

Measurement of Electrodermal Activity to Assess Distress in Hospitalized Cattle

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Introduction

Skin impedance is a measurement of electrical conductivity on the surface of the skin. Impedance is affected by ion content at the surface of the dermal epithelium. Increased sympathetic tone changes skin impedance. Sympathetic tone is proportionately associated with pain or distress, therefore skin impedance may be measured in an attempt to quantify “clinical pain / distress”. This relatively new technology may be able to demonstrate differences with the intensity of patient “distress”. Skin impedance is measured by use of a tool which measures electrodermal activity (EDA).

Materials and Methods

A commercially available EDA measurement device (Pain Gauge®) was used to measure the electrodermal activity on non-haired skin of hospitalized patients. The Pain Gauge® converts the level of resistance measured between two electrodes to a 10-point scale (0 = “Calm/No Pain”; 9.9 = “Tense/ Severe pain”). The diagnosis was retrieved from the medical records and classified by body system and by medical vs surgical disorder.

Results

The most consistent EDA measurements were obtained on the nasal planum. Less consistent areas

included the perineum, vulva, prepuce, ear and anus. Based on EDA, the most severely distressing problems seemed to involve neurological (EDA = 7.5) and respiratory (EDA = 8.2) systems and generalized infection (“septicemia” EDA = 8.0). Interestingly, surgical conditions of the gastrointestinal tract (EDA = 9.2) seemed to be more intensely painful than medical diseases of the gastrointestinal tract (EDA = 4.8), whereas surgical conditions of the musculoskeletal system (EDA = 7.2) were similar in intensity of EDA compared with medical diseases of the musculoskeletal system (EDA = 7.0).

Significance

Understanding the clinical intensity of noxious stimuli associated with various body systems may help guide decisions for the need or type of pre-emptive analgesia. Serial measurements may also aid in assessment of efficacy of analgesic therapy. This hand-held technology give the practitioner immediate feedback and is easily applied in the field and on the farm.