Adaptive overhead tether system for freely moving swine

Porcine Innovations Group (P.I.G.), BME 200/300

10/30/2026 - 11/5/2026

Client: Dr. Marco Failla Mulone
Advisor: Dr. Jonathan Soucy

P.I.G

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Problem statement

The UW-Madison Department of Neurosurgery is developing a chronic large-animal neuromonitoring platform using multiple intracranial catheters for continuous or repeated brain interstitial fluid sampling. A cranial fixation device that organizes and protects these catheters has already been developed; however, the lab requires the development of a complementary tether and harness system that manages tubing and cables extending from the cranial device, while simultaneously allowing the animal to move naturally within a stationary enclosure. The developed system needs to be able to dynamically follow the animal, maintain appropriate tubing length, minimize tensile and rotational forces, prevent entanglement or kinking, and allow normal behaviors.

Brief status update

This week the team met with design lab staff to troubleshoot our design process, learn about fabrication methods for the tether couplers, and learn about the materials available at the design lab. This past Friday, we also had the opportunity to discuss our project with peers outside of our immediate team and got outside input on material selection and fabrication methods.

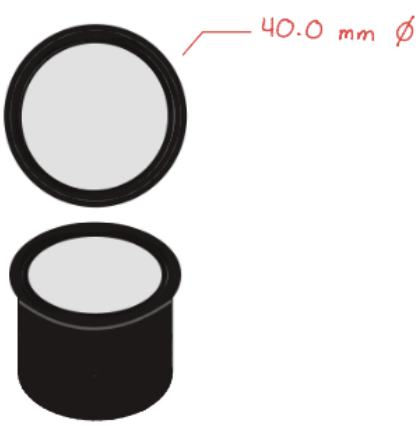
Difficulties/advice requests

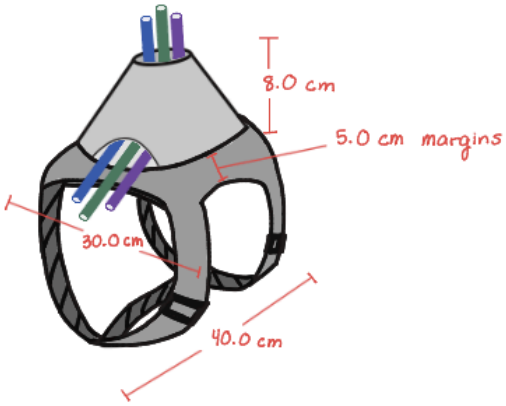
For Dr. Failla Mulone:

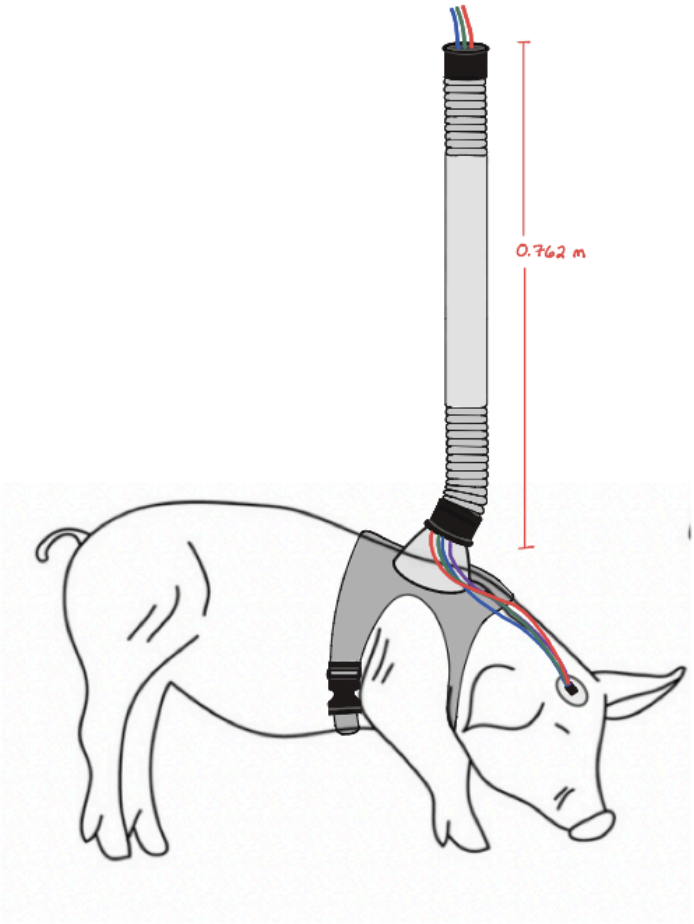
The team has concerns about the material ordering timeline. If it is a more expedient option and easier for the Neurosurgery department to approve, the team can set up a spending account at the Grainger Engineering Design Lab. This spending account would be set up with an initial deposit from the Neurosurgery department. Then, the team would be able to order necessary materials directly through the Grainger design lab, avoiding the constant need to seek approval from the finance department.

