2012 Semi Annual Training Conference – May 2012

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Brief Outline of Partial Selected ECD Research and Information[1]

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[1] This document is intended to provide a basic overview and selected summary of injury related information and research concerning TASER International, Inc. ("TASER") brand electronic control devices (("ECD") or Conducted Electrical Weapons ("CEW")). For a more complete current bibliography of ECD related research please go to www.TASER.com or www.ecdlaw.info. Also included for points of reference are selected data regarding general health concerns and mortality, morbidity, cause of deaths, and injuries among the United States population.

Selected Basic Numbers

Basic Selected TASER®[2] Electronic Control Device ("ECD") Statistics:

- As of March 31, 2012:
    - TASER has sold approximately 607,000 ECDs worldwide (does not include civilian TASER ECDs)
    - TASER has sold ECDs to 16,880 law enforcement and military agencies
        - 7,237 of these agencies deploy ECDs to all of their patrol officers
    - TASER has sold ECDs in 107 countries (195 recognized countries in world)
    - Approximately 247,000 civilian TASER ECDs have been sold to the general public since 1994
- Estimated ECD exposure numbers:
    - ECD Field Use/Suspect Applications: 1,618,930 ± 2% (as of May 16, 2012)
    - ECD Training/Voluntary Applications: 1,351,891 ± 7% (as of Dec. 31, 2011)

    Total TASER ECD Applications: 2.97 million +

Police-Citizen Contacts, Use of Force, and Excessive Force (2005): [3]

- "An estimated 19% [43.5 million] of U.S. residents age 16 or older had a face-to-face contact with a police officer in 2005."
    - "Of the 43.5 million persons who had contact with police in 2005, an estimated 1.6% had force used or threatened against them during their most recent contact, a rate relatively unchanged from 2002 (1.5%)."
        - "Of persons who had force used against them in 2005, an estimated 83% felt the force was excessive."

[2] X26 is a trademark of TASER International, Inc., and TASER® is a registered trademark of TASER International, Inc., registered in the U.S. All rights reserved.

[3] Matthew R. Durose, Erica L. Smith, and Patrick A. Langan, Ph.D., BJS Statisticians, Contacts Between Police and the Public, 2005, Special Report, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, April 2007, NCJ 215243.

Selected (US) Societal Problems Influencing Force Response:

- **Current Illicit Drug Abusers** ("CIDA") increasing annually (current drug use means use of an illicit drug during the month prior to the survey interview):
    - (2009) 21,800,000 CIDA age 12 and older (8.7% of population)[4]
    - (2004) 19,100,000 CIDA age 12 and older (7.9% of population)[5]
- **Drug caused hospital emergency department ("ED") visits:**
    - (2007) "In 2007, hospitals in the United States delivered over 116 million ED visits, and DAWN estimates that about 1.9 million (1,883,272 [CI: 1,561,490 to 2,205,054]) were associated with drug misuse or abuse."[6]
- **People in serious psychological distress ("SPD") annually in the U.S.:**
    - (2007) 23,400,000 SPD (10.9% of adults)[7]
    - (2004) 21,400,000 SPD (9.9% of adults)[8]
- **Drunk or Drugged Driving (2006-2009):**[9]
    - "Combined 2006 to 2009 data indicate that 13.2 percent of persons aged 16 or older (an estimated 30.6 million persons) drove under the influence of alcohol in the past year and 4.3 percent (an estimated 10.1 million persons) drove under the influence of illicit drugs in the same time period."
        - Highest rate was in Wisconsin with 23.7% of population
    - "[I]n 2008, 32 percent of all traffic related deaths—nearly 12,000 deaths—were the result of alcohol-related crashes."

[4] Substance Abuse and Mental Health Services Administration. (2010). Results from the 2009 National Survey on Drug Use and Health: Volume I. Summary of National Findings (Office of Applied Studies, NSDUH Series H-38A, HHS Publication No. SMA 10-4586Findings). Rockville, MD.

[5] Substance Abuse and Mental Health Services Administration. (2005). Results from the 2004 National Survey on Drug Use and Health: National Findings (Office of Applied Studies, NSDUH Series H-28, DHHS Publication No. SMA 05-4062). Rockville, MD.

[6] Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Drug Abuse Warning Network, 2007: National Estimates of Drug-Related Emergency Department Visits. Rockville, MD, 2010.

[7] Serious Psychological Distress and Receipt of Mental Health Services, The NDSUH (National Survey on Drug Use and Health) Report, National Survey on Drug Use and Health, December 22, 2008.

[8] Substance Abuse and Mental Health Services Administration. (2005). Results from the 2004 National Survey on Drug Use and Health: National Findings (Office of Applied Studies, NSDUH Series H-28, DHHS Publication No. SMA 05-4062). Rockville, MD.

[9] State Estimates of Drunk and Drugged Driving, The NSDUH (National Survey on Drug Use and Health) Report, December 9, 2010, NSDUH_205.

- **DSM-IV Substance Dependence:**

    - In 2009, an estimated 22.5 million persons (8.9 % of the population aged 12 or older) were classified with substance dependence or abuse in the past year based on criteria specified in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV).[10]

[10] Substance Abuse and Mental Health Services Administration. (2010). Results from the 2009 National Survey on Drug Use and Health: Volume I. Summary of National Findings (Office of Applied Studies, NSDUH (National Survey on Drug Use and Health) Series H-38A, HHS Publication No. SMA 10-4586Findings). Rockville, MD.

Basic Selected Mortality Summary Numbers:

["LEO" refers to "Law Enforcement Officer;" "SCD" refers to "sudden cardiac death"; "NCAA" refers to the "National Collegiate Athletic Association;" "CSP" refers to "competitive sports participants;" and "SUD" refers to "sudden unexplained death"]:

Abbreviated summary of selected approximate mortality numbers:

- 1.6 deaths per 100 hospital emergency room admissions (weekdays)
- 1.8 deaths per 100 hospital emergency room admissions (weekends)
- 1 death per 126 people in the U.S. population (annual 2009)
- 1 death per 323 LEOs' uses of weapons
- 1 death per 600 LEOs' uses of pepper spray
- 1 death per 700 persons jailed
- 1 death per 5,521 LEOs (annually)
- 1 death per 15,385 law enforcement arrests

Sudden Cardiac Death (SCD):[11]

- 1 SCD death per 14,925 males
- 1 SCD SUD per 83,333 males (< 35 years of age)

Sudden Cardiac Death (SCD) Minnesota (MN) High School CSP:

- 1 SCD death per 72,500 MN high school CSP over 3 years of high school
- 1 SCD death per 217,400 MN high school CSP per year

Sudden Cardiac Death (SCD) Children:

- 1 SCD death per 12,438 children age 1-18 (in patient years)[12]
- 1 SCD death per 15,698 children age 12-18 (in patient years)[13]

[11] Eckart RE, Shry EA, Burke AP, et al. Sudden death in young adults: an autopsy-based series of a population undergoing active surveillance. J Am Coll Cardiol. Sep 13 2011;58(12):1254-1261.

[12] Atkins DL, Everson-Stewart S, Sears GK, Daya M, Osmond MH, Warden CR, Berg RA. Epidemiology and outcomes from out-of-hospital cardiac arrest in children: the Resuscitation Outcomes Consortium Epistry-Cardiac Arrest. *Circulation*. 2009;119:1484 – 1491.

Sudden Cardiac Death (SCD) NCAA Participants:

- 1 SCD death per 1,282 NCAA basketball black male athletes per year
- 1 SCD death per 3,126 NCAA basketball Division I male athletes per year
- 1 SCD death per 11,394 NCAA basketball athletes per year
- 1 SCD death per 12,990 NCAA black male athletes per year
- 1 SCD death per 21,293 NCAA swimming participants per year
- 1 SCD death per 23,397 NCAA lacrosse participants per year
- 1 SCD death per 38,497 NCAA football participants per year
- 1 SCD death per 41,695 NCAA cross-country participants per year
- 1 SCD death per 43,770 NCAA participants per year

[13] Atkins DL, Everson-Stewart S, Sears GK, Daya M, Osmond MH, Warden CR, Berg RA. Epidemiology and outcomes from out-of-hospital cardiac arrest in children: the Resuscitation Outcomes Consortium Epistry-Cardiac Arrest. Circulation. 2009;119:1484 – 1491.

Law Enforcement Officer (LEO) related deaths per category summary table:

Category of deaths (mortality)	Deaths per factor	Deaths per 100,000 of specific incident
LEOs use of weapons deaths	1 death per 323 arrests using weapons	
Pepper spray deaths per uses	1 death per 600 uses of pepper spray	
Jail Inmates deaths per year	1 death per 658-709 jail inmates	150 per 100,000 inmates
LEOs deaths per year	1 death per year for every 5,521 LEOs	18 per 100,000 LEOs
Arrests deaths per arrests	1 death per 15,384.6 arrests	6.5 per 100,000 arrests

Probability, see, *Hirsch v. CSX Transp., Inc.*, 656 F.3d 359 (6th Cir. (Ohio) 2011):

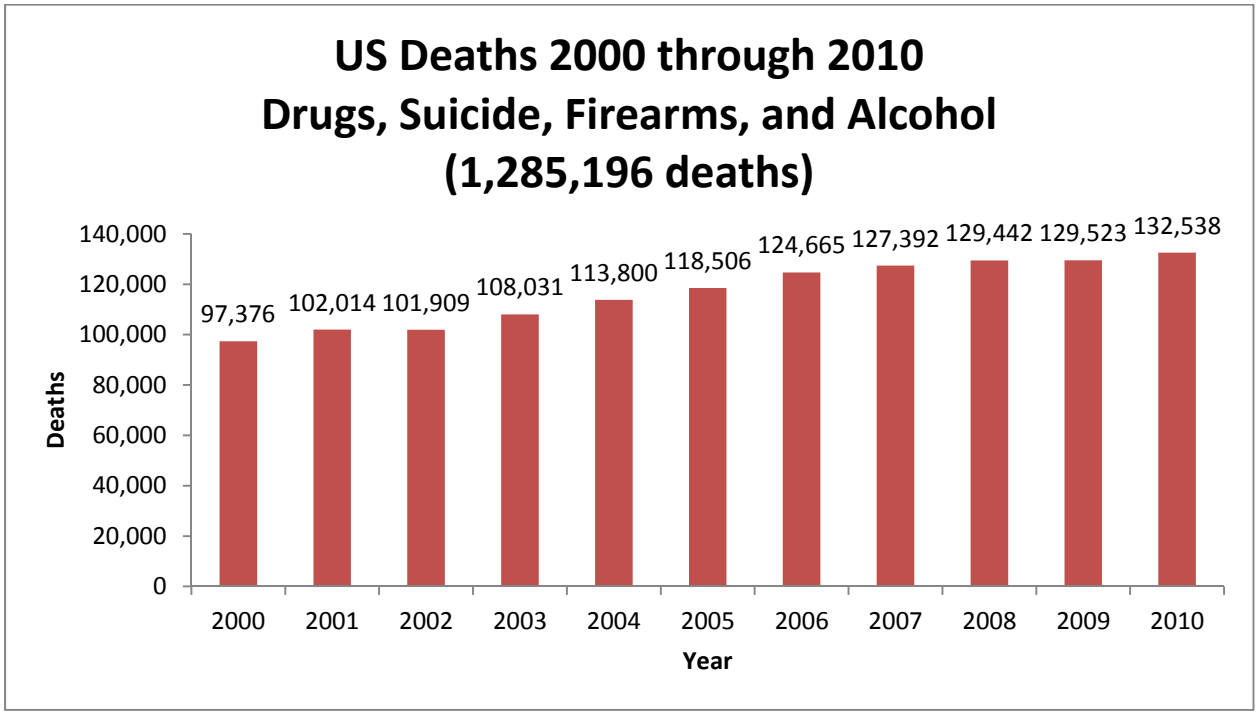
- As referenced in *Hirsch*, at 364, see: National Safety Council, Injury Facts 37 (2011 ed.),[14] and Harvard Center for Risk Analysis.[15]
- Including, *Hirsch*, 656, at page 364:

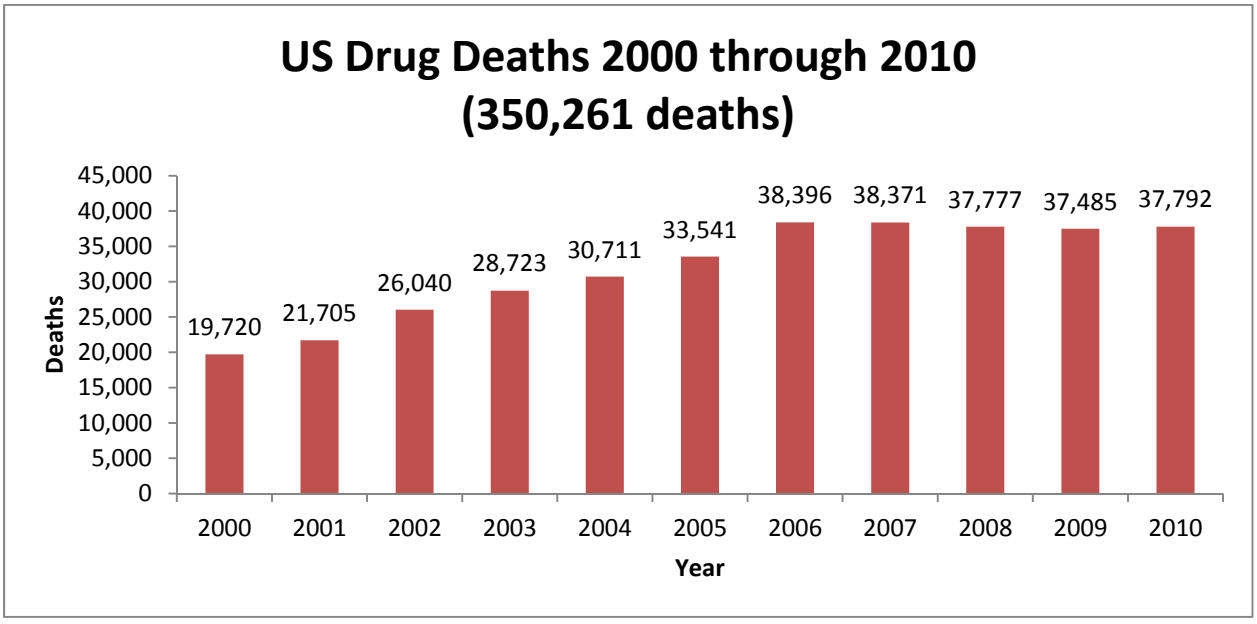
> Beyond the uncertainty surrounding the Plaintiffs' exposure, there is still more reason to question Dr. Kornberg's assessment: a one-in-a-million chance is small. Indeed, it is proverbially small. If something has a one-in-a-million chance of causing cancer in an individual, then it will not cause cancer in 999,999. For some perspective, the National Safety Council estimates a person's lifetime risk of dying in a motor vehicle accident as 1 in 88. The lifetime risk of dying in "air and space transport accidents" is roughly 1 in 7,000. The risk of being killed by lightning is roughly 1 in 84,000, while the risk of being killed in a "fireworks discharge" stands at around 1 in 386,000. National Safety Council, Injury Facts 37 (2011 ed.), available at http://www.nsc.org/NSC%20Picture%20Library/News/web_graphics/Injury_Facts_37.pdf. These risks—of death, not disease—are all much smaller than what the Plaintiffs allege in this case: lifetime odds of developing cancer at 50% of 1 in 1,000,000. To even approach that number, we can look at the average person's risk of dying from bathtub drowning in any given year (1 in 840,000). Harvard Center for Risk Analysis, http://www.hcra.harvard.edu/quiz.html (last visited Sept. 6, 2011).
>
> In light of all of the above, Dr. Kornberg's statement is simply insufficient to establish a genuine issue of material fact regarding whether reasonable physicians would prescribe a medical monitoring regime for the Plaintiffs. Viewing the facts of this case together, the Plaintiffs have alleged only a risk that borders on legal insignificance, have failed to produce evidence establishing even this hypothetical risk with any degree of certainty, and have demanded a jury trial based upon their expert's review of this evidence and conclusory statement of the relevant legal standard. In this context, Dr. Kornberg's affidavit amounts to a "mere ... scintilla" of evidence. Shropshire, 550 F.3d at 576.

