

## Letter to the Editor

### Acidosis, lactate, electrolytes, muscle enzymes, and other factors in the blood of *Sus scrofa* following repeated TASER® exposures

*Keywords:* Electronic weapons; Acidosis; TASER; In custody deaths; Restraint asphyxia

*To the Editor,*

In Jauchem et al.'s recently published report of the study they performed "to investigate effects of repeated exposures of TASER International's Advanced TASER X26 on muscle contraction and resultant changes in blood factors" [1], the authors identified the fact that TASER exposure caused rested and anesthetized pigs to suffer:

- (a) "severe acidemia" for at least an hour after TASER exposure,
- (b) "increases in hematocrit, potassium, and sodium" for at least 30 min after TASER exposure,
- (c) "significantly decreases" oxygen saturation "immediately after [TASER] exposure" that "returns to pre-exposure levels within 30 min."

Please know that I consider Jauchem et al.'s study findings to be an incredibly important contribution to those seeking an honest and unbiased answer to the question, "Can TASERS kill?" And, I fully appreciate the substance of the statement Jauchem et al. published within their report's "Introduction": "The current study was not intended to fully address the suitability of employment of electro-muscular incapacitating devices, but rather to obtain initial data on effectiveness and any immediate health effects."

However, I am extremely concerned about the manner in which the report's "Conclusion" was written and worded. Because it lacks a "conclusively" specific statement to the contrary, I worry that some individuals may misinterpret the study's conclusion, and subsequently misrepresent the study's findings as having shown that "It is doubtful" that a human being subjected to TASER exposure would be caused to suffer "any serious health consequences."

It is a fact that law enforcement personnel are not legitimately allowed to subject a human being to TASER exposure unless the target individual is acting in a manner that strongly suggests that she/he presents a serious danger or threat to her-/himself or others, and the target individual fails to

respond to repeated verbal cues to stop her/his dangerous or threatening activity [2].

It is a fact that all human beings who legitimately qualify for subjection to TASER exposure have engaged in extremely exertive physical activity for an unknown period of time (minutes-to-hours) prior to TASER exposure [2–4]. Certainly, rested and anesthetized human beings have never been (and never will be) legitimately subjected to TASER exposure in "real life" situations.

It is a fact that many human beings who have been subjected to TASER exposure were TASED more than once during the incident that generated the TASER exposure. A single collection of 167 TASER exposure incidents associated with death (documented by one reporter, with access to a limited number of US states and Canadian provinces), that occurred between September of 1999 and January of 2006, clearly and specifically described at least 97 cases (59%) wherein the victim was TASED more than once [3]. Several of those cases specified that the victim was TASED anywhere from "6" to "10" times. One case (#152) specified that the victim was TASED "19" times! The average number of times that these individuals were TASED cannot be calculated, however, because the actual number of TASER exposures were not reported in all of the 167 cases. Many cases simply documented "repeated" or "multiple" TASER exposures. Furthermore, some cases were entirely non-specific as to whether or not the individual was TASED more than once. (Those cases were not included when calculating the cases wherein the victim was specifically described as having been TASED more than once.)

From that same TASER exposure case collection, it can also be reasonably considered a fact that a person who is TASED – even only once – frequently can continue to struggle and engage in extremely exertive physical activity after the TASER exposure [3]. Continued struggle after TASER exposure occurred in the vast majority of the 167 cases documented.

Lastly; it is a fact that many "excited delirium" victims who died due to restraint asphyxia demonstrated severe acidemia (with associated potassium level elevation), even when a

TASER was *not* employed during the struggle and forceful manner of restraint that commonly accompanied the effort required to take them into law enforcement “custody” – or to transport them to a care-provision facility – or to “control” their dangerous behavior within a care-provision facility [5–11].