Additionally, after reviewing our project with our advisor and design lab staff, the team has determined that with the current information we have, and without communication from the Veterinary care team, we are unable to design the external cranial to dorsal protection system at this time.

Current design







Materials and expenses

First Prototype										
Clear plastic tub	Thick clear plastic tube used for the middle section of the protot			Wendt		10/16/2026		$0.00	$0.00	
PVC pipe	Thick and thin sections of PVC attached to ends of clear tube. Rc			Wendt		10/16/2026		$0.00	$0.00	
Clear flexible tub	Clear flexible tubing used at ends of straight tube for flexibility			Wendt		10/16/2026		$0.00	$0.00	
Thin flexible plas	This was used to make our first iteration of the cone that will att			Wendt		10/16/2026		$0.00	$0.00	
Hot Glue	The 2 sections of PVC pipe were glued together using hot glue a			Wendt		10/16/2026		$0.00	$0.00	
Duct Tape	We taped the PVC to the clear tube and also taped the cone to t			Wendt		10/16/2026		$0.00	$0.00	
Lazy Susan	Bearing of a lazy susan that we can use to make the overhead sv			Wendt		11/5/2026		$0.00	$0.00	
Materials Being Ordered										
Harness	Harness that will secure the teth	Pig Gear	N/A	Pig Gear	N/A	10/19/2026	1	$25.00	$25.00	https://www
Polycarbonate Tu	Rigid section of the tether	APPROVED VEND	ULK-PT-PC-27	Grainger	55PF57	10/30/2026	1	$31.43	$31.43	https://www
oring PVC Tubing	ttachment from head to harness	KURIYAMA	K7160-16X5	Grainger	796KH4	10/30/2026	$1.0	$28.72	$28.72	https://www
								TOTAL:	**$56.43**	

BPAG Expense Spreadsheet

Goals

Major team goals for the next week

1. Design CAD model for tether-to-platform coupler and tether-to-harness coupler
2. Update CAD model for tether and swivel platform
3. Begin developing fabrication plans

Next week's individual goals

- Alisha Schaeffer
    - Assist in fabrication of our model if possible
    - Continue researching specific 'connection-point' methods brought up in the Show & Tell held on 10/30/26
- Katelynn Johnson
    - Assist development of CAD models
    - Research fabrication methods for fabrication plan development
- Gabriela Medina Medina
    - Research fabrication methods
    - Assist in fabrication of our model if possible
- Evan Hoffman
    - Design harness to tether "traffic cone" attachment
    - Continue to research if other materials may be better for our intended uses and brainstorm ideas for swivel platform
- Catherine Sit
    - Research more materials as fabrication plan changes
    - Assist in creation of CAD model
- Joshua Grauman
    - Assist in fabrication of our model if possible
    - Research specific methods brought up by other groups in the Show & Tell held on 10/30/26

Timeline

Task	September				October					November				December	
	10	16	18	25	2	7	16	23	30	6	20	26	30	4	9
Project R&D															
Empathize	X	X	X	X											
Background	X	X	X	X											
Prototyping							X	X	X	X					
Testings															
Deliverables															
Progress Reports	X	X	X	X	X	X	X	X	X	X					

PDS		X	X	X	X	X	X	X	X	X					
Design Matrix			X	X											
Prelim Presentation				X	X										
Prelim Deliverables					X	X	X								
Show and Tell									X						
Final Poster															
Final Deliverables															
Meetings															
Client		X					X								
Advisor	X	X	X	X	X	X	X	X		X					
Website															
Update	X	X	X	X	X	X	X	X	X	X					