[14] Available at http:// www.nsc. org/ NSC% 20Picture% 20Library/News/web_ graphics/Injury_Facts_37.pdf.

[15] Available at http://www.hcra.harvard.edu/quiz. html.

- National Vital Statistics Reports ("NVSR"), National Center for Health Statistics ("NCHS", Centers for Disease Control and Prevention ("CDC"), U.S. Department of Health and Human Services ("DHS"):[16]





[16] Multiple separate resources for 2000-2010 Division of Vital Statistics, Deaths: National Vital Statistics Reports ("NVST"), Centers for Disease Control and Prevention ("CDC"), National Center for Health Statistics, Department of Health and Human Services ("DHS").

- 2009 - US Population Death/Mortality Numbers:
  - In 2009 there was 1 death for every 126 people in the U.S. population:
    - 2009 U.S. population = 307,006,550
    - 2009 total U.S. deaths = 2,436,682
    - 307,006,550 population ÷ 2,436,682 deaths = (1 death per) 126 people
  - In 2009 of those 2,436,682 who died in the U.S. there were 129,523 (132,538 in 2010) deaths from drugs, suicide, firearms, or alcohol.
    - 2009 U.S. deaths from:
      - Drugs – 37,485 or a rate of 12.2 per 100,000 people in population
      - Suicide – 36,547 or a rate of 11.9 per 100,000 people
      - Firearms – 31,228 or a rate of 10.2 per 100,000 people
      - Alcohol – 24,263 or a rate of 7.9 per 100,000 people
    - In 2009 for every 18.81 people who died one of those 18.81 people died from drugs, suicide, firearms, or alcohol.
    - In 2009 for every 65 people who died one of those 65 people died from drugs.

Basic 2009 U.S. Death Rates (US Population 2009: 307,006,550): [17]

Cause of Death (death rates per 100,000 of general population)	2010	2009	2008
All causes of Death	798.7	793.7	813.2
Infant Death Rate All Causes	614.0	642.1	659.3
Major Cardiovascular Diseases	251.8	253.9	264.7
Pneumonia	16.0	16.5	18.0
Transport Accidents	12.2	12.7	14.1
Drugs	12.2	12.2	12.4
Suicide	12.2	11.9	11.8
Firearm	10.2	10.2	10.4
Alcohol	8.2	7.9	7.9
Falls	8.4	8.1	7.9
HIV	2.7	3.1	3.4
Injury at Work	1.6	1.7	1.9
Peptic Ulcer	1.0	1.0	1.0
Influenza	0.2	0.9	0.6
Complications of Medical and Surgical Care	0.8	0.8	0.9
Hernia	0.6	0.6	0.6
Pregnancy, Childbirth, and the Puerperium	0.3	0.3	0.3
Tuberculosis	0.2	0.2	0.2
Malnutrition	0.9	0.1	0.1

Basic Arrest Related Death ("ARD") Numbers:

- **Pepper spray** – approximately 1 in 600 will die
    - "The study of in-custody deaths concluded that pepper spray contributed to death in two of the 63 cases, both involving people with asthma."[18]
    - "The [26 deaths] fatality total suggests that one person dies after being pepper sprayed for about every 600 times the spray is used by police."[19]
- **Positional asphyxia** – in a pepper spray study in 7 out of 63 "clear cut" cases of suspect death the death was attributed to positional asphyxia.[20]

[17] Kenneth D. Kochanek, M.A.; Jiaquan Xu, M.D.; Sherry L. Murphy, B.S.; Arialdi M. Minino M.P.H.; and Hsiang-Ching Kung, Ph.D., Division of Vital Statistics, Volume 59, Number 4, National Vital Statistics Reports, National Center for Health Statistics, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, March 16, 2011. (Preliminary data for 2009.)

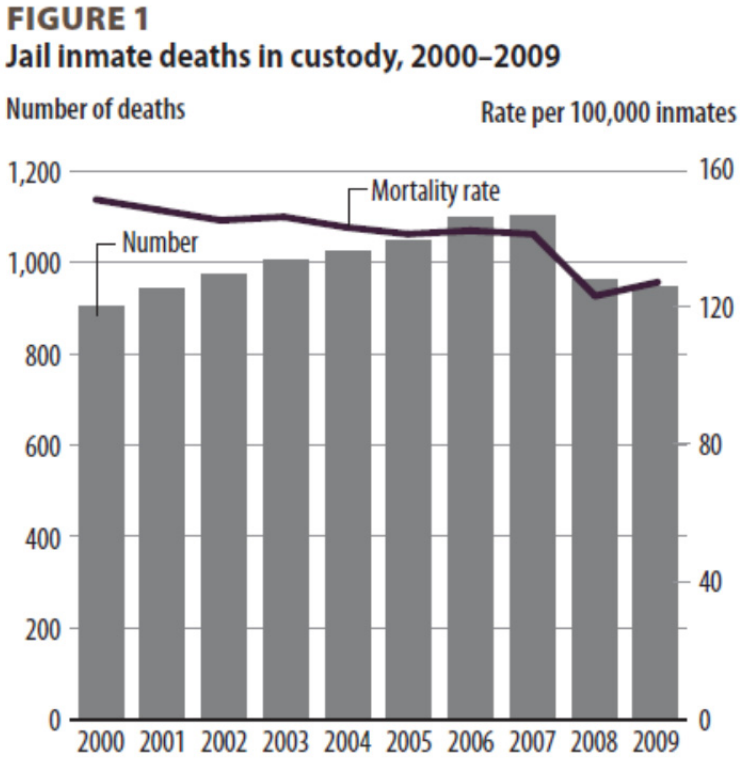
[18] The Effectiveness and Safety of Pepper Spray, NIJ Research for Practice, Office of Justice Programs, National Institute of Justice, Office of Justice Programs, U.S. Department of Justice, April 2003, NCJ 195739.

[19] Pepper Spray Update: More Fatalities, More Questions, ACLU of Southern California, page 2, June 1995.

[20] The Effectiveness and Safety of Pepper Spray, NIJ Research for Practice, Office of Justice Programs, National Institute of Justice, Office of Justice Programs, U.S. Department of Justice, April 2003, NCJ 195739.

Death Rate in Jails (no listing of ECD)**:**

- Local U.S. Jails (in-custody deaths) – 2008 and 2009 (NJ/BJS Report[21]):
  - 2009 - 948 deaths, 127 deaths per 100,000 inmates (1 death per 787 detainees).
  - 2008 - 960 deaths, 123 deaths per 100,000 inmates (1 death per 813 detainees).



- Local U.S. Jails (in-custody deaths) – from 2000 through 2007 (NIJ/BJS Report[22]):
  - 8,110 persons died in local jails from 2000 through 2007
    - Approximately 1 death per 658-709 inmates (depending on year)
  - Local jail in-custody rates of death for 2000 through 2007:
    - approximately 141-152 deaths per 100,000 inmates (depending on year)
- "Nevada's rate of custody deaths of 247 per 100,000 inmates is similar to the national average (250 per 100,000 inmates), but is substantially higher than the

[21] Margaret E. Noonan and E. Ann Carson, BJS Statisticians, Prison and Jail Deaths in Custody, 2000-2009 - Statistical Tables, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, December 2011, NCJ 236219.

[22] Margaret Noonan, BJS Statistician, Mortality in Local Jails, 2000-2007, Deaths in Custody Reporting Program, Special Report, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, July 2010, NCJ 222988.

average for other Western states (219 per 100,000 inmates)."[23]

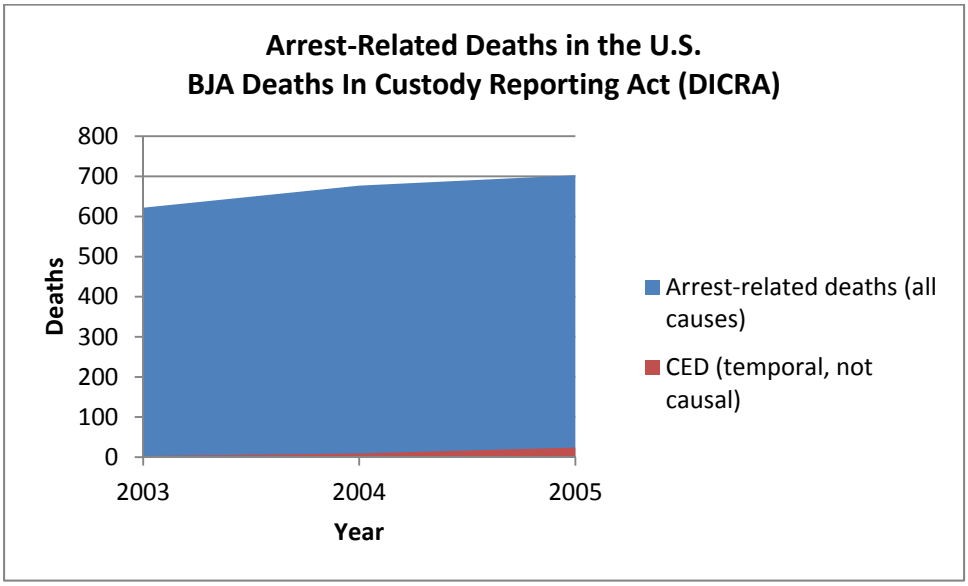
- In Ontario, Canada "[t]he crude rate of death among male inmates was 420.1 per 100 000 in federal institutions and 211.5 per 100 000 in provincial institutions."[24]

Pre-Arrest/Arrest Risk of Death (no listing of ECD):[25]

- Pre-arrest/arrest risk of death is 6.5 deaths per 100,000 arrests or
- 1 death per 15,384.6 arrests

	No. of Deaths (n=77)	Percent	Risk of Death per 100,000
Events Prior to and During Arrest	14 deaths	18.1 %	6.5 per 100,000 arrests
Police Pursuits or Chases	10 deaths	12.9 %	
Transport of Suspects	2 deaths	2.6 %	0.93 per 100,000 arrests
During Incarceration	51 deaths	66.2%	268 per 100,000 inmates

US ARDs, BJS, Deaths in Custody Reporting Act ("DICRA"):[26]



[23] Brian R. Brehman, Terance D. Miethe, Ph.D., and Timothy C. Hart, Ph.D., Deaths in Custody in Nevada, Center for Analysis of Crime Statistics, Department of Criminal Justice, College of Urban Affairs, University of Las Vegas, 2001-2006, State Data Brief, July 2009, CACS 2009-01-01 CR.

[24] Wendy L. Wobeser, Jason Datema, Benoit Bechard, Peter Ford, Causes of death among people in custody in Ontario, 1990–1999, Canadian Medical Association Journal, November 12, 2002; 167 (10) 1109-1113.

[25] Steven A. Koehler, MPH, PhD, et. al., Deaths Among Criminal Suspects, Law Enforcement Officers, Civilians, and Prison Inmates: A Coroner-Based Study, The American Journal of Forensic Medicine and Pathology, pages 334-338, Volume 24, Number 4, December 2003.

[26] Christopher J. Mumola, BJS Policy Analyst, Arrest-Related Deaths in the United States, 2003-2005, Special Report, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, October 2007, NCJ 219534.

- January 2003-December 2009 DICRA Report:[27]
    - A total of 4,813 deaths were reported to the Arrest-Related Deaths program from January 2003 through December 2009.
    - Of reported arrest-related deaths, 61% (2,931) were classified as homicides by law enforcement personnel, 11% (541) were suicides, 11% (525) were due to intoxication, 6% (272) were accidental injuries, and 5% (244) were attributed to natural causes.

(2004) U.S. Medical Examiners and Coroners' Numbers:[28]

- 2,000 Medical Examiner ("ME") / Coroner ("C") Offices in U.S.:
    - 7,320 ME/C full-time equivalent ME/C employees
    - $718,500,000.00 total ME/C annual budgets
- 2,398,000 human deaths:
    - 956,000 deaths referred to ME/C offices
        - 487,000 deaths accepted for investigation
            - 677 Arrest Related Deaths ("ARDs") (all causes)[29]
                - 9 ARDs involved the use of ECDs or other conducted-energy devices[30]

Additional Mortality Numbers:

Hospital Emergency Department Mortality Rates:[31]

- 1.8 out of 100 – hospital emergency department mortality rate on weekends
- 1.6 out of 100 – hospital emergency department mortality rate on weekdays

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[27] Andrea M. Burch, Arrest-Related Deaths, 2003-2009 - Statistical Tables, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, November 2011, NCJ 235385.

[28] Matthew J. Hickman, Ph.D., Kristen A. Hughes, MPA. Bureau of Justice Statistics, Kevin J. Strom, Ph.D., Jeri D. Ropero-Miller, Ph.D., DABFT, RTI International, Medical Examiners and Coroners' Offices, 2004, Special Report, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, June 2007, NCJ 216756.