Considering these facts, I would deeply appreciate it if Jauchem et al. would answer the following four simple questions related to their opinion of the most reasonable human-application-interpretation of their important study findings regarding the effects of TASER exposure on rested and anesthetized *Sus Scrofa* muscle contraction and resultant changes in blood factors:

- (1) Your study showed that rested and anesthetized pigs suffered “severe acidemia” for at least an hour after TASER exposure. If a human being had been excessively exerting her-/himself for an unknown period of time (minutes-to-hours) prior to even only one TASER exposure, is it not reasonable to anticipate that the human being would exhibit significantly greater acidemia after being TASED than the level suffered by rested and anesthetized pigs? *If NOT, why not?*
- (2) Your study showed that rested and anesthetized pigs suffered “increases in hematocrit, potassium, and sodium” for at least 30 min post-TASER exposure. If a human being had been excessively exerting her-/himself for an unknown period of time (minutes-to-hours) prior to even only one TASER exposure, is it not reasonable to anticipate that the human being would exhibit significantly greater increases in hematocrit, potassium, and sodium after being TASED than the level suffered by rested and anesthetized pigs? *If NOT, why not?*
- (3) Your study showed that rested and anesthetized pigs suffered “significantly decreased” oxygen saturation “immediately after [TASER] exposure,” even though the pigs were not subjected to a position that interfered with their ability to breathe before, during, or after TASER exposure. If a human being had been excessively exerting her-/himself for an unknown period of time (minutes-to-hours) prior to even only one TASER exposure, and was immediately thereafter restrained in a manner that might cause her/him to experience difficulty breathing, is it not reasonable to anticipate that a human being would exhibit a significantly greater decrease in oxygen saturation than the level suffered by rested, anesthetized, and well-ventilated pigs? *If NOT, why not?*
- (4) Did your study findings conclusively demonstrate that one or more TASER exposures would likely have NO “serious health consequences” for a human being who was acting in a manner that legitimately allowed her/him to be subjected to TASER exposure during “real life” situations wherein the TASER was employed? *If NOT, why not?*

I believe that if Jauchem et al. clearly and completely answer these four simple questions (especially question #4), their

answers will adequately and effectively prevent misinterpretation and misrepresentation of their study’s very important findings.

And, I trust that others will agree that it is important for Jauchem et al. to do so.

Thank you for your attention.

## References<sup>1</sup>

- [1] J.R. Jauchem, C.J. Sherry, D.A. Fines, M.C. Cook, Acidosis, lactate, electrolytes, muscle enzymes, and other factors in the blood of *Sus scrofa* following repeated TASER<sup>®</sup> exposures, *Forensic Sci. Int.* 161 (1) (2006) 20–30.
- [2] Police Executive Research Forum. PERF conducted energy device policy and training guidelines for consideration, October 25, 2005. [http://www.policeforum.org/upload/PERF-CED-Guidelines-Updated-10-25-05%5B1%5D\\_715866088\\_1230200514040.pdf](http://www.policeforum.org/upload/PERF-CED-Guidelines-Updated-10-25-05%5B1%5D_715866088_1230200514040.pdf).
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- [4] Taser International “Memorandum of Law.” May 3, 2004: <http://www.taser.com/documents/memorandumoflaw.doc>.
- [5] J.L. Hick, S.W. Smith, M.T. Lynch, Metabolic acidosis in restraint-associated cardiac arrest: a case series, *Acad. Emerg. Med.* 6 (1999) 239–243 [This is a reference cited within Jauchem et al.’s *Forensic Sci Int* report: #39].
- [6] The Estate of Billy G. Bennett, Jr. v. City of Oklahoma City, Oklahoma; a political subdivision of the State of Oklahoma; et al. The United States District Court, Western District of Oklahoma. Case No. CIV-02-1220F.
- [7] Baby Leavy, et al. vs. City of Janesville, et al. The United States District Court, Western District of Wisconsin; Case No. 05-C-0402-S.
- [8] Boyer v Albuquerque Ambulance, The City of Albuquerque, et al. The United States District Court, District of New Mexico; No. CV-03-997 JH/WDS.
- [9] The Estate of Mary Giannetti vs The City of Stillwater; Norman McNickle, Stillwater Chief of Police; Stillwater Police Officers Lindell Miller, Scott Whitley, and Bruce McDougal: In The United States District Court, Western District Of Oklahoma; CASE NO. CV-04-926-B.
- [10] Rodriguez v. Laredo Medical Center, et al; Webb County, Texas, District Court; 111th Judicial District; Case No. 2005-CVQ-001138-D2.
- [11] Jacquelyn Singleton and the Estate of Ivory Singleton et al. v. Sheriff of Charleston County and County of Charleston EMS; Civil Action Number 04-CP-10-678.

