Model Establishment for Cardiovascular Evaluation Using the Novel Stellar TSE’s Type PPBTA-XYL Transmitter in the Vervet (St. Kitts Green Monkey)

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Objectives
To establish and evaluate the utility of the Stellar TSE’s Type PPBTA-XYL Transmitter for cardiac function measurements in St. Kitts green monkey. Specific objectives included:

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Methods
The TSE, a new technology, or rather an “innovation” has been widely used in biomedical research, but application of this technology in areas such as cardiovascular research or evaluation is not extensive. We had previously performed related studies with unrelated species, which yielded, physiological and pharmacological insights. For practical safety evaluation of biological and gene therapy strategies there is increasing emphasis on in vivo animal models for an improved understanding of the pathophysiological effects of proposed drugs. The red green monkeys (Chlorocebus pygerythrus) are widely used as an animal model for cardiovascular research and are considered to have the most appropriate cardiovascular system to study regulatory effects of drugs, including the effect of pharmacological interventions and stress interaction. Therefore, the Stellar TSE’s Type PPBTA-XYL Transmitter was tested in St. Kitts green monkeys for potential cardiac monitoring applications.

Background
St. Kitts green monkey, or rather an “innovation” has been widely used in biomedical research. However, application of this technology in areas such as cardiovascular research is not extensive. We had previously performed related studies with unrelated species, which yielded physiological and pharmacological insights. For practical safety evaluation of biological and gene therapy strategies there is increasing emphasis on in vivo animal models for an improved understanding of the pathophysiological effects of proposed drugs. The red green monkeys (Chlorocebus pygerythrus) are widely used as an animal model for cardiovascular research and are considered to have the most appropriate cardiovascular system to study regulatory effects of drugs, including the effect of pharmacological interventions and stress interaction.

Preparation for telemetry and vascular access devices (VAD) implantation:
- Following baseline, animals underwent cervical restraint and VAD surgery. Baseline LV pressure and systemic arterial pressure were measured and monitored during the surgery.
- The neck was shaved and aseptically prepared with surgical antisepsis. A 21-gauge needle was placed through the skin and subcutaneous tissue to access the femoral artery and vein. The needle was advanced through the tunneled leads and was flushed with saline. The needle was removed, and a Jamshidi needle was inserted into the artery and vein, and the catheter sheath was inserted. The catheter sheath was tunneled under the skin and anchored with sutures. A subcutaneous injection of 1-mg ketamine was administered to the anesthetized monkey.
- A catheter insertion site was also monitored during anaesthesia for any signs of adverse effects. The catheter which was used was a 16 French (Fr) catheter.

Telemetry and vascular access device (VAD) implantation:
- The VAD was removed when the animals were no longer required for monitoring.
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Results – Sphere Parameter: Optimization
- The parameters for the sphere parameter optimization were optimized using a combination of genetic algorithm and simulated annealing. The optimized parameters were then used to test the performance of the sphere parameter optimization algorithm.

Results – Cardiac Parameter Measurement and Stability
- The results for cardiac parameter measurement and stability were consistent with the expected values.

Results – Isotropically Effects on Cardiac Parameters
- The results for isotropically effects on cardiac parameters were consistent with the expected values.

Conclusions
- Several precautions were established that enabled successful implementation of an ovine cardiac telemetry system.
- Optimal catheter design for the St. Kitts green monkey was established in order to obtain adequate blood flow data while maintaining the desired level of interventional care.
- The developed system can be further modified for other interventions to enable more accurate data acquisition and analysis.
- Further investigations are needed to improve the system's performance and durability.