[29] Christopher J. Mumola, BJS Policy Analyst, Arrest-Related Deaths in the United States, 2003-2005, Special Report, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, October 2007, NCJ 219534.

[30] Christopher J. Mumola, BJS Policy Analyst, Arrest-Related Deaths in the United States, 2003-2005, Special Report, Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice, October 2007, NCJ 219534.

[31] Chaim M. Bell, M.D., Donald A. Redelmeier, M.D., Mortality Among Patients Admitted to Hospitals on Weekends as Compared With Weekdays, N.Eng.J. Med., Vol 345, No. 9, August 30, 2001, pages 663-668.

- "When all possible diagnoses (conditions accounting for the 3,789,917 admissions) were included in the analysis, there was a small increase in mortality among patients, admitted on a weekend (1.8 percent vs. 1.6 percent)."

Sudden Death in Young Adults:[32]

- Sudden Cardiac Death (SCD) mortality rate (person-years for the 1998-2008 study period comprising 15.2 million person-years of active surveillance):
    - males: 6.7 per 100,000 [1:14,925]
    - females: 1.4 per 100,000 [1:71,428]

- SCD mortality incidence of sudden unexplained death (SUD) by age:
    - < 35 years of age: 1.2 per 100,000 [1:83,333]
    - ≥ 35 years of age: 2.0 per 100,000 [1:50,000]

- Miscellaneous causes of exertional sudden cardiac death (SCD) included:
    - moving furniture and/or equipment,
    - mowing lawn,
    - dancing,
    - fighting, and
    - sexual intercourse.

Table 2 Specific Activities at Time of Exertional Sudden Death in 361 Young Adults

Recreational sports	186 (51.5%)
Running	114 (31.6%)
Basketball	20 (5.5%)
Walking	14 (3.9%)
Swimming	11 (3.0%)
Weightlifting	5 (1.4%)
Baseball	4 (1.1%)
Biking	4 (1.1%)
Military training	150 (41.6%)
Organized physical training*	138 (38.2%)
Road march/land navigation	7 (2.0%)
Miscellaneous	5 (1.4%)
Miscellaneous	17 (4.8%)
Not specified	8 (2.2%)

*Organized physical training defined as group-level activity to include performance of physical fitness testing (sit-up, push-ups, and timed distance running). Additional recreational sports representing <1% included football (n = 3), racquetball (n = 3), soccer (n = 3), volleyball (n = 2), hiking (n = 1), paintball (n = 1), and tennis (n = 1). Miscellaneous causes included moving furniture and/or equipment (n = 8), mowing lawn (n = 4), dancing (n = 2), fighting (n = 2), and sexual intercourse (n = 1).

Table 3 Cause-Specific Findings in 902 Cases of Adjudicated Unanticipated Sudden Cardiac Death Stratified by Age <35 Years and ≥35 Years in a Cohort Undergoing Active Surveillance

Findings	<35 Yrs of Age (n = 298)	≥35 Yrs of Age (n = 604)	p Value
Sudden unexplained death	123 (41.3%)	64 (10.6%)	<0.001
Atherosclerotic disease	69 (23.2%)	442 (73.2%)	<0.001
Hypertrophic cardiomyopathy	38 (12.8%)	19 (3.1%)	<0.001
Myocarditis	17 (5.7%)	13 (2.2%)	0.009
Idiopathic dilated cardiomyopathy	14 (4.7%)	21 (3.5%)	0.478
Anomalous coronary artery	12 (4.0%)	1 (0.2%)	<0.001
Hypertensive cardiomyopathy	11 (3.7%)	15 (2.5%)	0.419
Arrhythmogenic RV dysplasia	4 (1.3%)	6 (1.0%)	0.737
Ischemic cardiomyopathy	2 (0.7%)	14 (2.3%)	0.135
Other*	8 (2.7%)	9 (1.5%)	—

Data presented as raw (columnar percent [incidence]). *Other cases (n = cases <35 years of age, cases ≥35 years of age, respectively): additional causes of death associated with coronary artery disease included coronary artery bridge (n = 6, 1), spontaneous coronary thrombosis (n = 1, 2%) and spontaneous coronary dissection (n = 0, 1); causes of death associated with valvular heart disease included aortic valve disease (n = 0, 3), mitral valve disease (n = 1, 1), and endocarditis (n = 0, 1).
RV = right ventricle.

[32] Eckart RE, Shry EA, Burke AP, et al. Sudden death in young adults: an autopsy-based series of a population undergoing active surveillance. *J Am Coll Cardiol.* Sep 13 2011;58(12):1254-1261.

Sudden Cardiac Death (SCD) NCAA[33] Athletes:[34]

- SCD incidence (risk) of NCAA student-athlete - 1:43,770 participants per year
    - SCD incidence (risk) of NCAA male athletes - 33,134 participants per year
        - SCD incidence (risk) of NCAA white male athletes - 1:58 653 per year
        - SCD incidence (risk) in NCAA black male athletes - 1:12,990 per year
- NCAA Basketball:
    - SCD Incidence (risk) of NCAA basketball participants - 1:11,394 per year
        - SCD Incidence (risk) of NCAA basketball participants by ethnicity:
            - SCD incidence (risk) in NCAA white male athletes - 1:21,824 per year
            - SCD incidence (risk) in NCAA black male athletes - 1:5,743 per year
    - SCD incidence (risk) of NCAA Division I male - 1:3,126 per year
        - SCD incidence (risk) in NCAA white male athletes - 1:3,947 per year
        - SCD incidence (risk) in NCAA black male athletes - 1:1,282 per year
- NCAA Swimming SCD incidence (risk) - 1:21,293
- NCAA Football SCD incidence (risk) in Division I - 1:25,297
- NCAA Lacrosse SCD incidence (risk) - 1:23,357
- NCAA Football SCD incidence (risk) - 1:38,497
- NCAA Cross-country SCD incidence (risk) - 1:41,695

[33] NCAA – National Collegiate Athletic Association.

[34] Harmon KG, Asif IM, Klossner D, Drezner JA. Incidence of sudden cardiac death in national collegiate athletic association athletes. *Circulation*. 2011;123:1594–1600. See also, Link MS, Estes NA 3rd., Sudden cardiac death in the athlete: bridging the gaps between evidence, policy, and practice. *Circulation*. 2012 May 22;125(20):2511-6.

- NCAA SCD Athletes According to Sex, Ethnicity, and Division, 2004-2008:

Table 1. Incidence of SCD in NCAA Athletes According to Sex, Ethnicity, and Division, 2004–2008

	No. of Athlete-Years	No. of Deaths	Death Rate (per Year)
NCAA athletes	1 969 663	45	1:43 770
Sex			
Male	1 126 557	34	1:33 134
Female	843 106	11	1:76 646
Ethnicity			
Black	300 835	17	1:17 696
White	1 583 635	27	1:58 653
By division			
Division I	788 023	27	1:29 186
Division II	424 572	10	1:42 457
Division III	760 258	8	1:95 032

SCD indicates sudden cardiac death; NCAA, National Collegiate Athletic Association.

- Incidence of NCAA SCD by Sport, 2004-2008:

Table 2. Incidence of NCAA SCD by Sport, 2004–2008

Sport	Number of Deaths	Overall Incidence*	Incidence in Males	Incidence in Females	Incidence in African Americans	Incidence in Caucasians
Basketball	14	1:11,394	1:6,993	1:37,799	1:5,743	1:21,824
Division I	9	1:5,451	1:3,126	1:23,901	1:5,284	1:6,135
Division II	3	1:12,631	1:11,330	1:15,232	1:9,503	1:20,822
Division III	2	1:24,681	1:13,646	†	1:6,952	†
Swimming	4	1:21,293	1:34,552	1,16,457	†	1:20,981
Lacrosse	3	1:23,357	1:19,770	1:30,531	†	1:23,357
Football	8	1:38,497	1:38,497	†	1:59,814	1:14,401
Cross-country	3	1:41,695	1:59,484	1:32,801	1:12,043	1:51,033

NCAA indicates National Collegiate Athletic Association; SCD, sudden cardiac death.
*SCD incidence is expresed as number of athletes per year.
†No deaths for incidence calculation.

Table 3. Capture-Recapture Analysis

	No. of Deaths in Aggregate Database	Cap-Recap Estimate of No. of Deaths	95% Confidence Interval	No. of Athletes	Aggregate Database Incidence*	Cap-Recap Incidence Estimate
Total	45	49.6	45.4–50.4	1 969 663	1:43 770	1:39 711
Division I	27	28.4	27.4–32.5	788 023	1:29 186	1:29 186
Division II/III	18	22.4	18.8–43.1	1 184 830	1:65 824	1:52 894

Cap-Recap indicates capture-recapture.
*SCD incidence rates are expressed in number of athletes per year.

SCD During Competitive Sports Activities in Minnesota High School Athletes:[35]

- "During the study period there were 1,453,280 overall sports participations and 651,695 student athlete participants among the 27 high school sports. The calculated risk for sudden death was 1:500,000 participations and 1:217,400 participants per academic year (or 0.46/100,000, annually). Over a 3-year high school career for a student athlete the estimated risk was 1:72,500."
    - Calculated risk for sudden cardiac death (SCD) was:
        - 1:500,000 participations
        - 1:217,400 participants per academic year
        - 1:72,500 over a 3-year high school competitive sports career

Out-of-Hospital Nontraumatic Cardiac Arrest (OHCA): Children:[36]

- The incidence of pediatric OHCA:
    - 8.04 per 100 000 person-years (1:12,438):
        - 72.71 in infants;
        - 3.73 in children; and
        - 6.37 in adolescents (1:15,698);
    - versus 126.52 per 100 000 person-years for adults (1:790).
- Survival for:
    - all pediatric OHCA was 6.4%:

[35] Maron, Barry J., Gohman, Thomas E., Aeppli, Dorothee, Prevalence of Sudden Cardiac Death During Competitive Sports Activities in Minnesota High School Athletes, JACC Vol. 32, No. 7, December 1998:1881–4.

[36] Atkins DL, Everson-Stewart S, Sears GK, Daya M, Osmond MH, Warden CR, Berg RA. Epidemiology and outcomes from out-of-hospital cardiac arrest in children: the Resuscitation Outcomes Consortium Epistry-Cardiac Arrest. Circulation. 2009;119:1484 – 1491.

- 3.3% for infants;
- 9.1% for children; and
- 8.9% for adolescents:

  - versus 4.5% for adults.

Routine Cardiac Ablation Procedures Rates of Major Complications/Deaths:[37]

- Mortality rate – 1,000 deaths per million, or 1 in 1,000
- Major complications rate from routine cardiac ablation – 3.8 out of 100

Severe Mental Illness Mortality Rates: [38]

- A 2-3 fold increased mortality rate
- "People with severe mental illnesses (SMI), such as schizophrenia, depression or bipolar disorder, have worse physical health and reduced life expectancy compared to the general population .... Evidence shows that they have a 2–3 fold increased mortality rate and that the mortality gap associated with mental illness compared to the general population has widened in recent decades."

Antipsychotics and the Risk of Sudden Cardiac Death:[39]

- Current use of antipsychotics was associated with a 3-fold increase in risk of sudden cardiac death.
- "**Results:** The study population comprised 554 cases of sudden cardiac death. Current use of antipsychotics was associated with a 3-fold increase in risk of sudden cardiac death. The risk of sudden cardiac death was highest among those using butyrophenone antipsychotics, those with a defined daily dose equivalent of more than 0.5 and short-term (≤90 days) users. The association with current antipsychotic use was higher for witnessed cases (n=334) than for unwitnessed cases."

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[37] Marius Bohnen, BSc, William G. Stevenson, MD, FHRS, Usha B. Tedrow, MD, MSc, FHRS, Gregory F. Michaud, MD, FHRS, Roy M. John, MD, PhD, FHRS, Laurence M. Epstein, MD, FHRS, Christine M. Albert, MD, MPH, Bruce A. Koplan, MD, MPH, FHRS, Incidence and predictors of major complications from contemporary catheter ablation to treat cardiac arrhythmias, doi:10.1016/j.hrthm.2011.05.017.

[38] M. De Hert, J.M. Dekker, D. Wood, K.G. Kahl, R.I.G. Holt, H.-J. Möller, Cardiovascular disease and diabetes in people with severe mental illness position statement from the European Psychiatric Association (EPA), supported by the European Association for the Study of Diabetes (EASD) and the European Society of Cardiology (ESC), European Psychiatry xxx (2009) xxx–xxx, doi:10.1016/j.eurpsy.2009.01.005.

[39] Sabine M. J. M. Straus, MD; Gyse`le S. Bleumink, MD; Jeanne P. Dieleman, PhD; Johan van der Lei, MD, PhD; Geert W. 't Jong, PhD; J. Herre Kingma, MD, PhD; Miriam C. J. M. Sturkenboom, PhD; Bruno H. C. Stricker, PhD, Antipsychotics and the Risk of Sudden Cardiac Death, Arch Intern Med/Vol 164, June 28, 2004, 1293-1297, 1839.

- "**Conclusions:** Current use of antipsychotics in a general population is associated with an increased risk of sudden cardiac death, even at a low dose and for indications other than schizophrenia. Risk of sudden cardiac death was highest among recent users but remained elevate during long-term use."

SUDEP – Sudden Unexpected Death in Epilepsy Mortality:

- "Epilepsy is one of the most common neurologic diseases in the world, seen in 3% of the world's population."[40]

- "Approximately 2 million people in the United States have epilepsy."[41]

- "Epilepsy patients are at an increased risk of mortality compared with the rest of the population. Standardized mortality rate in epilepsy patients is shown to be 1.6–9.3 times higher in this population."[42]

- "SUDEP accounts for 8%–17% of deaths in people with epilepsy. The incidence is estimated to be 2–10 per 1,000 person years in population based studies."[43] [citation omitted]

- "People with epilepsy have a 2.6-fold increased risk of premature death compared with the general population."[44]

- "The risk of sudden death in young adults with epilepsy is increased 24-fold."[45]

- SUDEP "is the most frequent cause of epilepsy-related death with incidence rates of up to nine per 1000 person-years in people with pharmacoresistant epilepsy."[46]

- In children with epilepsy, the cumulative risk of dying suddenly is 7% within 40 years."[47]

[40] Velagapudi, M.D., Poonam, Turagam, M.D., Mohit, Laurence, M.D., Thomas, and Koceril, M.D., Abraham, Review: Cardiac Arrhythmias and Sudden Unexpected Death in Epilepsy (SUDEP), PACE, Vol 35, March 2012, pgs 363-370, doi: 10.1111/j.1540-8159.2011.03276.x.

