

# Veterinary bone marrow aspirate models

Date: 10/31/2024

Client: Dr. McLean Gunderson

Advisor: Prof. Randy Bartels

Team:

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- Helene Schroeder - Co-Leader, BSAC - [hschroeder4@wisc.edu](mailto:hschroeder4@wisc.edu)
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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

This week the team met to work on finalizing and ordering materials for the model. We settled on several ball and socket joints to test for the shoulder joint. For the muscle we are looking into more cost effective alternatives to silicone sheets as we expect this component will have to be replaced. We met again later in the week to finalize our pitch and call to action for the Show and Tell this Friday where we will be able to get feedback and advice from our peers.

## Difficulties / advice requests

The team is working on creating a CAD model from the 3D scan files in SolidWorks and are working through trying to remove the mesh from the .stl file it was imported as. We were able to 3D print an unmodified humerus from the .stl, but will need to remove the mesh/convert the file type to begin modifying the bone model.



<b>Meetings</b>															
Client		X		X											
Advisor	X	X	X			X									
<b>Website</b>															
Update	X	X	X	X	X	X	X	X							

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

## Current design

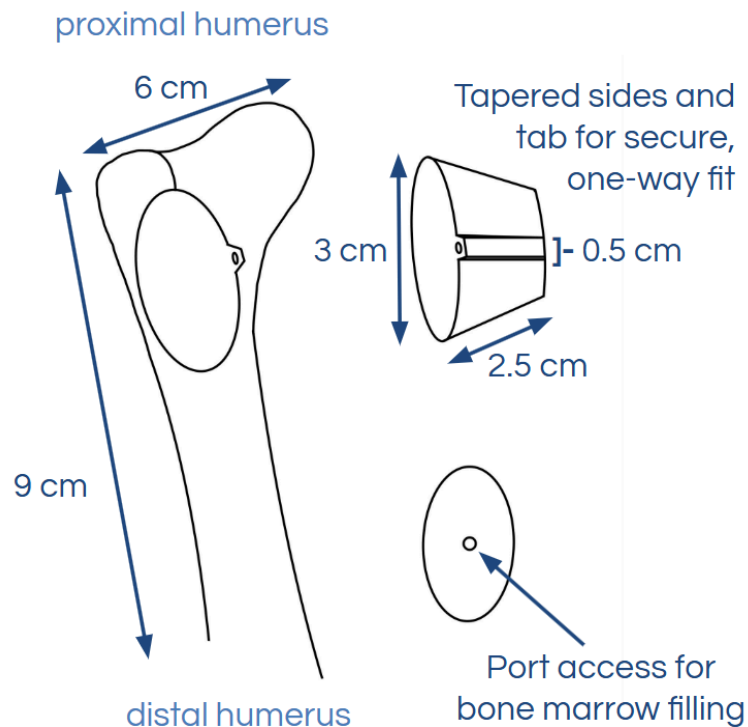


Figure 1: Drawing of the Slide Method of attachment

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
  - Continued working on the CAD model of entire bone structure
  - Continued working on the CAD model for the replaceable component
  - Finalized fabrication plans and order any outside materials needed
- Avery
  - Worked on CAD model with team and individually.
  - Finalized plans for Show and Tell presentation and 3D printed test humerus.
  - Helped teammates set up and start using SolidWorks.
- Helene
  - Determined what to present during Show and Tell next week.
  - Worked on the models with the team.
- Anya
  - Determined the best course of action for the shoulder joint.
  - Found materials for the muscles, and joints.
  - Helped with ideas of what to present for show and tell next week.
- Ella
  - Discussed whether or not to change the CAD models to include a ball in the socket joint between the scapula and humerus, or to buy a joint instead.
  - Discussed potential materials for the pseudo-muscle of the model
  - Continued working with SolidWorks and becoming more familiar with the program.
- Ellie
  - Worked on the CAD model with the team
  - Helped figure out plans for show and tell presentation

## Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Avery Schuda	10/31/24	-Met with team to work on CAD model and ordering materials -Worked on patching holes in scans using Fusion and CAD model in SolidWorks -Met with Anya to 3D print humerus in the Makerspace -Met with team to work on Show and Tell pitch	7	7	48

Ellie Kothbauer		-Met with team to work on CAD design and materials -Discuss show and tell to prepare for presentation.	3	3	33
Anya Bergman		-Met with team to work on CAD and discuss materials - Printed out test bone to look at print quality and have a prop for show and tell -looked at different materials for purchasing	4	4	29
Helene Schroeder	10/31/24	- Met with team to work on CAD model, discuss materials, and discuss Show & Tell	3	3	30
Ella Cain		-Met with the team to work on CAD models of bones and discuss materials -Met with the team to plan for the show-and-tell session on Friday. -Looked at muscle material options and research articles	5	5	36

## Materials and expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
<b>Category 1</b>										
Material test swatches	PLA, ABS, and PETG test swatches	UW Makerspace		UW Makerspace		9/26/2024	3	0.17	\$0.51	
									\$0.00	
<b>Category 2</b>										
									\$0.00	
									\$0.00	
								<b>TOTAL:</b>	<b>\$0.51</b>	