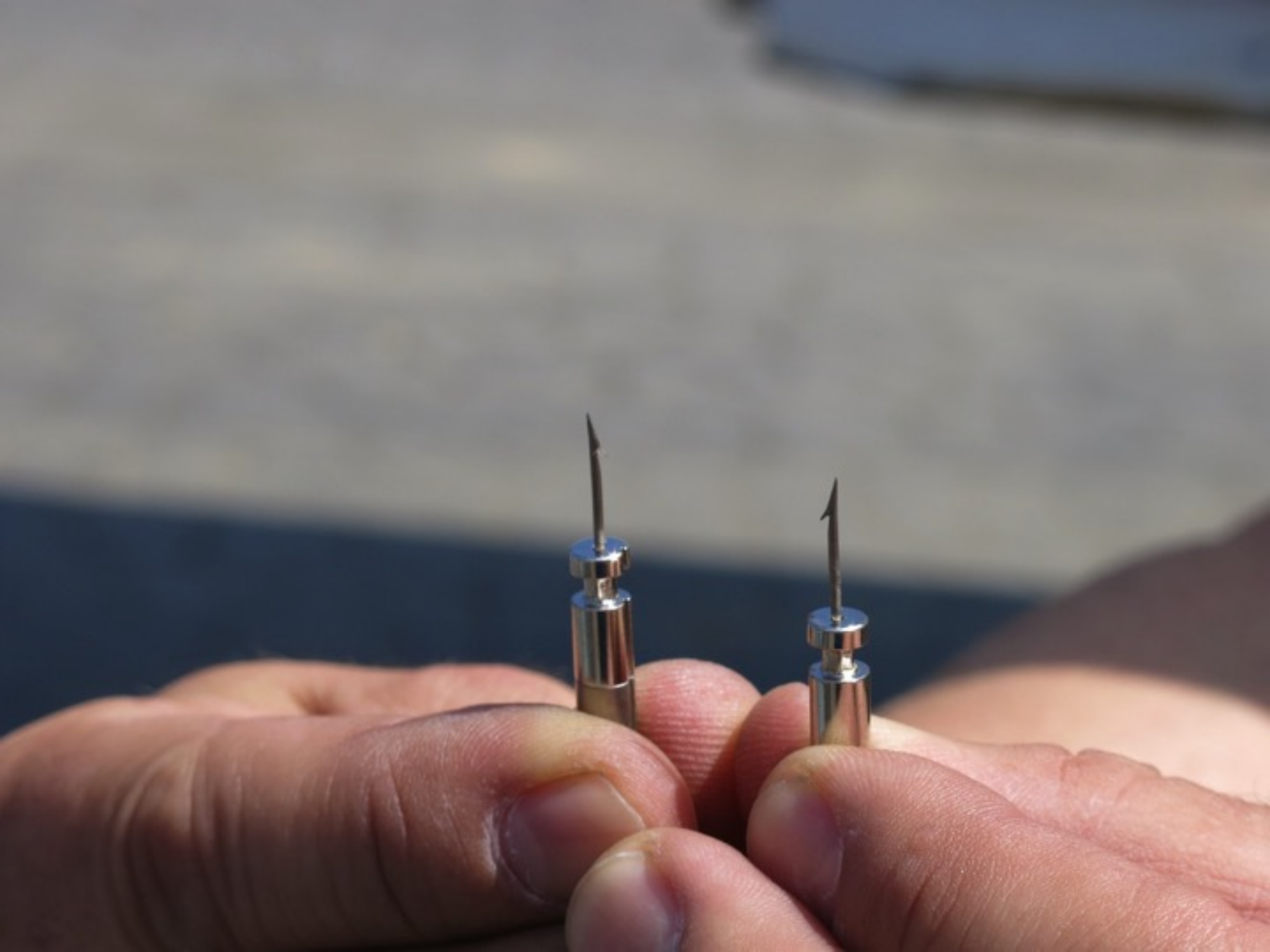
a



b



- ✓ Pull
- ✓ Retain and handle as evidence
- ✓ Check for other discharge sites
- ✓ Document well
- ✓ Rarely fracture, PTx, ocular injury



For the Trauma Provider

1. Local
2. Systemic
3. Secondary

For the Trauma Provider

1. Local
2. Systemic
3. Secondary

Involuntary Muscle Contraction

For the Trauma Provider

1. Local
2. Systemic
3. Secondary

PAIN!

