C4.3: Exploration of Porcine Stress-hormone Response to Critical Care

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Abstract:
Introduction: ICU patients have disrupted circadian rhythms; it is unknown if rhythms recover during the ICU stay. Rhythm recovery indicates adaptation to stress. A porcine ICU model was developed to study circadian rhythms under controlled conditions. Research questions: Do study
protocols protect animal welfare by minimizing distress? Do circadian rhythms recover over time in the ICU? Using an observational, interrupted time-series design, stress-hormone responses and circadian rhythms in plasma epinephrine, norepinephrine and cortisol were explored in two swine during a ≤ 7-day stay in the ICU.

Method(s): The animal care and use committee approved the study. Littermate male domestic farm pigs (Yorkshire/Blue Butt cross) were surgically instrumented under anesthesia and aseptic conditions, and admitted to the ICU where they were mechanically ventilated and cared for with clinical protocols by ICU nurses with continuous intravenous pentobarbital titrated to effect. Blood was obtained from an arterial catheter every 2 hours during the middle (Phase I) and end (Phase II) of the ICU stay for hormone radioimmunoassay. Individual single-oscillator cosinor models were computed for each subject, phase and hormone using least squares approach, zero-amplitude test to judge model significance, and R2 to assess goodness-of-fit.

Results: There was 2% loss of samples (5 of 222 measures). Intra- and inter-assay coefficients of variation for the catecholamines were ≤ 12% and < 6% for cortisol. Values were normal except during episodes of intense stress. There was no significant circadian rhythm in epinephrine, a significant rhythm in Phase II norepinephrine for one subject, and significant rhythm in Phase II cortisol for both subjects.

Discussion & Conclusions: Intense physiologic or psychological stress induced an endocrine response, but most stress-hormone values were normal. Recovery of cortisol rhythm suggests that sedated swine adapted over time to the ICU; recovery of catecholamine rhythms may lag behind cortisol. The small sample size, even with a longitudinal time-series approach, postures the findings as exploratory. The stress-hormone responses indicate minimal stress and suggest that these swine adapted to the ICU. The sedation protocol may confer protection from stress.

Abstract History:
This abstract has not been presented or accepted for presentation in whole or in part at the SNRS or other scientific meeting.

Financial Disclosure:
No, I (or a member of my immediate family) have not received something of value* from or own stock (or stock options) in a commercial company or institution related directly or indirectly to the subject of my presentation.

FDA Disclosure:
The FDA has cleared all pharmaceuticals and/or medical devices for the use described in this presentation.

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