Filled boxes = projected timeline
X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments

This week we had planned on beginning fabrication; however, we were unable to do so. Instead, we met with design team staff in order to troubleshoot our design process. This meeting was incredibly helpful and gave us key goals to accomplish in the coming weeks that do not rely on the ordered materials.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Alisha Schaeffer	10/11/2026	Worked on my sections of the Preliminary Report	2.5	10	**34**
	10/12/2026	Revised some of the preliminary report	1		
	10/13/2026	Watched a surgery of the insertion of wires and cardiac arrest experiment	5		
	10/14/2026	Went over some revisions to final design at the Client Meeting	1		
	10/14/2026	Created a document for questions and brainstormed some questions for meeting with Swine laboratory researcher	0.5		

	10/16/2026	Helped fabricate tether proof-of-concept prototype	1.5	3.5	
	10/21/2026	Met with team over Zoom to discuss materials and orders to prepare for final fabrication of the prototype	1		
	10/22/2026	Researched what materials to use for certain parts of the prototype	1		
	10/23/26	Met with team and discussed material selection	1.5	1.5	
	11/5/26	**Met with Design Lab Staff to plan fabrication.**	**1**	**1**	
Katelynn Johnson	10/11/2026	Updated design matrix drawings	1.5	8	**38**
	10/12/2026	Edited the preliminary report	2		
	10/13/2026	Edited the preliminary report	3		
	10/14/2026	Prepared questions for client meeting	0.5		
	10/14/2026	Updated final design sketch after client meeting.	1		
	10/16/2026	Worked with team to develop proof-of-concept tether prototype	2	3	
	10/22/2026	Researched materials to order	1		
	10/23/2026	Researched materials to order	1	2	
	10/28/2026	Worked with Evan to order materials	1		
	11/5/2026	**Met with Design Lab Staff to plan fabrication.**	**1**	**2**	
	11/5/2026	**Worked on fabrication plans**	**1**		
Gabriela Medina Medina	10/12/2026	Edited preliminary report	0.5	4	**29.25**
	10/13/2026	Updated PDS	2		
	10/13/2026	Edited preliminary report	1		
	10/14/2026	Prepared questions for client	0.5		
	10/21/2026	Team Meeting discussing material selection	1	3	
	10/16/2023	Worked with team to develop proof of concept	2		

	10/23/2026	Researched Materials to order	1	1	
	10/29/2026	**Completed required training**	**3**	**3**	
Evan Hoffman	10/9/2026	Materials and fabrication research and working on report	2	3.5	**22**
	10/12/2026	Modeled prototype and looked into limits of catheters	1.5		
	10/16/2026	Fabricating initial prototype	1	**5**	
	10/21/2026	Team meeting to discuss material selection and prototype fabrication	1		
	10/22/2026	Created CAD model of prototype and worked on sourcing materials	3		
	10/28/2026	Final materials research and ordering	1	1	
	11/5/2026	**Met with Wendt design staff to get some of our questions answered**	**1**	**2**	
	11/5/2026	**Modeled "traffic cone in SolidWorks"**	**1**		
Catherine Sit	10/11/26	Worked on preliminary report	1	4.5	**20.25**
	10/13/26	Finished section on preliminary report	2.5		
	10/14/26	Client meeting	1		
	10/16/16	Fabricated prototype tether	2	3	
	10/22/26	Researched harness materials and tether materials	1		
	10/23/26	Researched materials and fabrication methods	1.5	1	
	11/5/2026	**Wendt fabrication/design meeting to develop fabrication plan**	**1**	**1**	
Joshua Grauman	10/09/26	Discussed with the group fabrication materials for the prototype	1	5	**33**
	10/11/26 10/13/26	Finished part of preliminary report	3		
	10/14/26	Met with client to go over presentation	1		
	10/16/26	Fabricated tether portion of prototype	2	4	
	10/21/26	Met with team via Zoom to discuss materials, harness prototype, and the	1		

		connection point of the harness and tether			
	10/22/26	Researched materials	1		
	10/23/26	Met with team and discussed material selection	1.5	1.5	
	11/2-4/26	**Lathe + mill Safety training**	**‘8’**	**1**	
	11/5/26	**Gathered notes and relayed them in the Notebook of the Show & Tell held on 10/30/26**	**1**		