Reversing Succinylcholine Paralysis

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Introduction: The consequences of a failed intubation in the parturient can be fatal because of: decreased FRC, increased oxygen consumption, delayed gastric emptying, and decreased levels of butyrylcholinesterase. Oxygen saturation can fall to critically low levels leading to cerebral and cardiac anoxia. Faced with a CICV (cannot intubate, cannot ventilate) situation, reversal of succinylcholine induced paralysis can be life saving.

Methods: We tested a series of macrocyles to measure their ability to bind succinylcholine and decamethonium. The affinity constant (Ka) was determined thermodynamically ($\Delta G = \Delta H - RT \ln Ka$) using a Microcal VP calorimeter to perform isothermal titrations.

Results: Cucurbit[7]uril binds depolarizing and non depolarizing muscle relaxants in the order: decamethonium > pancuronium > succinylcholine > vecuronium > rocuronium.

Discussion: Sugammadex, a modified cyclodextrin, can bind rocuronium, a drug that is not routinely used for rapid sequence induction, with a Ka = 10^7 /M. Sugammadex in a dose of 16mg/kg can restore a T4/T1 ratio to 0.9 in 2.2min. Cyclodextrins have a high affinity for cholesterol based drugs such as commonly used non depolarizing muscle relaxants: rocuronium > vecuronium > pancuronium, but no affinity for the depolarizers. In contrast, cucurbit[7]uril has a high affinity for diquaternary depolarizers with a Ka = 10^6 /M and may serve as chelating agents to further speed the clearance of succinylcholine or decamethonium thereby reversing apnea following a failed rapid sequence induction.

**Succinylcholine - CB7 complex**

\[ \text{Ka} = 100,000/M \]

**Decamethonium - CB7 complex**

\[ \text{Ka} = 5,170,000/M \]