



DEPARTMENT OF
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UNIVERSITY OF WISCONSIN-MADISON

Langendorff Apparatus for Cardiomyocyte Isolation

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Overview

- Problem Statement
- Background
- Product Design Specifications
- Design Matrix
- Future Work



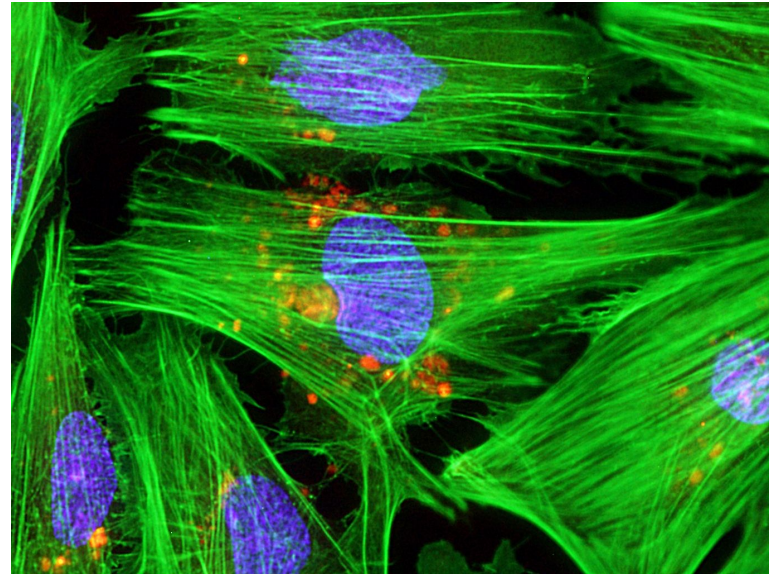
Problem Statement

For the purposes of isolating functional cardiomyocytes (CMs), we must design a Langendorff apparatus capable of retrogradely perfusing solutions through the aorta of an excised Guinea pig heart.



Client Background

- Dr. Erick Ríos Pérez
 - Post-doctoral researcher in Gail Robertson Lab
 - Research focuses¹:
 - hERG channels
 - Drug interactions

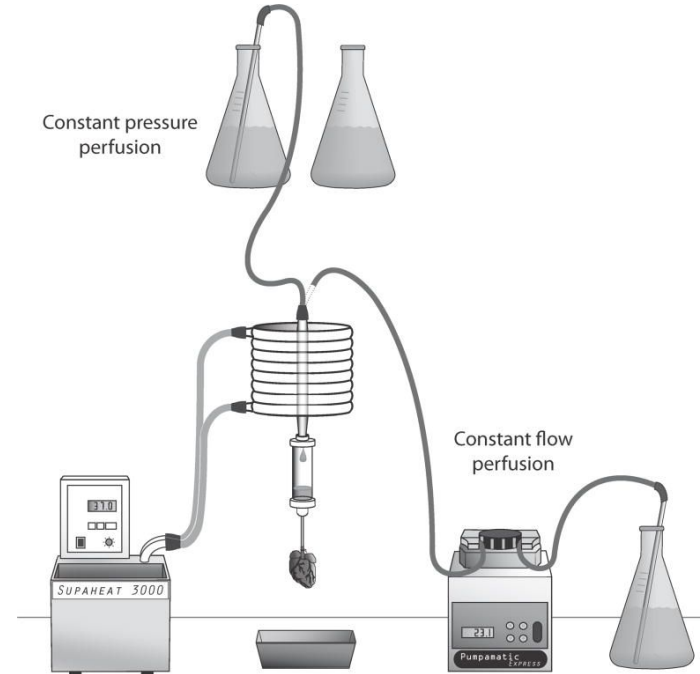


Cardiomyocytes²



Background - Langendorff Apparatus

- Well-established technique for cardiomyocyte isolation³⁻⁶
- Two methods of perfusion⁶:
 - Constant flow
 - Constant pressure



Langendorff Apparatus Schematic³



Background -Competing Designs



ADInstruments - Panlab (Constant Pressure or Constant Flow) ⁷



Radnoti - Rat/ Guinea Pig/ Rabbit⁸



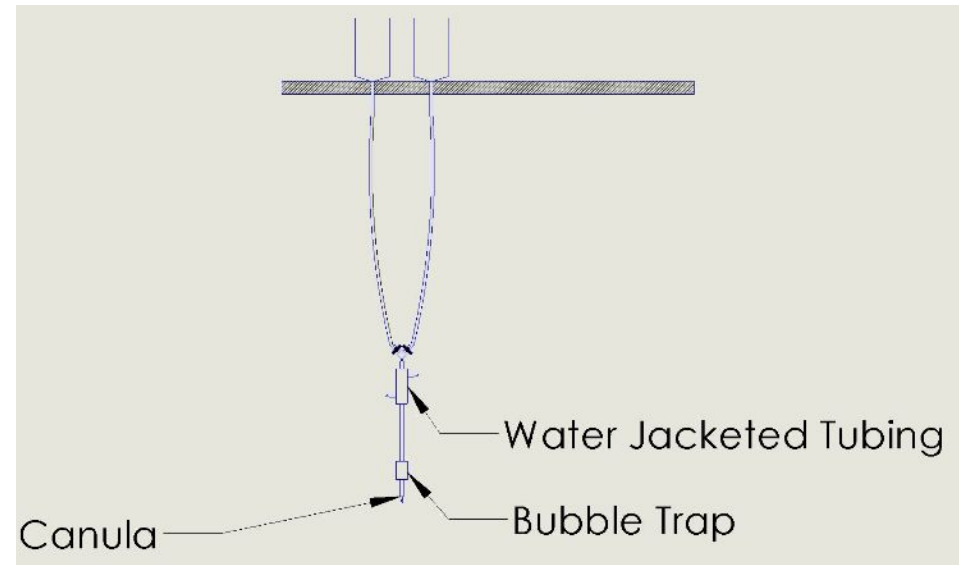
PDS Summary

- Perfusion with two, recyclable solutions
- Temperature of 37°C
- Maintain perfusion rate near 8.6 ± 3.6 ml/min⁹
- Maintain perfusion pressure near 50-80 mmHg⁹
- Rest in lab space provided
- Budget of \$200



