

**2019 ACMT Annual Scientific Meeting
MedTox Shark Tank Research Forum**

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Title: Percutaneous mechanical ventricular support for calcium channel blocker poisoned patients: A Porcine Model

Aims: To evaluate the utility of a percutaneously placed temporary ventricular support device in a porcine model of calcium channel blocker (CCB) toxicity.

Significance & Innovation: Xenobiotic induced cardiotoxicity represents a challenging resuscitation for emergency providers and is generally well managed using conventional medical interventions such as glucagon, high dose insulin (HDI) therapy and vasoactive agents. For the rare patient who fails such interventions extracorporeal life support (ECLS) can be considered. The barrier for most hospitals outside of select tertiary care centers is that ECLS is not available and such patients are not medically stable for transfer. However, many hospitals can call on the services of an interventional cardiologist for placement of a temporary ventricular assistance device to provide mechanical support for these patients. There have been isolated cases in which such devices have been used and published in the literature as either the primary mechanical support or as a bridge to ECLS. We propose a prospective study examining the utility of one such device, Impella, in a porcine model of severe CCB overdose.

Research approach & Timeline: We propose a porcine model of CCB overdose utilizing verapamil based on prior published models (Barry 2005). Pigs will be randomized to normal saline (NS) plus HDI at 30 minutes after overdose or NS plus Impella support followed by HDI at 30 minutes after overdose with time to death and MAP recovery being the primary outcome measures. If pigs survive >6 hours this could correlate with the human patient time to arrange for transport to a higher level of care or mobilize an ECLS team. Impella is approved with an automated controller for use in both ground and air transport.

At this point in time we are in Pre-IRB stage and further designing the experimental methods. We have identified a physician champion from cardiology as well as a porcine lab that is interested in the study. As of the time of this writing final budgeting for the animals, facilities and devices have yet to be confirmed. We have made contact with a representative from the Impella device company (ABIOMED) and will be approaching them to ascertain if they can donate the devices.

Major limitations: at this time are financial barriers to a large animal study with an expensive medical device. Due to expense, the number of animals and devices will likely only allow for a small sample size and thus the data may be limited. The other concern is if we should add vasopressors to the groups given that will mimic real life practice. The possibility of reusing an Impella device will be explored as a way to save on cost. Impella devices are available for both Left and Right sides of the heart and hearts poisoned with CCBs can lead to Biventricular failure and thus patients and pigs may require support for both ventricles. We propose to treat only the left side, again, as a temporary adjunct to bridge to recovery and/or ECLS which can bypass both pulmonary and systemic systems.