Introduction
Caudal anesthesia is commonly performed in children using local anesthetics to afford intra- and post-operative pain relief. However, no objective monitor exists to gauge the onset and offset of the medication administered epidurally. As part of a technology evaluation study, we used a novel monitor to objectively measure and report the effect of a local anesthetic by detecting changes in the underlying (non-stimulated) electromyogram (EMG) during the administration of a single dose of local anesthetic in small piglets.

Methods
- 10 piglets anesthetized, intubated, and mechanically ventilated.
- ECG, rectal temperature, pulse oximetry, end-tidal CO2, end-tidal isoflurane, and arterial pressure continuously monitored
- Blockade monitoring system (Biopac MP150) applied to each piglet using percutaneous needles at T4 and T10 dermatomes and monitored using EMG and EKG amplifiers.
- Continuous measurements were taken and reported at baseline, dose (chloroprocaine 3% caudal vs extra-caudal (“failed”), 1ml/kg bolus injection at 300sec).
- Spectral power was measured (100-150Hz) and reported in the time domain.
- Changes in power were measured and compared for: Time between injection and peak effect; and time between peak effect and 50% recovery (to baseline) in the piglet group (n=4) that received caudal local anesthetic injection.

Results

<table>
<thead>
<tr>
<th>Level (N=4)</th>
<th>Time to peak effect (mean±SEM) min</th>
<th>Time to 50% recession of peak effect (mean±SEM) min</th>
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</thead>
<tbody>
<tr>
<td>T4</td>
<td>5.63±3.35</td>
<td>27.9±4.53</td>
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<tr>
<td>T10</td>
<td>8.33±1.71</td>
<td>21.9±1.38</td>
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<tr>
<td>t-test</td>
<td>NS</td>
<td>NS</td>
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</tbody>
</table>

Conclusion
Objective measurement of real time changes associated with acute injection of local anesthetic in the caudal space were performed at T4 and T10 levels. Time from dose to peak effect and time from peak effect to 50% return to baseline were easily measured. These preliminary measurements are consistent with clinical reports using local anesthetics and suggest that it is possible to objectively measure real-time changes from epidural blockade.

Future Research
- Larger groups to confirm preliminary data
- Modifications of injection characteristics (drug, dose, volume, rate, adjuncts temperature, etc.)
- Elaboration of previously performed human studies.

References