Breathing Effect – Detail

[1]What is breathing?	Inhalation and exhalation of air or gaseous mixtures.[2] Inhalation involves the contraction of the diaphragm, scalene, intercostal, and accessory respiratory muscles. Exhalation is achieved through passive recoil of the thorax by relaxation of these muscles.[3] The primary function of breathing is the extraction of oxygen from the environment and the removal of carbon dioxide from the body.
What is respiratory acidosis?	A decrease in blood pH (measure of acidity or alkalinity) caused by retention of carbon dioxide due to inadequate pulmonary ventilation (breathing).[1]
How does respiratory acidosis relate to a TASER® Electronic Control Device (ECD) exposure?	Because a TASER ECD exposure causes muscle contraction, there has been speculation that use on humans could impair breathing.
What is an evidence-based conclusion as to whether a TASER ECD impairs breathing?	The available human data directly contradicts animal studies and does not reveal any evidence of breathing impairment or respiratory acidosis.
The evidence:	
Prospective Human Studies	(Ho 2008[4]) While reproducing a CEW [conducted electrical weapon] drive stun application to the trapezius muscle, the diaphragm was directly observed using ultrasonography. The right hemidiaphragm was visualized in an intracostal oblique view, using the liver as a sonographic window (Figure 1). We have demonstrated the presence of respiration through visualizing diaphragmatic excursion during a 10-second exposure (available online) to a TASER X26 CEW. There was no evidence of paralysis of the diaphragm during the exposure. Diaphragmatic excursion is demonstrated on this ultrasound video clip obtained using a SonoSite

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	MicroMaxx with a P17/5-1 MHz probe (SonoSite, Inc., Bothell, WA). (Ho 2007[5]) There was no respiratory impairment with a prolonged ECD application. Minute ventilation increased and end-tidal carbon dioxide decreased suggesting no evidence of respiratory acidosis. (Chan 2007[6]) There was no evidence of hypoxemia or hypoventilation in humans undergoing ECD application. (Dawes 2007[7]) There was an decrease in end-tidal carbon dioxide and no change in pH.
Animal Studies	(Jauchem 2007[8]) Complete cessation of breathing occurred in swine with each exposure resulting in respiratory acidosis. (Dennis 2007[9]) No spontaneous respiratory effort was observed during ECD exposure resulting in severe respiratory acidosis. (Esquivel 2007[10]) Repeated exposures to a conducted electrical weapon result in respiratory acidosis, metabolic vasodilation, and an increase in blood lactate level. These effects were transient in this study, with full recovery by 4 hours post exposure. The Stinger® S-400 [ECD] appears to have no serious adverse physiologic effects on healthy, anesthetized swine.
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