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<sup>1</sup> [References [6–11] are restraint asphyxia cases I have personally reviewed wherein the emergency department that received the victim obtained an ABG sample. Unfortunately (for a number of reasons), emergency departments frequently fail to obtain an ABG sample prior to discontinuing resuscitation efforts. However, in every case I have reviewed wherein the emergency department did obtain an ABG sample, the restraint asphyxia victim was documented to be suffering severe metabolic acidosis. Additionally, none of these cases involved the victim being subjected to TASER exposure.]



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## Reply to Letter to the Editor

### Re: Acidosis, lactate, electrolytes, muscle enzymes, and other factors in the blood of *Sus scrofa* following repeated TASER<sup>®</sup> exposures

**Keywords:** Acidosis; Electronic control devices; TASER<sup>®</sup>; Lactate; Hyperkalaemia

Miller [1] raises some concerns that were outside the scope of our study [2]. I do, however, want to point out a few details. Although hematocrit and sodium remained significantly elevated in our study for at least 30 min post-exposure, potassium was only elevated significantly *immediately* after electronic control device (ECD) exposure. Since potassium efflux from contracting muscles stops at the end of exercise [3], the time course of any additive effects of ECD exposure and exertion on potassium may be difficult to predict and would depend on the specific exposure scenario. Miller [4] has noted, “during excited delirium and restraint-struggle, the individual’s body produces abnormally large amounts of several body chemicals, especially adrenalin.” The body, however, exhibits a biphasic response of blood potassium to adrenalin, with transient hyperkalaemia followed by prolonged hypokalemia [5,6]. Thus, additive effects due to adrenalin release would be even more difficult to predict.

Oxygen saturation, although lowered transiently, began to exhibit a return toward baseline levels within 3 min after exposure. Again, the time course of any additive effects of changes due to other events would be speculative.

The acidosis would appear to be one of the major concerns regarding repeated electronic control device exposures in a short period of time. Miller [1] seems to suggest that anaesthesia may have been protective, in some way, against acidemia and other changes. Any basis for such an assumption is unknown. Some anaesthetics may have adverse effects on respiration [7]. The animals in our study [2] were observed to stop breathing during ECD exposures, but still survived. Studies of respiration of humans during ECD exposure are in progress [8], but results have not been reported in the peer-reviewed literature.

It is important to note that our exposure conditions were somewhat extreme compared with those commonly experienced during civilian law-enforcement use of TASER<sup>®</sup> International’s Advanced TASER<sup>®</sup> X26<sup>1</sup>. Therefore, it would

not be prudent to draw conclusions about such use on the basis of our study alone.

### References

- [1] C.D. Miller, Re: Acidosis, lactate, electrolytes, muscle enzymes, and other factors in the blood of *Sus scrofa* following repeated TASER<sup>®</sup> exposures (letter), *Forensic Sci. Int.*, doi:10.1016/j.foresciint.2006.12.003, in press.
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- [8] D. Dawes, J. Ho, J. Miner, J. Thacker, Respiratory ability during TASER application, Current Research in the Department of Emergency Medicine, Hennepin County Medical Center, November 2005, <http://www.hcmc.org/depts/em/currentresearch.htm> (Accessed on 12 June 2006).

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<sup>1</sup> X26 is a trademark of TASER International Inc. TASER<sup>®</sup> is a registered trademark of TASER International Inc., Scottsdale, AZ, USA.

