

# A Friction Testing-Bioreactor Device for Study of Synovial Joint Biomechanics, Mechanobiology, and Physical Regulation

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## Materials

Name	Company	Catalog Number	Comments
Aluminum foil	Reynolds Group Holdings	Reynolds Wrap	Sterile tissue harvest
Aluminum-framed acrylic enclosure	Custom made		Friction tester component
Autoclavable instant sealing sterilization pouches	Fisherbrand	01-812-54	Sterilization of tools
Autoclave	Buxton		Sterilization of tools
Beaker (250 mL)	Pyrex Vista	70000	Tissue harvest
Betadine (Povidone Iodine Prep Solution)	Medline Industries, LP	MDS093906	Sterile tissue harvest
Biological safety cabinet	Labconco	Purifier Logic+ Class II, Type A2 BSC	Sterile tissue harvest
Biospy punch	Steritool Inc.	50162	Tissue harvest
Box cutter	American Safety Razor Company	94-120-71	Tissue harvest
Circular acrylic-silicone post (synovium)	Custom made		Tissue mounting
Culture media	Custom made		DMEM (Cat No. 11-965-118; Gibco) supplemented with 50 µg/mL L-proline (Cat. No. P5607; Sigma), 100 µg/mL sodium pyruvate (Cat. No. S8636; Sigma), 1% ITS (Cat. No. 354350; Corning), and 1% antibiotic-antimycotic (Cat. No. 15-240-062, Gibco)
Cyanoacrylate (Loctite 420 Clear)	Henkel	135455	Tissue mounting
Dead weights	OHAUS		Normal load
Ethanol 200 proof	Decon Labs, Inc.	2701	Dilute to 70 %
Fixed base	ThorLabs, Inc.	SB1T	Friction tester component
Forceps (synovium harvest)	Fine Science Tools	11019-12	Tissue harvest

Forceps (synovium mounting)	Excelta	3C-S-PI	Tissue mounting
Horizontal linear encoder (for translating stage)	RSF Electronics, Inc.	MSA 670.63	Friction tester component; system resolution of 1 $\mu$ m
Hot glue gun and glue	FPC Corporation	Surebonder Pro 4000A	Tissue mounting
LabVIEW	National Instruments Corporation	LabVIEW 2010	Friction testing program
Load cell	JR3 Inc.	20E12A-M25B	Friction tester component; 0.0019 lbs resolution in x&y, 0.0038 lbs resolution in z
Loading platen	Custom made		Tissue mounting
O-ring	Parker	S1138AS568-009	Tissue mounting
Petri dish (60 mm)	Falcon	351007	Tissue mounting
PivotLok Work Positioner (tibia holder)	Industry Depot, Pivot Lok	PL325	Tissue harvest
Removable base	ThorLabs, Inc.	SB1B	Friction tester component
Ring stand			Tissue harvest
Scalpel blades	Havel's Inc.	FSC22	Tissue harvest
Scalpel handle	FEATHER Safety Razor Co., Ltd.	No. 4	Tissue harvest
Screwdriver	Wera	3334	Tissue harvest
Stage	JMAR		Friction tester component
Stepper motor	Oriental Motor Co., Ltd.	PK266-03B	Friction tester component
Suction tool	Virtual Industries, Inc.	PEN-VAC Vacuum Pen	Tissue mounting
Support rod	Custom made		Tissue mounting
Surgical scissors	Fine Science Tools	14061-09	Tissue mounting
Synovial fluid (bovine)	Animal Technologies, Inc.		Friction testing bath
Testing bath	Custom made		Phosphate-Buffered Saline (PBS) with protease inhibitors: 0.04% isothiazolone-base biocide (Proclin 950 Cat. No. 46878-U; Sigma) and 0.1% protease inhibitor - 0.05 M ethylenediaminetetraacetic acid, EDTA (Cat. No. 0369; Sigma)
Tissue culture incubator	Fisher Scientific	Isotemp	Sterile culture
Vertical linear encoder (for loading stage)	Renishaw	T1031-30A	Friction tester component; 20 nm resolution
Voice coil actuator	H2W Technologies	NCC20-15-027-1RC	Friction tester component