[41] Id.

[42] Id.

[43] Id.

[44] Surgesa, Rainer, and Sanderb, Josemir W., Review: Sudden unexpected death in epilepsy: mechanisms, prevalence, and prevention, Curr Opin Neurol 2012, 25:201–207, DOI:10.1097/WCO.0b013e3283506714.

[45] Id.

[46] Id.

[47] Id.

Law Enforcement Officer (LEO) Mortality, Assaults, and Injuries:[48]

- Averages over 2000-2009 decade:
  - 900,000 LEOs
  - 163 LEO deaths per year
  - 50,069 LEO assaults per year
  - 16,041 LEO injuries per year
- Thus, annually:
  - 1 LEO death per year per 5,521 officers
  - 1 LEO injured per year per 56 officers
  - 1 LEO assault per year per 18 officers

[48] National Law Enforcement Officers Memorial Fund: Deaths, Assaults & Injuries, http://www.nleomf.org/facts/officer-fatalities-data/daifacts.html [last updated 10/19/2011 2:32:30 PM]; Officer Safety Statistics, National Law Enforcement Officers Memorial Fund (NLEOMF), www.nleomf.org/facts.

Selected Court Cases Regarding ECDs as a Level of Force

TASER Electronic Control Device ("ECD") is not "deadly" force:

- *Marquez v. City of Phoenix*, CV-08-1132-PHX-NVW, 2010 WL 3342000 (D. Ariz. Aug. 25, 2010)

TASER ECD is a "non-deadly weapon":

- *Fils v. City of Aventura*, 647 F.3d 1272 (11th Cir. (Fla.) 2011)
- *Jackson v. Johnson*, CV 10-98-M-DWM, 2011 WL 2783830 (D. Mont. July 18, 2011)
- *Bernat v. California City Police Dept.,* 1:10-CV-00305-OWW, 2011 WL 1103130 (E.D. Cal., Mar. 22, 2011) (citing *Bryan v. MacPherson*)
- *Steen v. City of Pensacola*, 3:11-CV-142-RV/CJK, 2011 WL 3667499 (N.D. Fla. Aug. 22, 2011) (citing *Fils v. City of Aventura*)
- *Marella v. City of Bakersfield*, 1:09-CV-00453, 2010 WL 3386465 (E.D. Cal. Aug. 26, 2010) (citing *Bryan v. MacPherson*)

TASER ECD is "non-deadly force":

- *McGee v. City of Cincinnati Police Dept.*, 1:06-CV-726, 2007 WL 1169374 (S.D. Ohio Apr. 18, 2007)
- *Carter v. Colerain Twp.*, 105-CV-163,2007 WL 869727 (S.D. Ohio Mar. 20, 2007)

TASER ECD is "less than deadly force":

- *McKenney v. Harrison*, 635 F.3d 354, 362 (8th Cir. (Neb.) 2011) (citing *Mattos v. Agarano*)
- *Mattos v. Agarano*, 590 F.3d 1082, 1087 (9th Cir. (Haw.) 2010), *superseded* by *Mattos v. Agarano*, 661 F.3d 433 (9th Cir. (Haw.), Oct. 17, 2011)
- *Meyers v. Baltimore County, Maryland*, 814 F.Supp.2d 552 (D.Md. Sept. 28, 2011), (citing *Mattos v. Agarano*, 590 F.3d 1082, 1087 (9th Cir. (Haw.) 2010), *superseded* by *Mattos v. Agarano*, 661 F.3d 433 (9th Cir. (Haw.), Oct. 17, 2011).)

TASER ECD is "non-lethal":

- *Lewis v. Downey*, 581 F.3d 467, 475 (7th Cir. (Ill.) 2009) *cert. denied*, 130 S.Ct. 1936, 176 L.Ed.2d 366 (U.S. 2010)

- *Bryan v. MacPherson*, 630 F.3d 805, 825 (9th Cir. (Cal.) 2010)

- *Helfrich v. Lakeside Park Crestview Hills Police Auth.*, CIV. 08-210-WOB, 2010 WL 3927514 (E.D. Ky. Aug. 18, 2010) *report and recommendation adopted in part, rejected in part sub nom. Helfrich v. City of Lakeside Park*, CIV.A. 2008-210 WOB, 2010 WL 3927475 (E.D. Ky. Oct. 4, 2010)

- *Higgs v. Sanford*, CIV.A. 5:07CVP77R, 2009 WL 805121 (W.D. Ky. Mar. 25, 2009)

- *Buckley v. Haddock*, 292 F. App'x 791 (11th Cir. (Fla.) 2008)

- *United States v. Fore*, 507 F.3d 412, 413 (6th Cir. (Ky.) 2007)

- *Henry v. Purnell*, 428 F. Supp. 2d 393 (D. Md. 2006) *aff'd in part, vacated in part*, 501 F.3d 374 (4th Cir. 2007)

- *San Jose Charter of Hells Angels Motorcycle Club v. City of San Jose*, 402 F.3d 962, 969 n. 8 (9th Cir. (Cal.) 2005)

- *When Does Use of T[ASER ECD] Constitute Violation of Constitutional Rights*, 45 A.L.R.6th 1 (Originally published in 2009)

TASER ECD is not "lethal" force:

- *Marquez v. City of Phoenix*, CV-08-1132-PHX-NVW, 2010 WL 3342000 (D. Ariz. Aug. 25, 2010)

- *Rocha v. Schroeder*, 283 F. App'x 305 (5th Cir. (Tex.) 2008)

TASER ECD is "less lethal" weapon:

- *Phillips v. Community Ins. Corp.*, --- F.3d ----, 2012 WL 1449675 (7th Cir. (Wis.) Apr 27, 2012):

    - "Other courts of appeals have observed that baton launchers and similar 'impact weapons' employ a substantially greater degree of force than other weapons categorized as 'less lethal,' such as pepper spray, [TASER ECDs], or pain compliance techniques."

Selected Medical Studies and Legal Cases

ECD Safety Margin:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J. Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. "The literature suggests a substantial safety margin with respect to the use of CEDs when they are used according to manufacturer's instructions." Page 24.

2. (10/2009 MacDonald) John M. MacDonald, Robert J. Kaminski, and Michael R. Smith, The Effect of Less-Lethal Weapons on Injuries in Police Use-of-Force Events, American Journal of Public Health, October 2009.

    a. "CEDs appear to be relatively safe when used on healthy individuals in clinically controlled research settings. Given the findings from this study, as well as those from previously published research, law enforcement agencies should encourage the use of OC spray or CEDs in place of impact weapons and should consider authorizing their use as a replacement for hands-on force tactics against physically resistant suspects. … Our findings suggest that the incidence of injuries from police use-of-force incidents can be reduced substantially when police officers use CEDs and OC spray responsibly and in lieu of physical force to control physically resistant suspects."

3. (09/2009 PERF) Taylor B, Woods D, Kubu B, et al. Police Executive Research Forum (PERF), Comparing safety outcomes in police use-of-force cases for law enforcement agencies that have deployed Conducted Energy Devices and a matched comparison group that have not: A quasi-experimental evaluation, September 2009.

    a. "Overall, we found that the CED sites were associated with improved safety outcomes when compared to a group of matched non-CED sites on six of nine safety measures, including reductions in (1) officer injuries, (2-3) suspect injuries and severe injuries, (4-5) officers and suspects receiving injuries requiring medical attention, and (6) suspects receiving an injury that resulted in the suspect being taken to a hospital or other medical facility. Also within CED agencies, in some cases the actual use of a CED by an officer is associated with improved safety outcomes compared to other less-lethal weapons. The evidence from our study suggests that CEDs can be an effective weapon in helping prevent or minimize physical struggles in use-of-force cases. LEAs should consider the utility of the CED as a way to avoid up-close combative situations and reduce injuries to officers and suspects."

4. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

    a. "If deployed according to an appropriate use-of-force policy, and used in conjunction with a medically driven quality assurance process, Taser use by law enforcement officers appears to be a safe and effective tool to place uncooperative or combative subjects into custody."

5. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J. Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. "Collectively, these data are broadly reassuring and constitute the current best understanding of the human physiologic effects of conducted electrical weapons."

6. (06/2008 Eastman) Eastman, A.L., et al., Conductive electrical devices: a prospective, population-based study of the medical safety of law enforcement use, J Trauma, 2008. 64(6): p. 1567-72.

    a. "Law enforcement professionals are able to comply with CED policies of their agencies. Rational and supported CED policies allow for decreased uses of lethal force. … Police were compliant with policy in all cases, and, in addition to avoiding the use of lethal force in a significant number of circumstances [23 of 426 incidents, or 5.4%], the safety of CED use was demonstrated despite one death subsequently attributed to lethal toxic hyperthermia."

7. (2005) Wilkinson D., PSDB Further Evaluation of TASER Devices Hertfordshire, United Kingdom: United Kingdom Police Scientific Development Branch, 2005, page 108.

    a. "**Ventricular fibrillation:** In an attempt to evoke ventricular fibrillation, trains of simulated M26 or X26 Taser waveforms (designed to mimic the discharge patterns of the respective Taser devices) were applied to the ventricular muscle. When the simulated waveforms were applied in this way, neither the M26 nor X26 waveforms elicited ventricular fibrillation at peak current densities up to the maximum output available from the laboratory electrical stimulation system. The threshold peak current density for generation of ventricular fibrillation for the simulated M26 waveform was greater than 70-fold the modeled current density predicted to occur at the heart during Taser discharge. In the case of the simulated X26 waveform, the threshold peak

current density was greater than 240-fold the modeled current density. That this failure of the simulated M26 and X26 Taser waveforms to induce ventricular fibrillation was not a function of the biological test system was demonstrated in each experiment by the generation of VF using the rectangular stimulation pulses."

Risk of Injury:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. "There is no evidence in animals that indicates a high risk of injury from a single discharge lasting less than 15 seconds from a TASER® X26™." Page 26.

2. (09/2008 Mesloh) (NIJ funded study) Mesloh, Wolf, Henych & Thompson, Less Lethal Weapons for Law Enforcement: A Performance-Based Analysis, Law Enforcement Executive Forum, 2008.

    a. "TASERs play an important role in law enforcement. This research and this report show that electric weapons are deployed more frequently than other less-lethal weapons and tactics, but they also appear to enjoy higher success rates in conflict resolution. This success in bringing officer/suspect confrontations to an end is invaluable as it has the effect of reducing injuries to all persons in the conflict. ... The fact that TASERs offer society the best "set phasers on stun" solution currently available makes them extremely appealing to police in use-of-force situations. Added to this are the many safeguards implemented by TASER International to identify when and where a TASER has been discharged. These electronic and physical tracking safeguards highly discourage improper use. In a police use of force confrontation, the most humane weapon or tactic would be one in which the resultant injury would be the least severe. While TASERs are not injury free (puncture wounds from dart probes, or skin burns from drive stuns), the alternative (broken bones from batons, burning pain from pepper spray, and potential death from firearm) makes them a preferential choice. Clearly this research has shown that electric weapons are very effective at ending conflict situations quickly, this in turn leads to less injuries to both suspects and officers."

Risk of Death from ECD:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. "[T]he risk of human death due directly or primarily to the electrical effects of CED application has not been conclusively demonstrated." Page viii.

    b. "The risks of ... death remain low and make CEDs more favorable than other weapons." Page viii.

    c. "The risks of ... death remain low and make CEDs more favorable than other weapons." Page 10.

    d. "Unlike the risk of secondary injury due to falling or puncture, the risk of human death due directly or primarily to the electrical effects of CED application has not been conclusively demonstrated." Page 23.

    e. "The medical risks of repeated or continuous CED exposure beyond the durations studied in humans are currently unknown, and the role of CEDs in causing death is unclear in these cases." Page 27.

2. (05/2011 Pasquier) Pasquier, M., Electronic Control Device Exposure - A Review of Morbidity and Mortality, Annals of Emergency Medicine, May 2011.

    a. "[T]he role of electronic control device in mortality remains speculative."

3. (09/2010 Biria) Biria M, Bommana S, Kroll M, Lakkireddy D., Multi-System Interactions of Conducted Electrical Weapons (CEW) - A Review, Engineering in Medicine and Biology Society Proceedings, Sept 2010:1266-1270.

    a. "Exposure to CEW application causes minimal effect on different organs. Decrease in overall mortality and morbidity is the main benefit of these devices in comparison to firearms, batons, pepper spray and wrestling. Also, '[t]here is no report of life threatening arrhythmia induction during application of these devices on healthy subjects. Based on these findings, CEW is considered safe from a cardiovascular stand-point.'"

4. (07/2010 Smith) Smith M, Kaminski R, Alpert G, Fridell L, MacDonald J, Kubu B., A Multi-Method Evaluation of Police Use of Force Outcomes: Final Report to the National Institute of Justice, US Department of Justice, 2010.

    a. "Across 12 agencies and more than 25,000 use of force cases, the odds of a suspect being injured decreased by 70 percent when a CED was used. Controlling for other types of force and resistance, the use of CEDs

significantly reduced the probability of injuries. In very rare cases, people have died after being pepper sprayed or shocked with a Taser, although no clear evidence exists that the weapons themselves caused the deaths."

5. (03/2009 Vilke) Gary M. Vilke, Will D. Johnson III, Edward M. Castillo, Christian Sloane, and Theodore C. Chan, Tactical and subject considerations of in-custody deaths proximal to use of conductive energy devices, American Journal of Forensic Med Pathol, March 2009, 30 (1):23-25.

    a. "CEDs are used in circumstances of elevated risk of injury to both suspects and officers, including situations of persons armed during the confrontation. Deaths proximate to CED use appear to fit a narrow suspect profile."

6. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. "No study has demonstrated a pathophysiologic mechanism or effect that would account for delayed deaths minutes to hours after conducted electrical weapon exposure."

7. (06/30/2008 Nova Scotia) Report of the Advisory Panel to the Minister of Justice on the use of the Conducted Energy Device by Law Enforcement Agencies in Nova Scotia.

    a. "While to date there has been no medical research to establish a causal relationship between CED use and mortality, the panel notes that the science regarding the impact of CEDs is still evolving. ... To date in Canada, no report of a coroner or medical examiner has listed the CED as a cause of death or a contributory factor."