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**CHAS' Comments Regarding James R. Jauchem's Author Reply to  
Her "Letter to the Editor" regarding  
"Acidosis, Lactate, Electrolytes, Muscle Enzymes,  
and Other Factors in the Blood of *Sus Scrofa*  
Following Repeated TASER<sup>®</sup> Exposures"**

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**I'll be as brief as possible!**

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**From Jauchem's Letter Reply:**

**Miller seems to suggest that anaesthesia may have been protective, in some way, against acidemia and other changes. Any basis for such an assumption is unknown.**

**CHAS' REVIEW RESPONSE:**

**I challenge Jauchem to identify any part of my letter that "seems to suggest" such a thing! My letter was written in plain English, and in NO way did I suggest such a thing. Either Jauchem honestly is entirely clueless – or Jauchem is purposefully attempting to direct attention away from my entirely reasonable questions.**

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**From Jauchem's Letter Reply:**

**It is important to note that our exposure conditions were somewhat extreme compared with those commonly experienced during civilian law-enforcement use of TASER International's Advanced TASER X261.**

**From Jauchem's ARTICLE (the study's "exposure" description):**

**The skin was pierced with standard TASER darts (TASER International, Scottsdale, Arizona, USA). One dart was placed approximately 5 cm to the right of the midline (approximately 13 cm cranially from the xiphoid process); the other was approximately 7 cm left of the umbilicus (resulting in approximately 30 cm separation between darts diagonally).**

**CHAS' REVIEW RESPONSE:**

**"During civilian law-enforcement use of TASER International's Advanced TASER X261" an individual gets shot with two skin-piercing darts. There is NO CONTROL over how far apart the darts strike someone. There is LITTLE control over what body parts are struck by the darts. Thus, how can Jauchem possibly suggest that the very specifically-placed TASER darts of his study constitute an "exposure condition" that is "extreme" when compared to the haphazard manner "commonly experienced during civilian law-enforcement use of TASER International's Advanced TASER X261"?**

Again. Either Jauchem honestly is entirely clueless – or Jauchem is purposefully attempting to direct attention away from my entirely reasonable questions.

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From Jauchem's Letter Reply:

Therefore, it would not be prudent to draw conclusions about such use on the basis of our study alone.

#### **CHAS' REVIEW RESPONSE:**

Jauchem's excuse for refusing to answer my letter's four very simple questions is that he doesn't believe that it is "prudent" for him to "draw conclusions about" what HUMANS might suffer when subjected to TASER exposure, based upon his pig study findings.

Yet, within his pig study report, Jauchem et al are happy to publish their opinion that:

It is doubtful that these short-term levels of elevation would have any serious health consequences in a normal individual.

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#### **FINAL ANALYSIS:**

Jauchem et al's Pig Study factually-established clinical evidence that;

- ❖ Even when TASER EXPOSURE is not PRECEDED by excessive exertional activity ...
- ❖ Even when RECOVERY from TASER EXPOSURE is NOT impeded by an asphyxial form of physical restraint (or any other manner of positional-interference with breathing) ...
- ❖ A HEALTHY, RESTED and RELAXED, Human Being will suffer:
  - "severe acidemia" for at least an hour after the first TASER exposure.
  - "increases in hematocrit, potassium, and sodium" for at least 30 minutes after the first TASER exposure.
  - "significantly" DECREASED OXYGEN SATURATION "immediately after [the first TASER] exposure" – decreased oxygen saturation that doesn't return to "pre-exposure levels" until 30 minutes (or more) after the first TASER exposure.

Were Jauchem and his colleagues "unbiased" researchers, they couldn't possibly have the slightest bit of difficulty answering any of the four very simple questions offered in my Letter to the Editor regarding their Pig Study's findings – they couldn't possibly have the slightest bit of difficulty admitting to the very important findings demonstrated by their study.

Thus, Jauchem's REFUSAL to answer my letter's very simple questions clearly demonstrates that Jauchem et al are somehow dependent upon, or "related to" TASER International.