

# Veterinary bone marrow aspirate models

Date: 10/10/2024

Client: Dr. McLean Gunderson

Advisor: Prof. Randy Bartels

Team:

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## Problem Statement

Veterinary professionals commonly collect bone marrow aspirates from three main sites in dogs and cats: the iliac crest, the trochanteric fossa, and, mostly commonly, the proximal humerus. Currently no veterinary bone aspiration models exist for students to practice on, requiring the use of cadaver dogs. Cadavers can only be used for about 5-10 insertions of the Illinois bone marrow biopsy needle per site, but does not contain live bone marrow that can be collected. This project aims to create a low-cost 3D anatomically correct model of the humerus with relevant soft tissue structures, mimics the consistency and structure of the bones, and allows for insertion of "bone marrow" for collection, allowing veterinary students to practice the skill of bone marrow aspiration.

## Brief Status Update

Over the past week, the team presented the Preliminary Presentation to Dr. Gunderson, Dr. Bartels, and other peers. The team also worked together to complete the Preliminary Report due this past Wednesday.

## Difficulties / advice requests

We are having some difficulties finding exact quantitative literature values of various bone characteristics to compare the materials to. This makes it hard to do testing and compare our results to research.



Prototyping																				
Testings																				
<b>Deliverables</b>																				
Progress Reports	X	X	X	X	X	X														
PDS			X																	
Prelim presentation					X															
Prelim Report						X														
Final Poster																				
Final Report/Notebook																				
<b>Meetings</b>																				
Client		X		X																
Advisor	X	X	X			X														
<b>Website</b>																				
Update	X	X	X	X	X	X														

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

## Current design

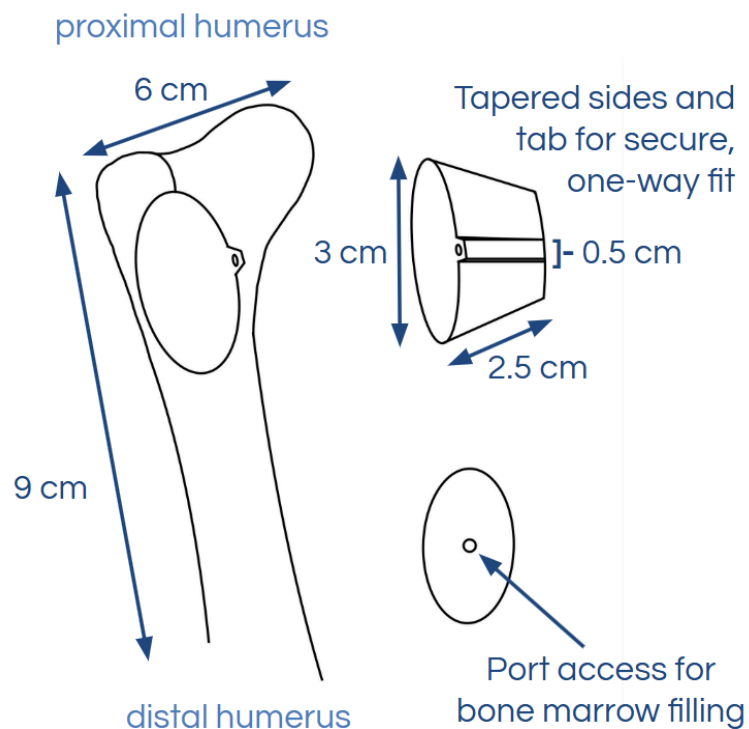


Figure 1: Drawing of the Slide Method of attachment

The proposed final design features the Slide Method of attachment for the design of the replaceable component. The oval section will be hollow to allow the client to fill the simulated bone marrow fluid into the port in the base of the design. The tab allows the user to easily orient the removable section correctly and slide it into place. Both the replaceable component and the rest of the bony structures (scapula, humerus, and fixed elbow) will be 3D printed using PLA. Surrounding the bones will be relevant musculature made from soft silicone which will further help the replaceable component remain in place when the needle enters and exits. The simulated skin, fabricated by the client out of neoprene and pourable silicone, will be affixed over top and will help to hold the musculature and bones in an anatomical position.

## Previous week's goals and accomplishments

- Team
  - Presented our Preliminary Design Presentation to our client, Dr. McLean Gunderson, and our advisor, Dr. Randy Bartels and to fellow classmates.
  - The team worked together to complete our preliminary report
- Avery
  - Finalized fabrication plan and prepare to order any outside materials needed
  - Completed preliminary presentation and preliminary report
  - Set sophomores up with CAD and provide resources for fundamental skills as we enter the design and prototyping phase of the project
- Helene
  - Completed necessary training and preparation to begin the fabrication of the model.
  - Completed the preliminary deliverables with the team.
  - Attended the BSAC meeting.
- Anya
  - Prepare for process of scanning and working on CAD design
  - Looked into potential muscle solutions
  - Researched more on bone structure specific to the dog type and size that we have chosen to model, in order to create more accurate structure.
- Ella
  - Presented the Preliminary Design Presentation.
  - Continued doing research about the materials for fabrication.
  - Prepare for the process of scanning and making a CAD model of the selected bones.
- Ellie
  - Presented Preliminary Design Presentation
  - Continued to research on fabrication of the model
  - Worked on CAD skills and helping to create a model of the selected bones

## Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Avery Schuda	10/10/24	-Completed the preliminary presentation -Met with team and worked to complete the preliminary report -Updated team areas of the LA notebook	10	10	33
Ellie Kothbauer	10/10/24	-Worked on preliminary presentation and presented it to other groups -Met with the team to work on the preliminary report -Continued research on bone marrow aspiration	7	7	22
Anya Bergman	10/10/24	- Worked on the preliminary presentation and presented it to other groups and advisor. -Met with the team to work on the preliminary report. -continued research in lab archives notebook	7	7	20
Helene Schroeder	10/10/24	- Presented the preliminary presentation. - Met with the team to work on the preliminary report. - Completed the preliminary report. - Continued research of bone marrow aspiration.	8	8	22
Ella Cain	10/10/24	-Presented the preliminary design presentation with the group -Worked on the preliminary report -Uploaded the preliminary report to the canvas page and team website -Continued research on best materials for the model's parts	7	7	23

## Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
<b>Category 1</b>										
Material test	PLA, ABS, and PETG	UW		UW		9/26/	3	0.17	\$0.51	

swatches	test swatches	Makerspace		Makerspace		2024				
									\$0.00	
<b>Category 2</b>										
									\$0.00	
									\$0.00	
								<b>TOTAL:</b>	<b>\$0.51</b>	