LOS ANGELES COUNTY SHERIFF'S DEPARTMENT

TACTICS & SURVIVAL



TRAINING CENTER

SHERIFF *Lee Baca*

1000 1000 1000 1000



Taser X26 Discharges in Swine: Ventricular Rhythm Capture is Dependent on Discharge Vector

Daniel J. Valentino, MD, Robert J. Walter, PhD, Andrew J. Dennis, DO, Bosko Margeta, MD, Frederic Starr, MD, Kimberly K. Nagy, MD, Faran Bokhari, MD, Dorion E. Wiley, MD, Kimberly T. Joseph, MD, and Roxanne R. Roberts, MD

2008

- ✓ Anesthetized swine, X-26, 10 sec
- ✓ Trans-cardiac Vector
- ✓ Real time TTE
- ✓ 85.2% ventricular capture with VT

Cardiac Electrophysiological Consequences of Neuromuscular Incapacitating Device Discharges

Kumaraswamy Nanthakumar, MD, Ian M. Billingsley, MD, Stephane Masse, MASC, Paul Dorian, MD, Douglas Cameron, MD, Vijay S. Chauhan, MD, Eugene Downar, MD, Elias Sevaptisidis, DEC

JACC



2006

- ✓ **Swine, 5 and 15 sec discharges**
- ✓ **EPI infusion simulating hyperadrenergic state**
- ✓ **Similar capture with VT/VF**



Echocardiographic Evaluation of a TASER-X26 Application in the Ideal Human Cardiac Axis

Jeffrey D. Ho, MD, Donald M. Dawes, MD, Robert F. Reardon, MD, Anne L. Lapine, MD, Benjamin J. Dolan, BS, Erik J. Lundin, BS, James R. Miner, MD

2008

- ✓ **Healthy *human* volunteers, n=34**
- ✓ **Right upper sternal border to apex vector**
- ✓ **10 second burst, X-26**
- ✓ **No ventricular capture under TTE**



Cardiovascular and Physiologic Effects of Conducted Electrical Weapon Discharge in Resting Adults

Jeffrey D. Ho, MD, James R. Miner, MD, Dhanunjaya R. Lakireddy, MD, Laura L. Bullman, MD, William G. Heegaard, MD, MPH

2006

- ✓ **Healthy *human* volunteers, n=66**
- ✓ **X-26, standard 5 sec discharge**
- ✓ **No change in 24hr **CK, lytes, RF, TPI****
- ✓ **No changes in delayed ECG**

The American Journal of Emergency Medicine

Abstracts: The 1st Practice With Night Questions: Ambulance-Pilot

Emergency: Airway Management: A Review for Airborne: Ambulance

Practice: Understanding of Medical Communication

Medical: Practice: Assessment of the Patient

Emergency: Airway: Management

Continuing: Education: Supplement: Management

Medical: Supplement: Airway: Management

Emergency: Management of the Patient: Airway: Management

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Donald M. Dawes MD^a, Jeffrey D. Ho MD^{b,*}, Robert F. Reardon MD^b, James R. Miner^b

THE AMERICAN JOURNAL OF
EMERGENCY MEDICINE

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Prolonged TASER use on exhausted humans does not worsen markers of acidosis^{☆☆☆☆}

Jeffrey D. Ho MD^{a,*}, Donald M. Dawes MD^b, Laura L. Bultman MD^e,
Ronald M. Moscatti MD^c, Timothy A. Janchar MD^d, James R. Miner MD^a

THE
American Journal of
Emergency Medicine

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Physiologic effects of prolonged conducted electrical weapon discharge in ethanol-intoxicated adults[☆]

Ronald Moscatti MD^{a,*}, Jeffrey D. Ho MD^b, Donald M. Dawes MD^c, James R. Miner MD^b

Cardiac Capture

- ✓ Muscle response depends on waveform, strength and duration of electrical stimulation
- ✓ Duration of stimulation for human cardiac muscle 10-100 fold skeletal motor or sensory nerve
- ✓ Short duration discharges sufficient for skeletal, but not cardiac muscle