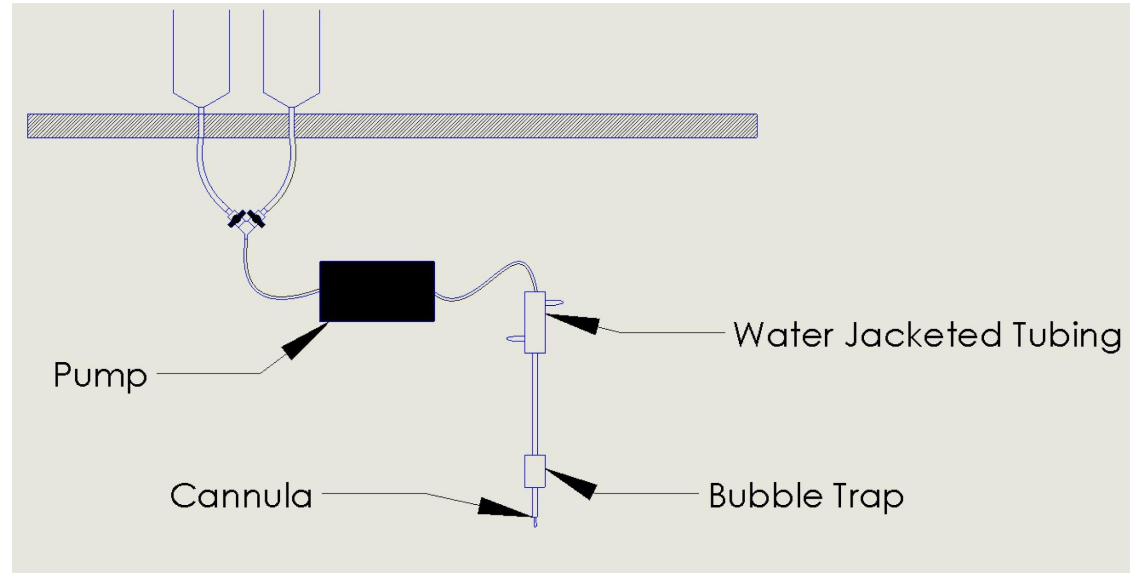
Gravity Fed Design

- Unreliable fluid flow rate
- Cheapest design
- Not bulky



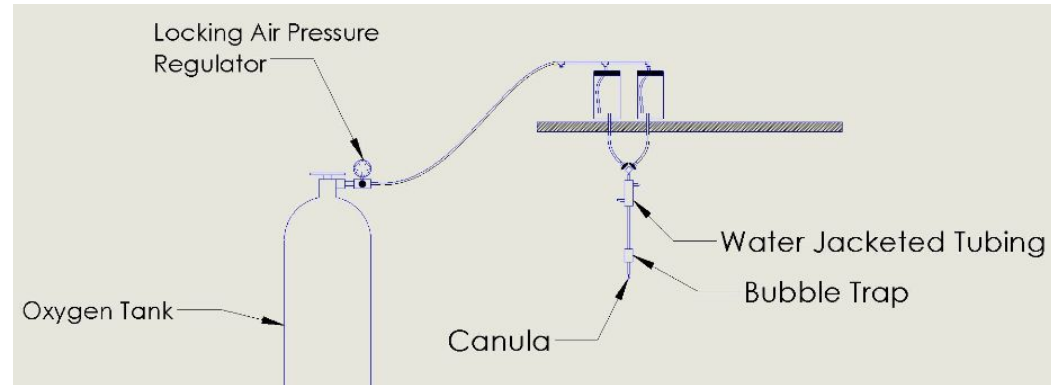
Peristaltic Pump Design

- Costly
- No excess connection points
- Slightly bulkier
- Predictable flow



Air Pressure Design

- Bulkiest
- Potential tank in each design
- Ease of recycling
- Closed system
- Consumables



Design Matrix

	Weight	Peristaltic Pump		Oxygen		Gravity	
Cost	20	3/5	12	1/5	4	5/5	20
Contamination	5	4/5	4	5/5	5	2/5	2
Ease of Use	30	3/5	18	3/5	18	5/5	30
Fabrication	10	2/5	4	3/5	6	5/5	10
Reliability	25	4/5	20	5/5	25	1/5	5
Safety	10	4/5	8	2/5	4	5/5	10
Total	100	66		62		77	



Future Work

- Preventing leakage of perfusates
- Maintaining temperature of perfusate
 - Testing/adjusting temperature of circulating water
- Gravity Fed Design
 - Computing specific height of tubing column



Acknowledgements

- Professor Wan-Ju Li
- Dr. Erick Ríos Pérez



References

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Questions / Comments?