Risk of Cardiac Arrhythmia from ECD:

1. (09/2011) Kroll M, Lakkireddy D, Rahko P, Panescu D. Ventricular Fibrillation Risk Estimation for Conducted Electrical Weapons: Critical Convolutions. Medline IEEE 2011.

    a. "CONCLUSIONS: Sophisticated published computer models have estimated the risk of ventricular fibrillation for conducted electrical weapons. A growing body of epidemiological data has now shown that these models produced over-estimates. With the use of male body habitus data, and correcting for the differences between swine and humans the models now give a theoretical VF

risk estimate of about 0.4 PPM or 1 per 2.5 million. This is consistent with the epidemiological findings to date."

2. (09/2011) Walcott G, Kroll M, Ideker R. Ventricular Fibrillation Threshold of Rapid Short Pulses. Medline IEEE 2011.

   "CONCLUSIONS: Over the range of pulse rates of 10-30 PPS, the capability of rapid short pulses to induce ventricular fibrillation is given by the aggregate current, which is the pulse charge multiplied by the pulse rate. The ability of rapid short pulses to induce VF is approximately equal to a 60 Hz AC current with an RMS current of 7.4 times the aggregate current of the rapid short pulses.

   This allows for the risk assessment of conducted electrical weapons by comparison to international electrical safety standards. The output of these weapons appears to be well below the VF risk limits as set by these standards."

3. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

   a. "[C]urrent research does not support a substantially increased risk of cardiac arrhythmia in field situations, even if the CED darts strike the front of the chest." Page viii.

   b. "There is currently no medical evidence that CEDs pose a significant risk for induced cardiac dysrhythmia in humans when deployed reasonably." Page 9.

   c. "The risks of cardiac arrhythmias ... remain low and make CEDs more favorable than other weapons." Page 10.

   d. "[E]xperiments using healthy human volunteers have found no cardiac dysrhythmias[9,10] ...following exposures less than 45 seconds." Page 27.

   e. "Swine studies involving exposure durations of 15 seconds or less are not associated with increased risks for ventricular fibrillation." Page 27.

4. (05/2011 Pasquier) Pasquier, M. Electronic Control Device Exposure - A Review of Morbidity and Mortality. Annals of Emergency Medicine May 2011.

   a. "[I]immediate induction of ventricular fibrillation does not seem to be a likely mechanism of electronic control device-associated death."

5. (01/2011 JEM) Vilke GM, Bozeman WP, Chan TC., Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the

Clinician. The Journal of Emergency Medicine, In Press, Corrected Proof, Position Paper Approved by the American Academy of Emergency Medicine Clinical Guidelines Committee.

a. "Results: There were 140 articles on CEWs screened, and 20 appropriate articles were rigorously reviewed and recommendations given. These studies did not report any evidence of dangerous laboratory abnormalities, physiologic changes, or immediate or delayed cardiac ischemia or dysrhythmias after exposure to CEW electrical discharges of up to 15 s."

b. "Studies have looked for dysrhythmias during and immediately after CEW use [1,11–14,19,20]. There have been no reports of ectopy, dysrhythmia, QT prolongation, interval changes, or other ECG changes immediately after CEW use. Additionally, studies have looked at delayed monitoring findings and there have been no changes in ECGs 60 min or longer post CEW use [13,17,20]."

c. "Echocardiograms during CEW use have also shown no abnormalities during activation to suggest electrical capture or structural cardiac damage [3,11]."

6. (04/2010 IACP) Electronic Control Weapons, Concepts and Issues Paper, International Association of Chiefs of Police (IACP) National Law Enforcement Policy Center, April 2010.

   a. "(04/10 IACP) [94 ECD] research papers were reviewed during the preparation of this document. Seven of these received financial support from a manufacturer. … The totality of information presently available suggests that [ECDs] do not create an increased risk of pacemaker malfunction, heart fibrillation, or death or serious injury, absent the legitimate concern of secondary injuries from falling down."

7. (09/2010 Biria) Biria M, Bommana S, Kroll M, Lakkireddy D., Multi-System Interactions of Conducted Electrical Weapons (CEW) - A Review, Engineering in Medicine and Biology Society Proceedings, Sept 2010:1266-1270.

   a. "There is no report of life threatening arrhythmia induction during application of these devices on healthy subjects. Based on these findings, CEW is considered safe from a cardiovascular stand-point."

8. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

a. “No evidence of dysrhythmia or myocardial ischemia is apparent, even when the barbs are positioned on the thorax and cardiac apex.”

9. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. “Experimental studies in human volunteers have found no cardiac dysrhythmias, ischemia, or necrosis after standard (5-second) or prolonged (15-second) conducted electrical weapon exposure.”

Targeting of ECD to Center Mass/Chest:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. “Law enforcement personnel are trained to target center body mass when using CEDs. TASER® International, Inc., (a major CED manufacturer) has recently recommended a change in target zone to below the chest. TASER® Bulletin 15 states, “By simply lowering the preferred target zone by a few inches to lower center mass, the goal of achieving Neuro Muscular Incapacitation (NMI) can be achieved more effectively while also improving risk management.”[39] The panel does recognize that CED use involving the area of the chest in front of the heart area is not totally risk-free; current research does not support a substantially increased risk of cardiac dysrhythmia in field situations from anterior chest CED dart penetrations.” Page 12.

2. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

    a. “No evidence of dysrhythmia or myocardial ischemia is apparent, even when the barbs are positioned on the thorax and cardiac apex.”

Epidemiological Studies – No Cardiac Arrhythmia:

1. (11/2009 Bozeman, Correspondence) Bozeman, W P., Additional Information on TASER [ECD] safety, Annals of Emergency Medicine, November 2009, Vol. 54, No. 5.

    a. "When this experience is combined with previous reports of medical outcomes after consecutive field use of conducted electrical weapons, including Eastman et al (n 426), Bozeman et al (n 1201), and a recent abstract by Angelidis et al (n 1101), there is a combined experience of 4,058 consecutively monitored conducted electrical weapon uses with an electrical shock delivered. Serious injuries are clearly rare, and there are no cases in any of the reports suggesting sudden cardiac death related to the [TASER ECD]."

2. (12/2009 Strote) Strote J, Walsh M, Angelidis M, Basta A, Hutson HR., Conducted electrical weapon use by law enforcement: an evaluation of safety and injury, J Trauma. May 2010; 68(5):1239-1246.

    a. "Conclusions: Significant injuries related to 6 years of law enforcement CEW use [1,001 individuals] in one city were rare. A large percentage of those subjected to CEW use had diagnoses of substance abuse and/or psychiatric conditions. Most admissions after CEW use were unrelated to law enforcement restraint."

3. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. "A three-year review of all Taser uses against criminal suspects at six law enforcement agencies found only three significant injuries out of 1,201 criminal suspects subdued by conducted electrical weapons (CEW), or Tasers, and reports that 99.75% of criminal suspects shocked by a Taser received no injuries or mild injuries only, such as scrapes and bruises. These weapons appear to be very safe, especially when compared to other options police have for subduing violent or combative suspects."

Prospective ECD Human Cardiac Studies:

1. (12/2011 VanMeenen) VanMeenen K, Lavietes M, Cherniack N, Bergen M, Teichman R, Servatius R., Respiratory and Cardiovascular Response During Electronic Control Device (ECD) Exposure in Law Enforcement Trainees. National Criminal Justice Reference Service. Dec 2011: 1-33.

a. “”**Conclusion.** This study examined the acute and longer term effects of ECD exposure in healthy volunteers exposed to the X26 as a component of their law enforcement training. There was no evidence that X26 exposure induced direct injury to cardiac and skeletal muscle tissue. For those with otherwise normal 12-lead ECG, exposure to the X26 did not persistently affect ECG morphology. For those with preexisting ECG abnormalities (9 of 101 subjects), 1 showed a NSST wave change in an increased number of leads post exposure, whereas another showed the development of inferior NSST wave changes after the X26 exposure.”

2. (06/2010 Moscati) Moscati R, Ho JD, Dawes DM, Miner JR. Physiologic effects of prolonged conducted electrical weapon discharge in ethanol-intoxicated adults. Am J Emerg Med. Jun 2010;28(5):582-587.

   a. “**Conclusions:** Prolonged continuous CEW exposure in the setting of acute alcohol intoxication has no clinically significant effect on subjects in terms of markers of metabolic acidosis. The acidosis seen is consistent with what occurs with ethanol intoxication or moderate exertion.”

3. (05/2010 Ho) Ho JD, Dawes DM, Reardon RF, et al. Human cardiovascular effects of a new generation conducted electrical weapon. Forensic Sci Int. May 26 2010. (Shot with ECD deployed probes.)

   a. “Conclusions: An apparent brief myocardial capture event occurred with the NGCEWv1. This device was not released and was redesigned. The NGCEWv2 appears to exhibit a reasonable degree of cardiac safety with frontal torso exposures and multiple probe combination configurations.”

4. (03/2010 Dawes) Dawes DM, Ho JD, Kroll MW, Miner JR. Electrical characteristics of an electronic control device under a physiologic load: a brief report. Pacing Clin Electrophysiol. Mar 2010;33(3):330-336.

   a. “**Conclusions:** The mean tissue resistance was 602.3 Ω in this study. There was a decrease in resistance of 8% over the 5-second exposure. This physiologic load is different than the 400 Ω laboratory load used historically by the manufacturer. We recommend future characterization of these devices use a physiologic load for reporting electrical characteristics. We also recommend that all the electrical characteristics be reported.”

5. (01/2010 Dawes) Dawes DM, Ho JD, Reardon RF, Miner JR. Echocardiographic evaluation of TASER X26 probe deployment into the chests of human volunteers. Am J Emerg Med. Jan 2010;28(1):49-55. (Shot with ECD deployed probes.)

a. "**Conclusion.** In agreement with 2 prior studies by these authors, the TASER X26 did not capture the myocardium when used with probe deployment, even in the cardiac electrical axis. These data are contrary to animal studies in which capture occurred. We recommend other investigators replicate our findings."

6. (07/2009 Bozeman) Bozeman W, Barnes D, Winslow J, et al. Immediate cardiovascular effects of the Taser X26 conducted electrical Weapon. Emerg Med J. 2009;26(8):567-570.

   a. "**Conclusion:** CEW exposure produced no detectable dysrhythmias and a statistically significant increase in heart rate. Overall, Taser CEW exposure appears to be safe and well tolerated from a cardiovascular standpoint in this population. This study increases the cumulative human subject experience of CEW exposure with continuous ECG monitoring and includes 28 full 5-s exposures."

7. (05/2009 Ho) Ho JD, Dawes DM, Heegaard WG, Calkins HG, Moscati RM, Miner JR. Absence of electrocardiographic change after prolonged application of a conducted electrical weapon in physically exhausted adults. J Emerg Med. May 12 2009.

   a. "**Conclusions:** Prolonged CEW application in an exhausted human sample did not cause a detectable change in their 12-lead ECGs. Theories of CEW induced dysrhythmia in non-rested humans are not supported by our findings."

8. (09/2008 Ho) Ho JD, Dawes DM, Reardon RF, et al. Echocardiographic evaluation of a TASER-X26 application in the ideal human cardiac axis. Acad Emerg Med. Sep 2008;15(9):838-844.

   a. "**Conclusions:** A 10-second ECD exposure in an ideal cardiac axis application did not demonstrate concerning tachyarrhythmias using human models. The swine model may have limitations when evaluating ECD technology."

9. (2007 Ho) Ho J, Reardon R, Dawes DM, Johnson M, Miner J. Ultrasound Measurement Of Cardiac Activity During Conducted Electrical Weapon Application In Exercising Adults: Fourth Mediterranean Emergency Medicine Congress (MEMC IV); 2007.

10. (2007 Ho) Ho J, Dawes D, Calkins H, Johnson M. Absence of Electrocardiographic Change Following Prolonged Application of a Conducted

Electrical Weapon in Physically Exhausted Adults. Acad Emerg Med 2007;14(5):128-129.

a. "**Conclusions:** Prolonged 15 second CEW application in a physically exhausted adult human sample did not cause a detectable change in their 12-lead ECGs. Theories of CEW induced dysrhythmias are not supported by our findings."

11. (06/2006 Ho) Ho J, Miner J, Lakkireddy D, Bultman L, Heegaard W. Cardiovascular and physiologic effects of conducted electrical weapon discharge in resting adults. Acad Emerg Med. Jun 2006;13(6):589-595.

a. "**Conclusions:** In this resting adult population, the TASER X26 CEW did not affect the recordable cardiac electrical activity within a 24-hour period following a standard five-second application. The authors were unable to detect any induced electrical dysrhythmias or significant direct cardiac cellular damage that may be related to sudden and unexpected death proximal to CEW exposure. Additionally, no evidence of dangerous hyperkalemia or induced acidosis was found. Further study in the area of the in-custody death phenomenon to better understand its causes is recommended."

ECDs Are Associated With Less Injury Than "Physical Force":

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

a. "[T]he relative risk of CED deployments appears to be lower than other use-of-force options." Page 3.

b. "The risks of cardiac arrhythmias or death remain low and make CEDs more favorable than other weapons." Page 10.

c. "All evidence suggests that the use of CEDs carries with it a risk as low as or lower than most alternatives." Page 24.

d. "CED use is associated with a significantly lower risk of injury than physical force, so it should be considered as an alternative in situations that would otherwise result in the application of physical force." Page 31.

2. (05/2011 Pasquier) Pasquier, M., Electronic Control Device Exposure - A Review of Morbidity and Mortality, Annals of Emergency Medicine, May 2011.

a. "Electronic control device use in the area of law enforcement is reported to reduce the risk of harm to both police officers and suspects, even compared with physical restraint."

3. (01/2011 CDC/CPSC) Haileyesus T, Annest JL, Mercy JA, Non-fatal conductive energy device-related injuries treated in US emergency departments, 2005-2008, Injury Prevention (2010). doi:10.1136/ip.2010.028704. Study funded by the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; with the assistance of the Division of Hazard and Injury Data Systems, US Consumer Product Safety Commission.

    a. "Of an average annual 75,000 suspects treated for non-fatal legal intervention injuries, 11% had injuries that were associated with the use of a CED or [TASER ECD]. ... Most suspects with CED-related injuries (93.6%) were treated and released from the hospital ED."

    b. "The estimated number of CED-related injuries treated in US hospitals increased substantially over the study period. This could be explained by the increased use of CEDs by police departments over this period and by officers following Police Executive Research Forum (PERF) guidelines to notify emergency medical service personnel and have the suspect medically evaluated after exposure to a CED discharge."

    c. Rates of injury (ROI) per 100,000 population included:

        – CED ROI 2.8 per 100,000 (95% CI was "1.4 to 4.2")
        – Physical contact w/officer ROI 17.6 per 100,000 (95% CI or 13.6 to 21.6)

    d. "The principal [CED injury] diagnoses were mostly puncture wounds (34.0%), contusions/abrasions (17.3%), foreign bodies (10.8%) and lacerations (6.8%)."

