INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

FINAL REPORT SUMMARY

(Please type all information. Use additional pages if necessary.)

PROTOCOL #: FDG20140039A
DATE: 13 August 2015

PROTOCOL TITLE: Treatment of Chronic Myocardial Infarction in a Pig (Sus scrofa) Model with Extracellular Matrix and Stem Cells.

PRINCIPAL INVESTIGATOR (PI) / TRAINING COORDINATOR (TC): Lt Col Darren Danielson and Dr. W. Douglas Boyd

DEPARTMENT: Cardiothoracic Surgery
PHONE #: 423-2300

INITIAL APPROVAL DATE: 4 September 2014
LAST TRIENNIAL REVISION DATE: N/A

FUNDING SOURCE: HQ/SGO

1. RECORD OF ANIMAL USAGE:

<table>
<thead>
<tr>
<th>Animal Species:</th>
<th>Total # Approved</th>
<th># Used this FY</th>
<th>Total # Used to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sus scrofa</td>
<td>73</td>
<td>49</td>
<td>49</td>
</tr>
</tbody>
</table>

2. PROTOCOL TYPE / CHARACTERISTICS: (Check all applicable terms in EACH column)
   ___ Training: Live Animal  ___ Medical Readiness  ___ Prolonged Restraint
   ___ Training: non-Live Animal  ___ Health Promotion  ___ Multiple Survival Surgery
   ___ Research: Survival (chronic)  ___ Prevention  ___ Behavioral Study
   ___ Research: non-Survival (acute)  ___ Utilization Mgt.  ___ Adjuvant Use
   ___ Other ( )  ___ Other (Treatment )  ___ Biohazard

3. PROTOCOL PAIN CATEGORY (USDA): (Check applicable) ___ C  ___ D  ___ E

4. PROTOCOL STATUS:
   *Request Protocol Closure:
   ___ Inactive, protocol never initiated
   ___ Inactive, protocol initiated but has not/will not be completed
   ___ Completed, all approved procedures/animal uses have been completed

5. Previous Amendments:
   List all amendments made to the protocol. IF none occurred, state NONE. Do not use N/A.

   For the Entire Study Chronologically

<table>
<thead>
<tr>
<th>Amendment Number</th>
<th>Date of Approval</th>
<th>Summary of the Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 Aug 2014</td>
<td>Animal use-telemetry technique development</td>
</tr>
<tr>
<td>2</td>
<td>21 May 2015</td>
<td>Personnel change PI from Danielson to Neff</td>
</tr>
</tbody>
</table>
6. **FUNDING STATUS:** Funding allocated: $32,550.00 Funds remaining: $0.00

7. **PROTOCOL PERSONNEL CHANGES:**

Have there been any personnel/staffing changes (PI/CI/AI/TC/Instructor) since the last IACUC approval of protocol, or annual review? 

- [X] Yes
- [ ] No

If yes, complete the following sections (Additions/Deletions). For additions, indicate whether or not the IACUC has approved this addition.

**ADDITIONS:** (Include Name, Protocol function - PI/CI/AI/TC/Instructor, IACUC approval - Yes/No)

Maj Lucas Neff (PI), 21 May 2015

**DELETIONS:** (Include Name, Protocol function - PI/CI/AI/TC/Instructor, Effective date of deletion)

Lt Col Darren Danielson (PI), 21 May 2015

8. **PROBLEMS / ADVERSE EVENTS:** Identify any problems or adverse events that have affected study progress. Itemize adverse events that have led to unanticipated animal illness, distress, injury, or death; and indicate whether or not these events were reported to the IACUC.

None.

9. **REDUCTION, REFINEMENT, OR REPLACEMENT OF ANIMAL USE:**

**REPLACEMENT (ALTERNATIVES):** Since the last IACUC approval, have alternatives to animal use become available that could be substituted in this protocol without adversely affecting study or training objectives?

None.

**REFINEMENT:** Since the last IACUC approval, have any study refinements been implemented to reduce the degree of pain or distress experienced by study animals, or have animals of lower phylogenetic status or sentience been identified as potential study/training models in this protocol?

None.

**REDUCTION:** Since the last IACUC approval, have any methods been identified to reduce the number of live animals used in this protocol?

None.

10. **PUBLICATIONS / PRESENTATIONS:** (List any scientific publications and/or presentations that have resulted from this protocol. Include pending/scheduled publications or presentations).

11. **Were the protocol objectives met, and how will the outcome or training benefit the DoD/USAF?**

Yes. Using the model developed in protocols FDG20120019A and FDG20130043A, we were able to successfully create myocardial infarctions in pigs with a high survival rate in order to study the effect of extracellular matrix and stem cells on myocardial regeneration.
12. **PROTOCOL OUTCOME SUMMARY:** (Please provide, in "ABSTRACT" format, a summary of the protocol objectives, materials and methods, results - include tables/figures, and conclusions/applications.)

**Objectives:** The goal of this protocol was to create myocardial infarctions in minipigs using polystyrene microspheres to infarct a portion of the left ventricle myocardium for future regenerative medicine studies.

**Methods:** Castrated male Yucatan minipigs were premedicated with oral amiodarone, aspirin, and clopidogrel according to protocol. Once the pigs were anesthetized a baseline echocardiogram was obtained. Under fluoroscopic guidance, a hockey stick catheter was placed in a femoral artery into the left anterior descending (LAD) coronary artery. A guide wire was then placed in the first or second diagonal branch of the LAD, over which a coronary artery balloon catheter was advanced. Once in place, the balloon catheter was inflated and polystyrene microspheres were injected to occlude the vessel. The echocardiogram was repeated, and the pigs were recovered. Two weeks later, provided there were no postoperative complications, the pigs were transferred to UC Davis for maintenance and further surgery.

**Results:** Forty-nine underwent myocardial infarctions without misadventure. Infusion of polystyrene beads into a diagonal branch of the LAD resulted in a repeatable and controlled myocardial infarction.

**Conclusion:** The method reported here provided consistent and repeatable myocardial infarcts with minimal morbidity.

LUCAS P. NEFF, Maj, USAF, MC (PI)  
24 Aug 2015 (Date)

W. DOUGLAS BOYD, M.D. (PI)  
25 Aug 2015 (Date)
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Grant Number: _______________________
From: __________________________________________

*If you utilized an external grant, please provide Grant # and where the grant came from. Thank you.*