What is breathing? Inhalation and exhalation of air or gaseous mixtures. 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. 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).

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) 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...
**MicroMaxx with a P17/5-1 MHz probe (SonoSite, Inc., Bothell, WA).**

(Ho 2007<sup>5</sup>) 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<sup>6</sup>) There was no evidence of hypoxemia or hypoventilation in humans undergoing ECD application.

(Dawes 2007<sup>7</sup>) There was an decrease in end-tidal carbon dioxide and no change in pH.

**Animal Studies**

(Jauchem 2007<sup>8</sup>) Complete cessation of breathing occurred in swine with each exposure resulting in respiratory acidosis.

(Dennis 2007<sup>9</sup>) No spontaneous respiratory effort was observed during ECD exposure resulting in severe respiratory acidosis.

(Esquivel 2007<sup>10</sup>) 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.

**Other Relevant Information**


Breathing Effect – Detail

<table>
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<tr>
<th>District Hospital, Lompoc, CA, USA. Hennepin County Medical Center, Minneapolis, MN, USA. TASER International, Scottsdale, AZ, USA: Fourth Mediterranean Emergency Medicine Congress (MEMC IV); 2007.</th>
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The document provides references to various studies and sources related to the effects of TASER weapons on the respiratory system. Here are some key points:

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