4. (10/2009 MacDonald) John M. MacDonald, Robert J. Kaminski, and Michael R. Smith, The Effect of Less-Lethal Weapons on Injuries in Police Use-of-Force Events, American Journal of Public Health, October 2009.

    a. "CEDs appear to be relatively safe when used on healthy individuals in clinically controlled research settings. Given the findings from this study, as well as those from previously published research, law enforcement agencies should encourage the use of OC spray or CEDs in place of impact weapons and should consider authorizing their use as a replacement for hands-on force tactics against physically resistant suspects. … Our findings suggest that the incidence of injuries from police use-of-force incidents can be reduced substantially when police officers use CEDs and OC spray responsibly and in lieu of physical force to control physically resistant suspects."

5. (01/2009 Hall Editorial) Hall CA., Public risk from tasers: Unacceptably high or low enough to accept?, Canadian Journal Emergency Medicine, Jan 2009; 11(1):84-86.

    a. “Despite the controversy surrounding taser use in North America, the question surrounding taser use should not be ‘Is it safe?’ but, rather, ‘Is it as safe as, or safer than, the alternatives?’”

No Evidence of Negative Effects With ECD Extended Duration Discharge:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. “The medical risks of repeated or continuous CED exposure beyond the durations studied in humans are currently unknown, and the role of CEDs in causing death is unclear in these cases.” Page 27.

2. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. “A rapidly evolving body of literature has examined a range of physiologic and cardiovascular effects of conducted electrical weapon exposure in human volunteers (Table 6). These studies, which include articles and published preliminary reports in abstract form, demonstrate no evidence of dangerous respiratory or metabolic effects using standard (5-second), prolonged (15-second), and extended (up to 45-second) conducted electrical weapon discharges.”

ECDs Reduce Use of Deadly Force:

1. (11/2011) Ready, Justin T., and White, Michael D., Exploring patterns of TASER [ECD] use by the police: an officer-level analysis, Journal of Crime and Justice, Vol. 34, No. 3, November 2011, 190–204.

    a. 67 (26.7%) of the 249 (of the 580 total) law enforcement officers who used the TASER ECD at least once in the field stated that they have used the ECD in a situation where they would have been legally justified in using deadly force (*i.e.* firearm).

2. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

a. "Studies by law enforcement agencies deploying CEDs have shown reduced injuries to both officers and suspects in use-of-force encounters and reduced use of deadly force. More recently, independent researchers have come to similar conclusions, when appropriate deployment and training policies are in place." Page VII.

3. (12/2010) Maryland Chiefs of Police Association, Maryland Sheriffs' Association, Agency Guidelines, For Use of Electronic Control Devices.

   a. "In addition, use of the ECD will often prevent the need to use a more serious level of force such as deadly force." Page 4, FN 4.

4. (12/2009) Report of the Maryland Attorney General's (Douglas F. Gansler's) Task Force on Electronic Weapons.

   a. "ECWs can reduce the incalculable human costs suffered when officers must use deadly force because a less-lethal option is unavailable." Page 19.

5. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

   a. "Most studies undertaken by law enforcement agencies (and others) indicate that deploying CEDs relative to other use-of-force options, such as pepper spray, physical force, police dogs, and batons, reduces injuries to officers and suspects and reduces the use of lethal force."

6. (11/2008) (Australia) The use of Taser weapons by New South Wales Police Force, A special report to Parliament under section 31 of the Ombudsman Act 1974.

   a. "In March 2008 findings from the inquest of the deaths of four young men who were shot dead by police were released by the Queensland State Coroner. In the findings, the coroner referred to the trial of T[ASER ECDs] by Queensland police, and the evaluation of the trial by the CMC. The coroner recognized that: [had] the officers involved in this incident had access to a [TASER ECD] they would have been deployed… [and] such deployment may have resulted in each of the incidents being resolved without anyone being killed." Page 29.

   b. "Police Commissioner Andrew Scipione stated that an increase in violent attacks on officers had prompted the extension. In addition, he stated: If this is but one option that gives the police officers in the streets of NSW some

alternative rather than to use deadly force, rather than to shoot somebody and killing them, then this is a good option." Page 38.

7. (06/2008 Eastman) Eastman, A.L., et al., Conductive electrical devices: a prospective, population-based study of the medical safety of law enforcement use, J Trauma, 2008, 64(6): p. 1567-72.

    a. “Law enforcement professionals are able to comply with CED policies of their agencies. Rational and supported CED policies allow for decreased uses of lethal force. … Police were compliant with policy in all cases, and, in addition to avoiding the use of lethal force in a significant number of circumstances [23 of 426 incidents, or 5.4%], the safety of CED use was demonstrated despite one death subsequently attributed to lethal toxic hyperthermia.”

8. (06/2008) (Canada) Breitkreuz, M.P., G. Chair. Study of the Conductive Energy Weapon–TASER®. Report of the Standing Committee on Public Safety and National Security. House of Commons, Canada, 39th Parliament, 2nd Session,

    a. "[T]he Committee agrees with the great majority of witnesses that the T[ASER] gun has its place in police work and that it can save lives during police interventions that would otherwise involve the use of deadly force." Page 13.

9. (07/2005) Sergeant Brian A. Bruce, Six Month T[ASER ECD] Study July 5, 2005, City of Columbus, Ohio Division of Police.

    a. "Based upon the study, there were fourteen [out of 172 (or 8.1%)] incidents where deadly force would have been justified where the [TASER ECD] was used." Page 7.

    b. "There were fourteen [out of 172 (or 8.1%)] incidents officers responded to where deadly force was justified, but officers were able to use time, distance, and barriers to deploy the [TASER ECD] as the response verse using deadly force to control the subjects."

10. (01/2005) Lieutenant Victor Wahl, TASER [ECD] Report, Madison (WI) Police Department (“MPD”).

    a. "A review of MPD T[ASER ECD] deployments shows that in six [out of 83 or 7.2%] cases it can fairly be said that the T[ASER ECD] deployment allowed officers to avoid having to utilize deadly force." Page 5.

    b. "Also, several of the instances in which T[ASER ECD] use was threatened or the T[ASER ECD] was displayed (but not deployed) involved armed subjects.

Those incidents easily could have rapidly escalated to deadly force encounters without the presence of the T[ASER ECD]." Page 6.

ECD Use in Hospital Setting:

1. (02/2010 Ho) Ho J, Clinton J, Lappe, M, Heegaard W, Williams M, Miner J., Introduction of the conducted electrical weapon into a hospital setting. J Emerg Med. Feb 1 2010.

    a. "**Conclusion:** CEW introduction into a health care setting demonstrated the ability to avert and control situations that could result in further injury to subjects, patients, and personnel. This correlates with a decrease in injury for hospital personnel. Further study is recommended for validation."

ECD Use on Mentally Ill Subjects:

1. (09/2007) Ho J, Dawes D, Johnson M, Johnson M, Lundin E, Miner J., Impact of conducted electrical weapons in a mentally ill population: a brief report. Am J Emerg Med. Sep 2007;25(7):780-785.

    a. "**Conclusion:** The mentally ill represents a significant portion of subjects upon whom CEWs are used. These data suggest frequent use of CEWs in situations where deadly force would otherwise be justified and in situations where subjects exhibit imminent danger to themselves. These data also suggest that escalation to deadly force was avoided in many mental illness and suicidal situations by the presence of a CEW."

ECD Use on Excited Delirium Subjects:

1. (02/2012 Vilke) Vilke GM, et al., Excited delirium syndrome (ExDS): Treatment options and considerations, Journal of Forensic and Legal Medicine (2012), doi:10.1016/j.jflm.2011.12.009.

    a. "Tactics used in the prehospital setting to control a patient in ExDS should revolve around patient and provider safety with rapid control and minimisation of the patient's exertional activity. The use of an electronic control device, such as a TASER® ECD, to gain control of a patient appears preferable to the more traditional and drawn out approach of going 'hands on', as fighting or heavy physical exertion has more of a deleterious effect on a patient's already tenuous acid-base status.[22-24] Thus, heavy exertion may make the patient more acidotic and contribute to a greater risk for sudden death compared with a short burst of electrical control and rapid restraint. Judicious restraint of the patient will prevent ongoing use of the large thigh and arm muscles, which

consume oxygen and contribute to acid-base disturbances. Containment and de-escalation where possible will minimise both stress and exertion."

2. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. "CED exposure may contribute to "stress," and stress may be an issue related to cause-of-death determination. All aspects of an altercation (including verbal altercation, physical struggle or physical restraint) constitute stress that may heighten the risk of sudden death in individuals who are intoxicated or who have pre-existing cardiac or other significant disease. Medical research suggests that CED deployment during restraint or subdual is not a contributor to stress of a magnitude that separates it from the other stress-inducing components of restraint or subdual." *Id*. at 19.

3. (12/2009 Ontario, Canada) Review of Conducted Energy Weapons Use in Ontario, Report of the Policing Standards Advisory Committee, Minister of Community Safety and Correctional Services, Ontario, Canada, December 11, 2009.

    a. (page 7) "In addition, seven inquest juries from Ontario during the period from 2005 to early 2009 recommended all front-line/primary response officers be authorized to use CEWs. The rationale for these recommendations stems from an acknowledgement that front-line officers may be in a position to facilitate a rapid resolution of violent situations without the use of lethal force and the situations in which a CEW is required are most often encountered by front-line/primary response officers. The presiding coroner of one of the inquests commented that:

        'Particularly where ED (excited delirium) may be involved, early control and restraint of the agitated subject will prevent possible serious consequences, and allow for earlier medical intervention and treatment…Use of a Taser, particularly in full deployment (probe) mode, has proven highly effective in gaining rapid control of subjects, avoiding prolonged and potentially dangerous physical confrontations.'"

6. (06/2008) Hagy D., Study of Deaths Following Electro Muscular Disruption: Interim Report. U.S. Department of Justice. Office of Justice Programs. June 2008.

    "CED technology may be a contributor to "stress" when stress is an issue related to cause of death determination. All aspects of an altercation (including verbal altercation, physical struggle or physical restraint) constitute stress that may represent a heightened risk in individuals who

have pre-existing cardiac or other significant disease. Current medical research suggests that CED deployment is not a stress of a magnitude that separates it from the other components of subdual." *Id*, at 3.

ECDs Reduce Suspect Injuries:

1. (07/2010 Smith) Smith M, Kaminski R, Alpert G, Fridell L, MacDonald J, Kubu B., A Multi-Method Evaluation of Police Use of Force Outcomes: Final Report to the National Institute of Justice: US Department of Justice, 2010.

    a. "Across 12 agencies and more than 25,000 use of force cases, the odds of a suspect being injured decreased by 70 percent when a CED was used. Controlling for other types of force and resistance, the use of CEDs significantly reduced the probability of injuries. In very rare cases, people have died after being pepper sprayed or shocked with a Taser, although no clear evidence exists that the weapons themselves caused the deaths."

2. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

    a. "Most studies undertaken by law enforcement agencies (and others) indicate that deploying CEDs relative to other use-of-force options, such as pepper spray, physical force, police dogs, and batons, reduces injuries to officers and suspects and reduces the use of lethal force."

3. (12/2008 Cincinnati, OH) Green, Saul A., Jerome, Richard B., Independent Monitor's Final Report, City of Cincinnati (Ohio).

    a. "The Monitoring Team also noted a significant decline in serious force-related incidents at this time. We attribute much of this decrease to the department-wide deployment of the Taser. Our review of use of force reporting and investigative files showed that the Taser replaced other types of force in the majority of incidents. Moreover, injuries to officers and citizens also declined." Page 36.

4. (12/2008 Butler) Chris Butler, Staff Sergeant, Calgary Police Service, Christine Hall, MSc MD FRCPC, Principal Investigator, RESTRAINT Study, Department of Emergency Medicine, Vancouver Island Health Authority, Police/Public Interaction: Arrests, Use of Force by Police, and Resulting Injuries to Subjects and Officers-A Description of Risk in One Major Canadian City (Calgary Police Services, Calgary, Alberta, Canada), Law Enforcement Executive Forum, 2008.

a. “The commonly held belief that the conducted energy weapon carries a significant risk of injury or death for the population of interest is not supported by the data. Within the force modality framework most commonly available to police officers, the CEW was less injurious than either the baton or empty hand physical control. Although the study used the intention to treat analysis, when we removed the incidents where the use of the CEW was unsuccessful (n = 14) (thereby requiring subsequent alternative force options-typically physical control), the safety profile of the CEW rose to 88.7% (i.e., no injury or minor injury to subjects only).”

5. (03/2009) Brewer J, Kroll M., Field Statistics Overview. In: Kroll M, Ho J, eds. *TASER Conducted Electrical Weapons: Physiology, Pathology, and Law*. New York City: Springer-Kluwer, 2009.

   a. “The injury reduction ranged from 24% to 82%. These were weighted by the number of CEWs. The weighted mean injury rate reduction was 64%. The 95% confidence bounds were 52–75%.”

6. (10/2007) Michael R. Smith, Robert J. Kaminski, Jeffrey Rojek, Geoffrey P. Alpert and Jason Mathis, The impact of conducted energy devices and other types of force and resistance on officer and suspect injuries, Policing: An International Journal of Police Strategies & Management, Vol. 30 No. 3, 2007, pp. 423-446.

   a. "CED use was associated with a 677 percent increase in the odds of suspects not being injured during use-of-force encounters. Thus, whereas hands on tactics significantly increased the risk of injury among both officers and suspects, CEDs significantly decreased the risk of injury to both groups." Page 437.

   b. "[T]he use of soft-hand tactics, hard-hand tactics, and canines by officers increased the odds of both minor and major injury to suspects, while the use of CEDs significantly decreased the odds of both types of injury." Page 437.

   c. "Given the minor nature of most injuries to officers and suspects, though, the substitution of OC spray or CEDs for hands-on control primarily will result in the prevention of bruises, abrasions, sprains, and the like. Balanced against this injury savings are the pain, irritation, and decontamination requirements associated with OC spray and the minor dart puncture wounds and rare complications associated with CEDs. Nonetheless, every use-of-force encounter carries with it the potential for serious injury and even minor injuries can result in the need for medical treatment or time lost from work. More importantly, the use of less lethal technologies from a stand-off distance may help to prevent the occasional serious injury that might otherwise occur from physical contact between officers and citizens. Consequently, the use of

CEDs or OC spray under these conditions makes the control of resistant persons safer for everyone." Page 440.