NIJ

Special

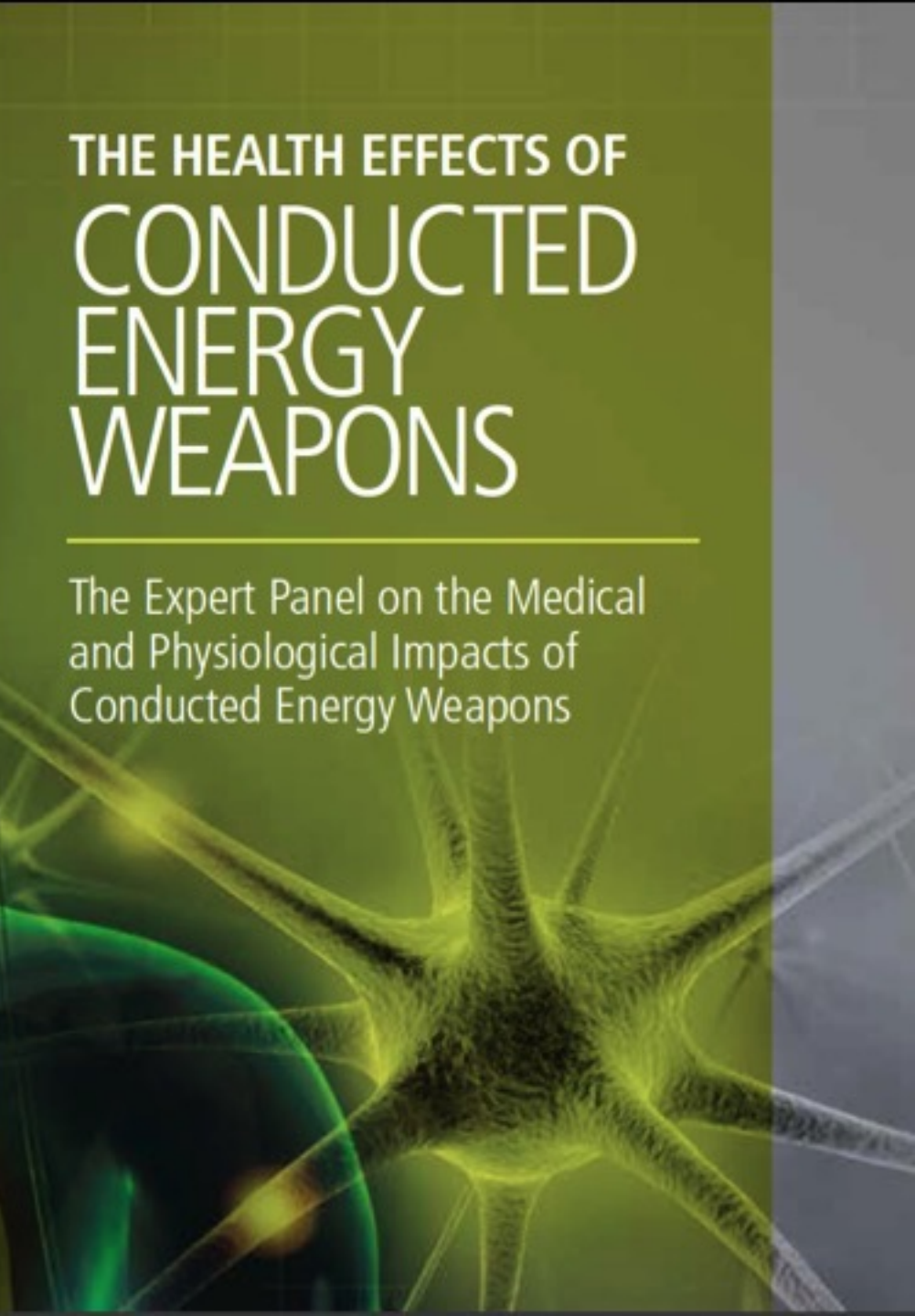
REPORT

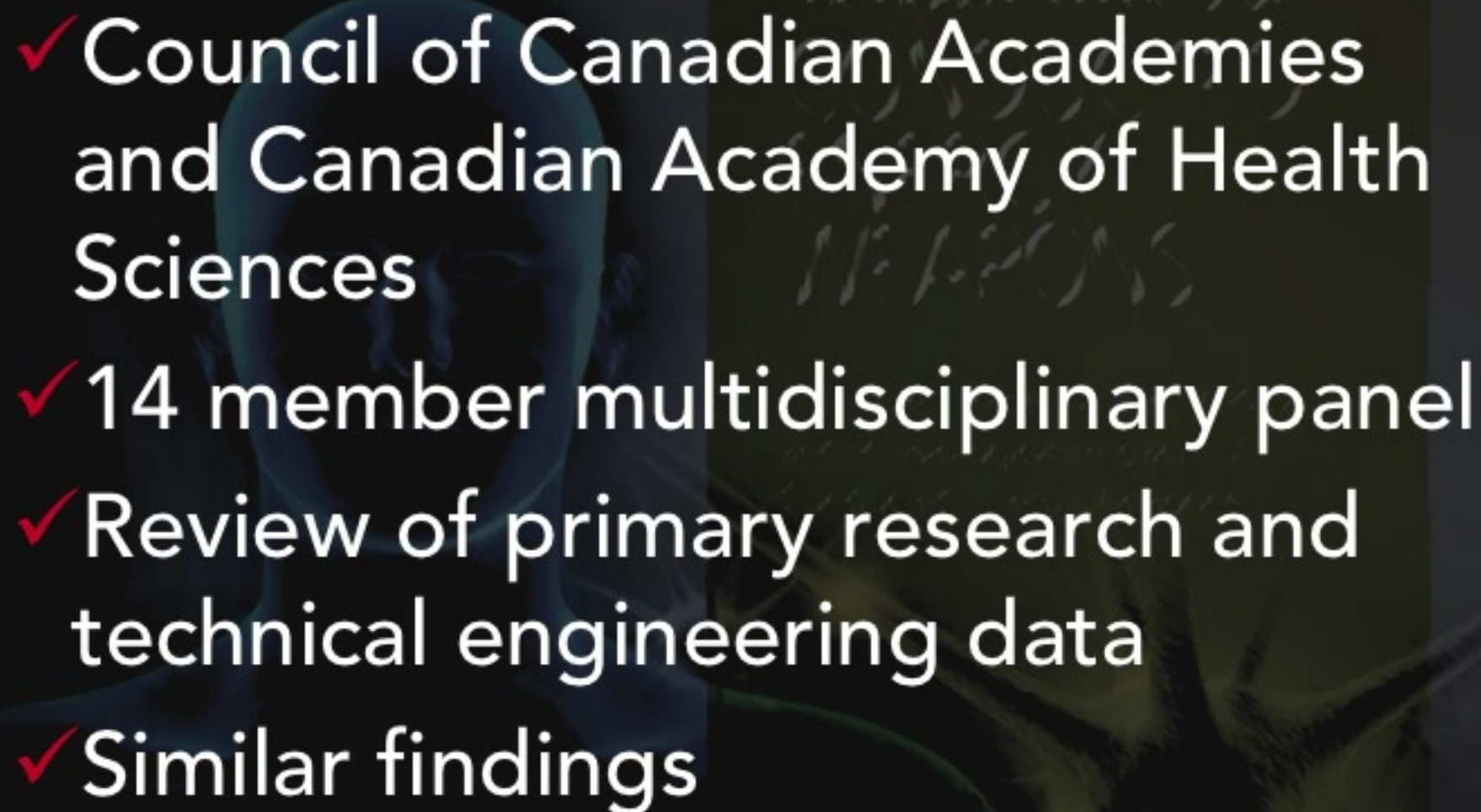
- ✓ Summary conclusion of US DOJ
- ✓ Low risk of serious injury
- ✓ No evidence of cardiac dysrhythmias
- ✓ Even in patients with *Psychois* or *Agitation* or *Excited Delerium*

