



### **E46 The Physiologic Effects of a TASER® Conducted Electrical Weapon (CEW) as a Function of Probe Spread**

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The goal of this presentation is to understand how the spread between the probes of a TASER® CEW affects human physiology.

This presentation will impact the forensic science community by discussing how forensic investigators may have to assign relative weights to contributions of particular arrest variables in the cause of death. Most of the literature on CEWs involves large-spread exposures. This is a pilot study that shows the CEW probe spread needs to be considered in examining its relative effect on physiology.

Forensic Examiners (FE) may be presented with an Arrest-Related Death (ARD) case that involves many confounding variables, including suspect-and law enforcement -related variables. Legal proceedings may rely on the opinion of the FE on the relative contributions of the variables on the death. The purpose of this presentation is to review a recently performed pilot study examining the physiologic effects of a TASER® X26 CEW as a function of probe spread.

Previously published work has shown that the two most important variables in the effectiveness of the CEW are the region of the probes (muscle groups are stimulated) and the spread between the probes (number of motor nerves stimulated). Most of the published physiologic research utilized large-spread exposures (typical training exposures); however, in field use, exposures range from “drive stuns” (touching the metal contact points to the suspect) through a range of spreads. A New York Police Department study found an average deployment of 5.5 feet, resulting in a spread of about nine inches. In encounters in which multiple CEW deployments occur, it is not uncommon for these to be lower spread, less effective exposures. Recently, while a basic understanding of the physiology of CEWs could guide the FE in determining the relative contribution of the CEW exposures on the subject’s physiology, there has been no research specifically examining the physiologic effects as a function of spread.

A pilot study examined the effect of a five-second TASER® X26 CEW on pH, lactate, catecholamines, and vital signs using back exposures with variable spreads: (1) a “drive stun”; (2) 1.5 inches; (3) 6 inches; and, (4) 20 inches. No significant changes in pH or vital signs were found with any of the exposures. With lactate, there was no change with the “drive stun” but small, statistically significant changes with the other spreads with a trend toward the change increasing with an increasing spread. There was no statistical difference between the groups in the change in catecholamines and no clear trend. Four subjects performed an additional 30-second exercise regimen. The pH and lactate for these subjects was significantly different from the five-second CEW exposures (median pH 7.28 v 7.34; median lactate 5.09 v 1.86). These subjects did not have catecholamines drawn with the exertion regimen. While the study is limited and only a pilot, there appears to be a greater effect on some physiologic measures as the spread increases. The effects of a 30-second exertion regimen are significantly greater than the five-second TASER® CEW exposure. This data is important for the FE to understand when evaluating an ARD case involving multiple variables.

#### **CEW, TASER®, Physiologic Effects**