7. (07/2006) Jenkinson E, Neeson C, Bleetman A. The relative risk of police use-of-force options: evaluating the potential for deployment of electronic weaponry. J Clin. Forensic Med. Jul 2006;13(5):229-241.

    a. "We found officer injury rates associated with M26 deployment were lower than those for CS spray and baton use. Subject injury rates were lower in M26 deployment than in deployment of CS spray, batons or police dogs. We suggest that the M26 should be made more widely available to police officers in the UK."

ECDs Reduce Officer Injuries:

1. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

    a. “Most studies undertaken by law enforcement agencies (and others) indicate that deploying CEDs relative to other use-of-force options, such as pepper spray, physical force, police dogs, and batons, reduces injuries to officers and suspects and reduces the use of lethal force.”

2. (03/2009) Brewer J, Kroll M., Field Statistics Overview. In: Kroll M, Ho J, eds. *TASER Conducted Electrical Weapons: Physiology, Pathology, and Law*. New York City: Springer-Kluwer; 2009.

    a. “The reported officer injury rate reduction ranged from 20% to 100%. The injury reduction statistics were weighted by the number of CEWs. The weighted mean injury reduction was 63%. The 95% confidence bounds were 55–72%.”

3. (07/2006) Jenkinson E, Neeson C, Bleetman A. The relative risk of police use-of-force options: evaluating the potential for deployment of electronic weaponry. J Clin. Forensic Med. Jul 2006;13(5):229-241.

    a. "We found officer injury rates associated with M26 deployment were lower than those for CS spray and baton use. Subject injury rates were lower in M26 deployment than in deployment of CS spray, batons or police dogs. We suggest that the M26 should be made more widely available to police officers in the UK."

No Clinically Significant Biochemical/Physiologic Changes:

1. (05/2011 Pasquier) Pasquier, M., Electronic Control Device Exposure: A Review of Morbidity and Mortality, Annals of Emergency Medicine, May 2011.

    a. "According to the available results, the physiologic changes from electronic control device exposure appear to be safe in healthy individuals who undergo an exposure duration of 5 to 15 seconds, ie, the duration that corresponds to the majority of field exposures."

2. (01/2011 JEM) Vilke GM, Bozeman WP, Chan TC., Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the Clinician, The Journal of Emergency Medicine, In Press, Corrected Proof. Position Paper Approved by the American Academy of Emergency Medicine Clinical Guidelines Committee.

    a. "Results: There were 140 articles on CEWs screened, and 20 appropriate articles were rigorously reviewed and recommendations given. These studies did not report any evidence of dangerous laboratory abnormalities, physiologic changes, or immediate or delayed cardiac ischemia or dysrhythmias after exposure to CEW electrical discharges of up to 15 s."

3. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. "A rapidly evolving body of literature has examined a range of physiologic and cardiovascular effects of conducted electrical weapon exposure in human volunteers (Table 6). These studies, which include articles and published preliminary reports in abstract form, demonstrate no evidence of dangerous respiratory or metabolic effects using standard (5-second), prolonged (15-second), and extended (up to 45-second) conducted electrical weapon discharges."

    b. "Other studies of conducted electrical weapon exposure in combination with exercise designed to simulate the physiologic effects of fleeing from or struggling with police demonstrate changes in pH, lactate, and other markers comparable to that induced by exercise of the same duration."

No Clinically Significant CK Increase (Rhabodmyolysis) from ECD:

1. (03/2012 Kunz) S.N. Kunz, et al., Acute pathophysiological influences of conducted electrical weapons in humans: A review of current literature, Forensic Sci. Int. (2012), doi:10.1016/j.forsciint.2012.02.014.

    a. "In summary, recent medical research could not prove a direct link between CEWs and the development of rhabdomyolysis. Even though a modest increase in creatine kinase cannot be excluded, no clinical features were noted."

2. (03/2011 Dawes) Dawes DM, Ho JD, Sweeney JD, et al. The effect of an electronic control device on muscle injury as determined by creatine kinase enzyme. Forensic Sci Med Pathol. Mar 2011;7(1):3-8.

    a. "Although we cannot draw conclusions about the individual devices included in this analysis, our findings indicated that multiple contact points or exposures may result in a larger increase in CK, but the duration of the exposure does not appear to have a significant effect on CK. There is a correlation between the distance between the probes and the change in CK."

ECD Exposure Does Not Raise Blood Pressure:

1. Systolic and diastolic blood pressure has been evaluated before and after ECD exposure in 6 papers. The weighted average effect is for the systolic pressure to go down by 3.1 mmHg and diastolic pressure to go down by 2.6 mmHg.

Author	N	SBP1	SBP2	Delta	DBP1	DBP2	Delta
Dawes[49]	11	141.3	142.9	1.6	81.8	76	-5.8
Ho[50]	45	149	147	-2	86	83	-3
Ho[51]	12	139	141	2	88	84	-4
Bozeman[52]	28	138.6	145.8	7.2	82.8	85.6	2.8
Vilke[53]	25	139	128	-11	86	78	-8
Vilke[54]	32	139	128	-11	84	83	-1
Totals	153			-3.1			-2.6

ECD Induced Stress Comparable or Less Than Some Other Force Options:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. "In general, the stress of receiving CED discharge(s) should be considered to be of a magnitude that is comparable to the stress of other components of subdual. All aspects of an altercation (including verbal altercation, physical struggle or physical restraint) constitute stress that may heighten the risk of sudden death in individuals who have pre-existing cardiac or other significant disease." Page ix.

Breathing – Evidence Suggests ECD Increases Respiratory Parameters:

1. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

    a. "Research to date, however, shows that human subjects seem to maintain the ability to breathe during exposure to a CED. In fact most evidence suggests hyperventilation with an increase in respiratory rate, tidal volume, and minute

[49] Dawes DM, Ho JD, Reardon RF, Miner JR. The cardiovascular, respiratory, and metabolic effects of a long duration electronic control device exposure in human volunteers. Forensic Sci Med Pathol. Dec 2010;6(4):268-274.

[50] Ho JD, Dawes DM, Reardon RF, et al. Human cardiovascular effects of a new generation conducted electrical weapon. Forensic Sci Int. May 26 2010.

[51] Ho JD, Dawes DM, Nelson RS, et al. Acidosis and catecholamine evaluation following simulated law enforcement "use of force" encounters. Acad Emerg Med. Jul 2010;17(7):e60-68.

[52] Bozeman WP, Barnes DG, Jr., Winslow JE, 3rd, Johnson JC, 3rd, Phillips CH, Alson R. Immediate cardiovascular effects of the Taser X26 conducted electrical weapon. Emerg Med J. Aug 2009;26(8):567-570.

[53] Vilke GM, Sloane CM, Suffecool A, et al. Physiologic effects of the TASER after exercise. Acad Emerg Med. Aug 2009;16(8):704-710.

[54] Vilke GM, Sloane CM, Bouton KD, et al. Physiological effects of a conducted electrical weapon on human subjects. Ann Emerg Med. Nov 2007;50(5):569-575.

ventilation during CED exposure." Page 15.

b. "[E]xperiments using healthy human volunteers have found no ... respiratory dysfunction[11] following exposures less than 45 seconds." Page 27.

2. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

   a. "A rapidly evolving body of literature has examined a range of physiologic and cardiovascular effects of conducted electrical weapon exposure in human volunteers (Table 6). These studies, which include articles and published preliminary reports in abstract form, demonstrate no evidence of dangerous respiratory or metabolic effects using standard (5-second), prolonged (15-second), and extended (up to 45-second) conducted electrical weapon discharges."

ECD Effectiveness:

1. (06/2009 AMA) Carolyn B. Robinowitz, MD, Chair, Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® [Conducted Electrical Devices (CEDs)] by Law Enforcement Agencies (Reference Committee D), American Medical Association.

   a. "If deployed according to an appropriate use-of-force policy, and used in conjunction with a medically driven quality assurance process, Taser use by law enforcement officers appears to be a safe and effective tool to place uncooperative or combative subjects into custody."

2. (09/2008 Mesloh) (NIJ funded study) Mesloh, Wolf, Henych & Thompson, Less Lethal Weapons for Law Enforcement: A Performance-Based Analysis, Law Enforcement Executive Forum, 2008.

   a. "TASERs play an important role in law enforcement. This research and this report show that electric weapons are deployed more frequently than other less-lethal weapons and tactics, but they also appear to enjoy higher success rates in conflict resolution. This success in bringing officer/suspect confrontations to an end is invaluable as it has the effect of reducing injuries to all persons in the conflict. ... The fact that TASERs offer society the best 'set phasers on stun' solution currently available makes them extremely appealing to police in use-of-force situations. Added to this are the many safeguards implemented by TASER International to identify when and where a TASER has been discharged. These electronic and physical tracking

safeguards highly discourage improper use. In a police use of force confrontation, the most humane weapon or tactic would be one in which the resultant injury would be the least severe. While TASERs are not injury free (puncture wounds from dart probes, or skin burns from drive stuns), the alternative (broken bones from batons, burning pain from pepper spray, and potential death from firearm) makes them a preferential choice. Clearly this research has shown that electric weapons are very effective at ending conflict situations quickly, this in turn leads to less injuries to both suspects and officers."

Cognitive Effects:

1. (06/05/2009) John Criscione, Ph.D., M.D., An Independent Assessment of the Physiological and Cognitive Effects from the X-26 TASER® Device in Volunteer Human Subjects, Final Report.

    a. A few quotes:

        (1) "A majority of subjects were able to hear commands given both during (90.6%) and after (96.9%) exposure."

        (2) "87.5% believed they would be unable to follow simple orders, had they been provided (e.g. raising arms)."

        (3) "A reported 80.6% of subjects claimed to regain control within one second after exposure ceased."

        (4) "Mean response time to execute the test once exposure ended was 1.14 (±0.85) seconds …"

        (5) "Subjects were able to retain consciousness, hearing and vision capabilities before, during and after application."

    b. "Psychomotor function was evaluated by measuring the time elapsed between the onset of X-26 TASER® exposure and first switchbox trigger event. Response times to execute the button-press task are shown in Figure 2. Figure 2 (a) corresponds to the audio stimulus button-press response times (n=7); a reduced number but sufficient for characterizing the baseline response because of tight grouping of the data, and consultation with a statistician has confirmed that this data has sufficient power to establish confidence. Mean baseline response time of the control set was 0.98 (±0.25) seconds. Figure 2 (b) depicts a distribution of the response times to execute the psychomotor task in the presence of the X-26 TASER® stimulus (n=30). Two subjects were excluded due to data acquisition failures. Mean response

time with the X-26 TASER® exposure was 6.06 (±0.91) seconds; two subjects were able to execute the task during the exposure period; response times for these individuals were 2.56 seconds and 4.59 seconds. A comparison of the response times for these two groups is shown in Figure 2 (c). The average time taken to press the button after start of X-26 TASER® stimulus minus the average time taken to press the button after start of audio stimulus is 5.08 seconds which is roughly equal to the duration of TASER stimulus (5 sec)."

c. "Mean response time to execute the test once exposure ended was 1.14 (±0.85) seconds and is shown in Figure 3 (b) (n=30). The negative time delays correspond to the two subjects able to trigger the switchbox before the five-second application ended. Figure 3 (c) compares the data with baseline. The average difference in response time from baseline is 0.16 seconds. The ability to press the button after the X-26 TASER® stimulus ended is roughly the same as the ability to press the button after an audio stimulus."

d. "The interviews conducted immediately following exposure contain information on the sensory and behavioral effects of X-26 TASER® exposure. Results are summarized in Table 3. Immobility and pain were the most common terms used to describe the sensation of exposure. Thoughts during exposure were primarily of the pain and tolerating the application, while those afterwards were of task completion and relief. Seventy five percent of subjects reported being conscious of their surroundings; 90.6% retained hearing capabilities and 81.3% maintained vision capabilities (five subjects closed their eyes during). A majority of subjects were able to hear commands given both during (90.6%) and after (96.9%) exposure. 71.9% of participants were unable to control their actions during X-26 TASER® exposure; 87.5% believed they would be unable to follow simple orders, had they been provided (e.g. raising arms). A reported 80.6% of subjects claimed to regain control within one second after exposure ceased."

e. "45.2% of the study population asserted that exposure would render them incapable of concentrating on the execution of a hypothetical attack during exposure; 32.2% believed it would be possible provided with an external cue or prompt. One subject claimed to have control of his actions during exposure. Eight subjects reportedly retained partial control of their actions. Had they had been attacked by someone prior to X-26 TASER® application, 96.9% of participants believed they would fail in task execution."

ECD Research Produces Consistent Findings (TASER versus others):

1. (01/2009 Bozeman) Bozeman W, II WH, Heck J, Graham D, Martin B, Winslow J., Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officer Against Criminal Suspects, Annals of Emergency Medicine, January 2009.

    a. "Findings from independent investigations have been concordant with those performed with industry support."

2. (03/24/2008) Report of the Fifth International Law Enforcement Forum for Minimal Force Options and Less-Lethal Technologies, Washington & Fairfax, November 2006, International Law Enforcement Forum.

    a. "It is important to note that TASER International [,Inc.] is the leader in the development and manufacture of CEDs. The ILEF recognizes that this vendor has invested in and conducted exhaustive research in order to increase device effectiveness as a tool for law enforcement while minimizing injury to subjects. Additionally, they have cooperated with and supported both government and independent researchers to continue to grow the body of knowledge on these systems. The ILEF views this open and responsible approach to research and testing as a model for other manufacturers to emulate." Page 38.

TASER ECD Operational Information

X26 ECD Log Shows Only Discharges Not Delivered Charge:

1. *Hoyt v. Cooks*, 672 F.3d 972 (C.A.11 (Ga.), Feb. 27, 2012).