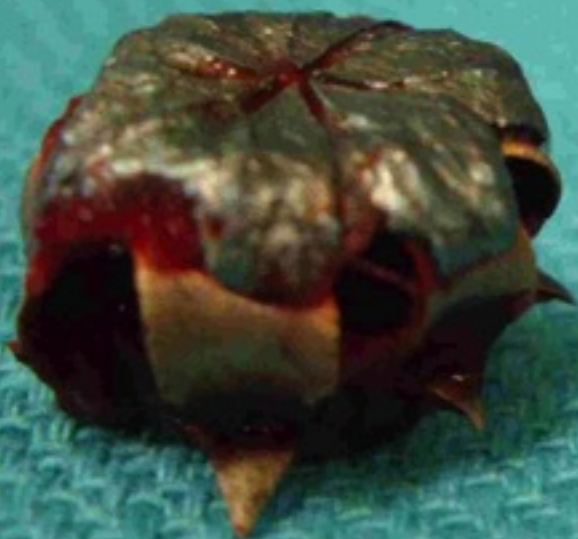
2013

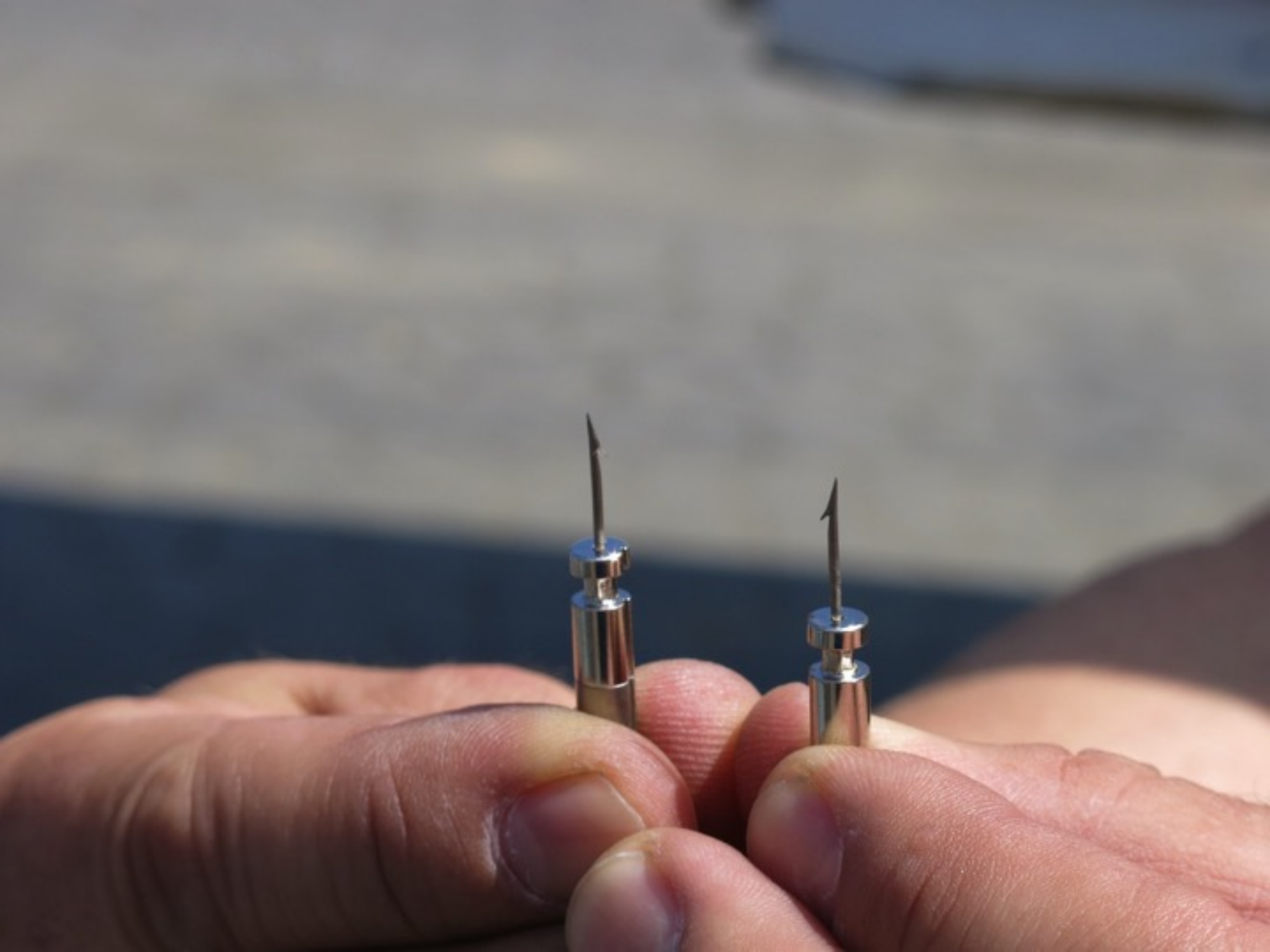
THE HEALTH EFFECTS OF CONDUCTED ENERGY WEAPONS

The Expert Panel on the Medical
and Physiological Impacts of
Conducted Energy Weapons



- 
- ✓ Council of Canadian Academies and Canadian Academy of Health Sciences
 - ✓ 14 member multidisciplinary panel
 - ✓ Review of primary research and technical engineering data
 - ✓ Similar findings





Summary

- ✓ Document well
- ✓ Local
 - Pull darts
- ✓ Systemic and Secondary
 - Likelihood of injury very low
 - Work-up dictated by scene history and physical exam

Summary

✓ Individualize for select subgroups

- Drug intoxication
- Underlying cardiac disease
- Children
- Pregnancy

✓ Admit

- ECG, ABG/Lac, CK, TPI