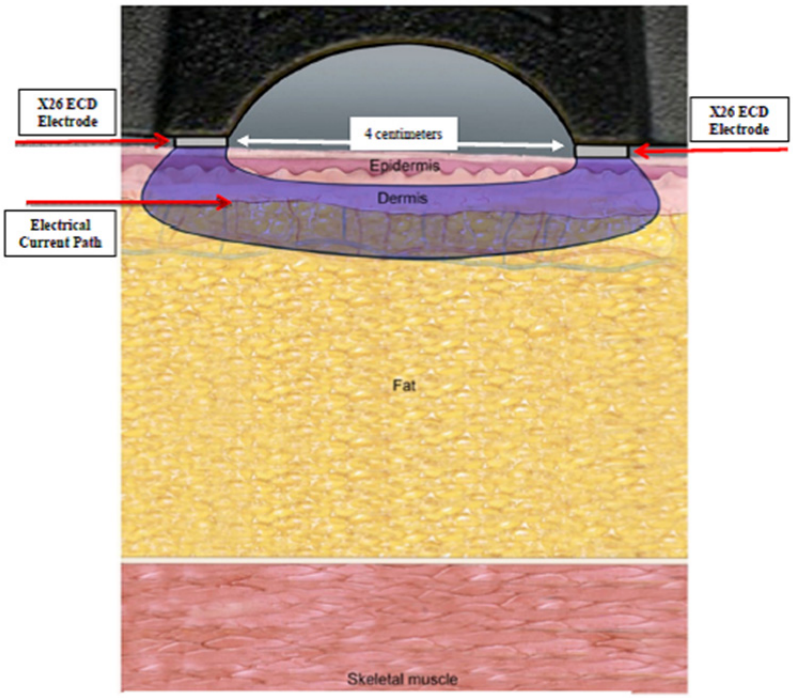
    a. "The record shows that an 'activation' of the T[TASER ECD] does not mean that the T[ASER ECD] actually touched or stunned Allen." *Hoyt*, 672 F.3d at 976.

2. *Skelly v. Okaloosa County, Fla. Bd. of County Commissioners*, 2010 WL 1192515 (N.D.Fla. Mar 22, 2010), *order vacated by*, *Skelly v. Okaloosa County Bd. of County Com'rs*, 415 Fed.Appx. 153 (11th Cir.(Fla.) Feb 17, 2011), *after appeal remand*, *Skelly v. Okaloosa County Bd. of County Com'rs*, 456 Fed.Appx. 845 (11th Cir.(Fla.) Feb 03, 2012).

    a. "[TASER ECD] log shows only device activation; it does not represent that a shock was actually delivered to a body nor does it distinguish between probe deployment and drive stun."

M26/X26 ECD Drive-Stun Effects:

1. X26 ECD drive-stun mode graphic illustration depicting path and depth of delivered electrical charge based upon finite-element modeling. [Graphic was mentioned in *Glowczenski v. TASER International, Inc.*, 2012 WL 976050, 2012 U.S. Dist. Lexis 39438 (E.D.N.Y. March 22, 2012). "After viewing an exhibit showing the flow of electrical charge from a T[ASER X26 ECD] in drive stun mode, which showed that the charge does not penetrate the dermal fat layer into the skeletal muscle of the recipient, and which [Dr. William] Manion [forensic pathologist and attorney] agreed was a “fair representation,” ..." *Id.* pg. 14.]



2. *Hoyt v. Cooks*, 672 F.3d 972 (C.A.11 (Ga.), Feb. 27, 2012).

   a. “Cooks said that he had stunned Allen once with the probes and two times in dry stun mode, although his T[ASER X26 ECD’s] data download showed that the device had been activated twelve times. Harkleroad said that he had stunned Allen three times in dry stun mode, but his T[ASER X26 ECD’s] data download showed that it had been activated six times. The record shows that an “activation” of the T[TASER ECD] does not mean that the T[ASER ECD] actually touched or stunned Allen. In any event, the more significant fact is that Allen was tased only once in the prong mode, and that all subsequent tasings were in the dry stun mode.” [*Hoyt*, at 976].

   b. FN4. “Dry stun mode” is also known as “drive stun mode.” Plaintiffs' expert described the difference between the probes and dry stun:

> The [Taser] was classified as an electro-muscular disruptor when used to fire small probes attached to the weapon with thin wires because, in that mode, it overrides the central nervous system and makes muscle control impossible. The TASER can also be used as a pain compliance weapon in what is called the "drive stun" mode. In the "drive stun" mode, the weapon is pressed against a person's body and the trigger is pulled resulting in pain (a burning sensation) but the "drive stun" mode does not disrupt muscle control. [*Hoyt*, at 976].

c. "FN5. As discussed below, the record in this case reveals a stark contrast between the prong mode (which overrides the central nervous system and disrupts muscle control) and the much less serious [drive] stun mode (which results merely in pain, a burning sensation)." [*Hoyt*, at 976].

3. (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011.

   a. "Risk of ventricular dysrhythmias is exceedingly low in the drive-stun mode of CEDs because the density of the current in the tissue is much lower in this mode." Page 10.

   b. "**Conclusions and Recommendations:** The "drive-stun" or contact mode of CED use is a pain compliance procedure, and does not cause muscular incapacitation enabling restraint. Some sources indicate that people suffering from excited delirium are relatively insensitive to pain as a result of their condition. Some reports from law enforcement reinforce this view, because there are individuals who do not appear to be affected by the pain associated with CED exposure. Thus, "drive-stun" mode and other pain compliance methods should not be repeated in these individuals if they are found to have little or no initial effect." Page 22.

4. (05/2011 Pasquier) Pasquier, M., Electronic Control Device Exposure- A Review of Morbidity and Mortality, Annals of Emergency Medicine, May 2011.

   a. "The gun can also be used as a contact device whereby the darts are not fired, but rather the 2 metal darts make direct contact with a person's body, in what police call a "drive stun." With this method, the shock is delivered directly to the subject and the main effect is therefore not neuromuscular incapacitation, but a painful stimulus.[17,21]"

5. (01/2011 JEM) Vilke GM, Bozeman WP, Chan TC., Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the

Clinician. The Journal of Emergency Medicine, In Press, Corrected Proof, Position Paper Approved by the American Academy of Emergency Medicine Clinical Guidelines Committee.

a. *Recommendation 3: Evaluation after Use of CEW in Drive Stun or Touch Stun Mode Level of recommendation: Class B.* For patients who have undergone drive stun or touch stun CEW exposure, medical screening should focus on local skin effects at the exposure site, which may include local skin irritation or minor contact burns. This recommendation is based on a literature review in which thousands of volunteers and individuals in police custody have had drive stun CEWs used with no untoward effects beyond local skin effects.

b. "Conclusions ... Among patients who had a CEW activation in drive stun or touch stun mode, evaluation should focus on skin manifestations, which are typically limited to surface burns, also called signature marks."

6. The 9th Circuit *en banc* decision of *Mattos v. Agarano*, 661 F.3d 433 (9th Cir., Oct. 17, 2011) (that included the combined *Brooks v. Seattle* case).

   a. *Mattos v. Agarano*, 661 F.3d 433 (9th Cir., Oct. 17, 2011) included:

      (1) "When a [TASER X26 ECD] is used in drivestun mode, the operator removes the dart cartridge and pushes two electrode contacts located on the front of the [TASER ECD] directly against the victim. In this mode, the [ECD] delivers an electric shock to the victim, but it does not cause an override of the victim's central nervous system as it does in dart-mode." *Mattos*, 661 F.3d at 443.

      (2) The Ninth Circuit declined to determine what level of force specifically is used when a [TASER X26 ECD] is used in drive-stun mode. *Mattos*, 661 F.3d at 443.

   b. [**Superseded – no longer good law**] *Mattos v. Agarano*, 661 F.3d 433 (9th Cir., Oct. 17, 2011) *superseded Brooks v. City of Seattle*, 599 F.3d 1018 (C.A.9 (Wash) March 26, 2010) which stated in part (***since it was superseded this is NOT good law***):

      (1) Drive stun quantum of force less than "intermediate" *Brooks,* 599 F.3d at 1028.

      (2) "The [ECD]'s use in 'touch' or 'drive-stun' mode-as the Officers used it here-involves touching the [ECD to the body and causes temporary, localized pain only." *Id. a*t 1026.

(3) "The use of the [ECD] in drive-stun mode is painful, certainly, but also temporary and localized, without incapacitating muscle contractions or significant lasting injury." *Id. a*t 1027.

7. **General Description of ECD firing modes:** The ECD can be used primarily in one of two ways. In probe or dart mode, it fires two projectiles that are designed to penetrate the suspect's skin and deliver a continuous charge of electricity across the area between the probes, capturing the muscle nerves and causing some degree of neuromuscular incapacitation. *See, e.g., Neal-Lomax v. Las Vegas Metro. Police Dept.*, 574 F. Supp. 2d 1170, 1176 (D. Nev. 2008) *aff'd*, 371 F. App'x 752 (9th Cir. 2010) (explaining mechanics of the TASER X26 ECD). In its other capacity, however, when the probe or dart cartridge is removed, or an expended cartridge is in place the ECD becomes a simple stun gun. *Id.* This is often referred to as using the ECD in "drive-stun" mode. *Id.*; *Neal-Lomax*, 574 F. Supp. 2d at 1176. "Drive stunning does not incapacitate or damage a suspect, but it does cause pain . . . ." *Ellis v. Columbus City Police Dept.*, CIVA 1:07CV124SASAA, 2009 WL 3347300, n. 2 (N.D. Miss. Oct. 14, 2009). In drive-stun mode, the ECD must be "physically placed in contact with the person and discharged. . . . . The drive stun mode is used for pain compliance and works only on the area of the body to which the [ECD] is applied." *Neal-Lomax*, 574 F. Supp. 2d at 1176. When applied in drive-stun mode, the ECD does not typically remain in contact with the subject during the entire duration of the discharge due to the subject already struggling against the officers and his reaction to the ECD, causing it to bounce in and out of contact with him.

8. *Michael Imp v. Chris Wallace, et al.*, CV-1-509, 2011 WL 4396941 (D.Minn. Sept. 21, 2011).

   a. Page 12: "FN 10. An X-26 Taser used in drive-stun mode directly contacts the subject without deployment of the darts. See Baker Aff. Ex. C, at 20 (expert report of Joshua Lego); McKenney v. Harrison, 635 F.3d 354, 364 (8th Cir. 2011) (Murphy, J., concurring) (citing Bryan v. MacPherson, 630 F.3d 805, 826 (9th Cir. 2010) (Wardlaw, J., concurring in denial of rehearing en banc). In dart mode, a taser penetrates the skin and causes neuro-muscular interruption (NMI). See Baker Aff. Ex. C, at 20; see McKenney, 635 F.3d at 364. NMI causes the subject to lose control of his muscles, which can lead to injuries from falling while paralyzed. See McKenney, 635 F.3d at 364; Bryan, 630 F.3d at 824. In contrast, drive-stun mode causes a painful stimulus but does not lead to NMI. Baker Aff. Ex. C, at 20; McKenney, 635 F.3d at 364. As a result, a taser in drive-stun mode is more than trivial force, but it is a less intrusive — and less risk-laden — use of force than a taser in dart mode."

Drive Stun: Movement, Multiple Locations:

1. *Hoyt v. Cooks*, 672 F.3d 972 (C.A.11 (Ga.), Feb. 27, 2012).

    a. “The record shows that an ‘activation’ of the T[TASER ECD] does not mean that the T[ASER ECD] actually touched or stunned Allen.” *Hoyt*, 672 F.3d at 976.

2. *Glowczenski v. TASER International, Inc.,* 2012 WL 976050, 2012 U.S. Dist. Lexis 39438 (E.D.N.Y. March 22, 2012).

    a. “According to [TASER], each ECD trigger pull activates a 5 second cycle, but when in drive stun mode, it delivers an electrical charge only for the time that it is in direct contact with the skin.”

3. *Neal-Lomax v. Las Vegas Metro. Police Dept.*, 574 F. Supp. 2d 1170, 1176 (D. Nev. 2008) *aff'd*, 371 F. App'x 752 (9th Cir. 2010).

    a. When applied in drive-stun mode, the ECD does not typically remain in contact with the subject during the entire duration of the discharge due to the subject already struggling against the officers and his reaction to the ECD, causing it to bounce in and out of contact with him. *Neal-Lomax*, 574 F. Supp. 2d at 1176.

4. *Green v. Garris*, 2008 WL 2222321, 2008 U.S. Dist. LEXIS 42302, *27 (M.D. Fla. 2008).

    a. “In Green's case, the electrodes skipped along the skin-causing the [TASER ECD] to come in contact with the body more than once during the same drive stun. The contact marks (these are not true “burns”) shown in the photographs attached to Green's complaint are consistently normal with the use of a [TASER ECD] in the drive stun mode. Often an officer does not have a choice in the location of the electrodes' contact with the attacker's body.”

5. *Buckley v. Haddock*, Not Reported in F.Supp.2d, 2007 WL 710169 (N.D.Fla., March 6, 2007), *reversed by*, *Buckley v. Haddock*, 292 Fed.Appx. 791 (C.A.11 (Fla.), Sept. 9, 2008).

    a. See video of incident showing three (3) X26 ECD drive stun cycles with each five (5) second cycle delivered with intermittent body contact and to different parts of the body. Thus, multiple ECD application locations per five (5) second cycle.

50,000 Volts Delivered to Body Myth:

1. (03/2010 Dawes) Dawes DM, Ho JD, Kroll MW, Miner JR, Electrical characteristics of an electronic control device under a physiologic load: a brief report, Pacing Clin Electrophysiol, Mar 2010;33(3):330-6.

    a. "**Results:** For the eight subjects, the mean spread between top and bottom probes was 12.1 inches (30.7 cm). The mean resistance was 602.3 Ω with a range of 470.5–691.4 Ω. The resistance decreased slightly over the 5-second discharge with a mean decrease of 8.0%. The mean rectified charge per pulse was 123.0 μC. The mean main phase charge per pulse was 110.5 μC. The mean pulse width was 126.9 μs. The mean voltage per pulse was 580.1 V. The mean current per pulse was 0.97 A. The average peak main phase voltage was 1899.2 V and the average peak main phase current was 3.10 A."

2. *Michael Imp v. Chris Wallace, et al.*, CV-1-509, 2011 WL 4396941 (D.Minn. Sept. 21, 2011).

    a. Page 7: "FN 8. Imp misunderstands voltage. First, voltage is a measure of electric potential per unit charge and is only meaningful in the context of current. While "50,000 volts" may sound frightening, any child whose hair stands on end while touching a low-current Van de Graff generator observes that an electric potential of even hundreds of thousands of volts does not necessarily cause shock or injury. Moreover, voltage is not additive with each taser contact: applying the taser ten times does not mean that Imp had "500,000 volts of electricity being shot into him." Pl.'s Mem. Opp'n 2–3. Lastly, even if relevant, the record and video support two taser deployments, not ten."