Tissue Dissociation

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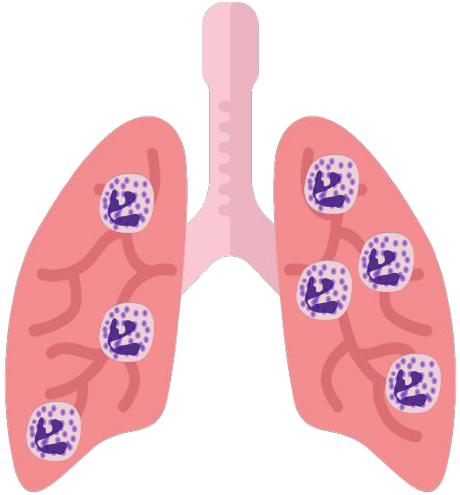
Problem Statement

Dr. Mathur's research group receives tissue samples from lung biopsies that are too small and/or time sensitive to allow for use of common tissue dissociation methods. Our goal is to develop a tissue dissociation method that will allow for interrogation of gene expression as well as cell surface markers. Specifically, Dr. Mathur is interested in the effect of tissue resident eosinophils on asthma.

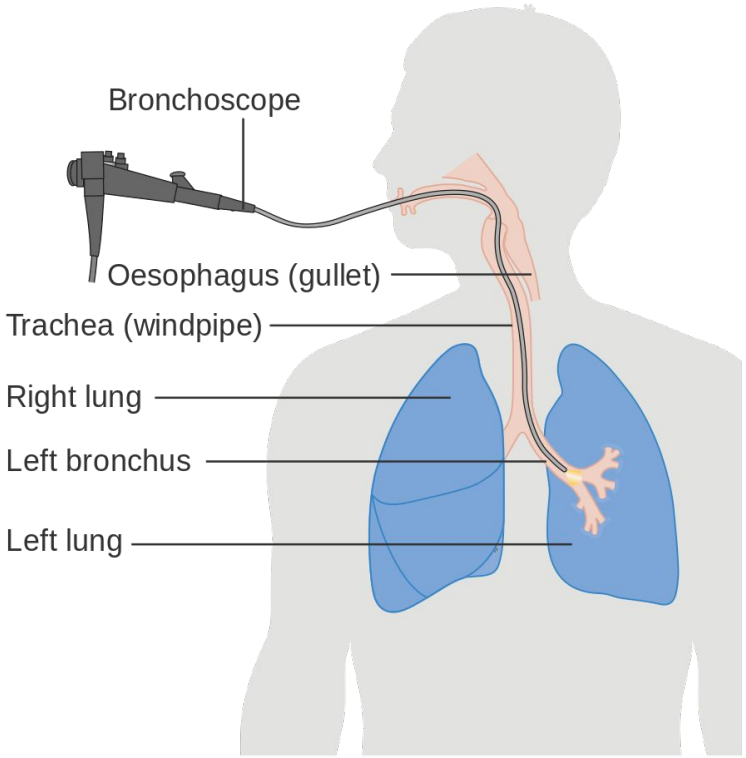
Background Material

Asthma and the Eosinophil



Background Material

Lung Biopsies

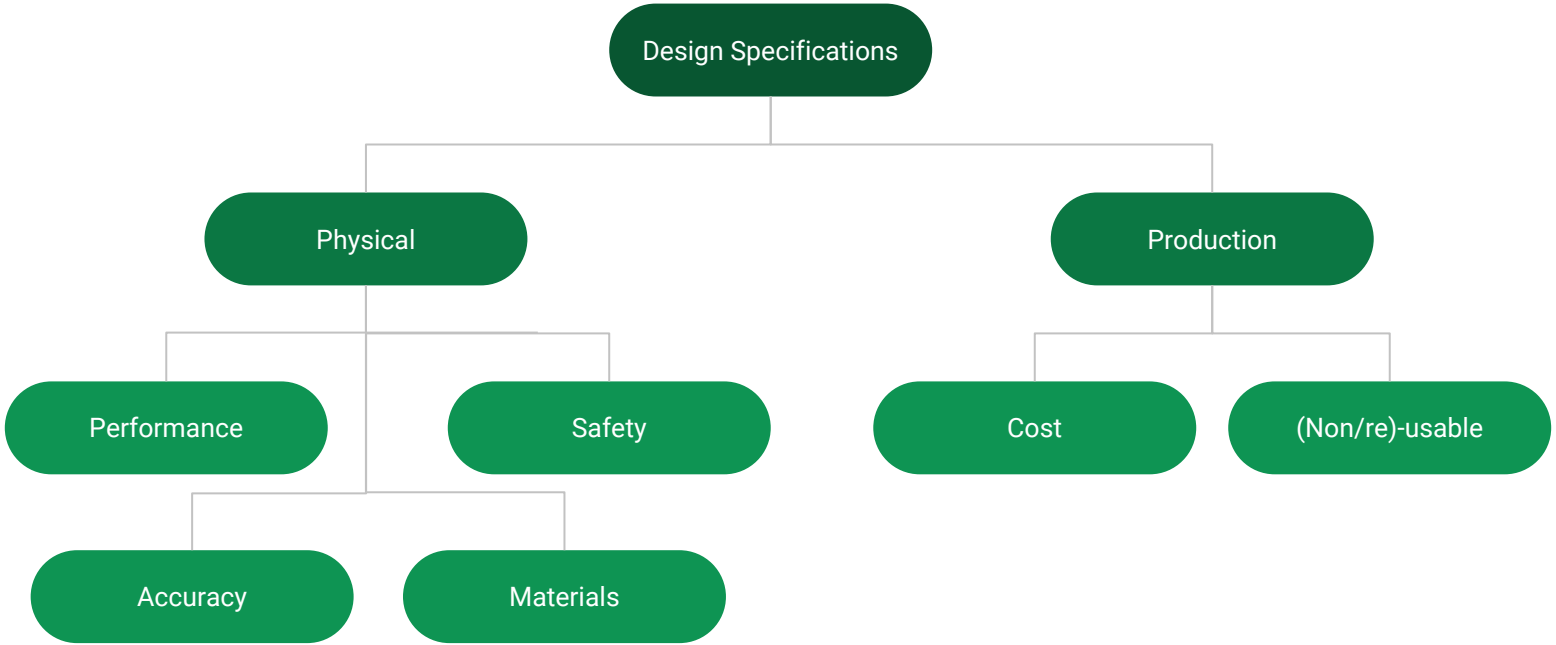


Background Material

Current Methods

- Literature standard: enzymatic
  - Long incubation
  - Surface markers damage/change
- gentleMACs
  - Larger sample required

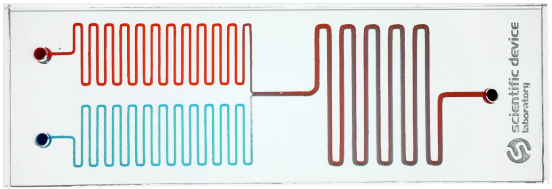
Previous Work


Design Specifications
Physical
Production
Performance
Safety
Cost
(Non/re)-usable
Accuracy
Materials

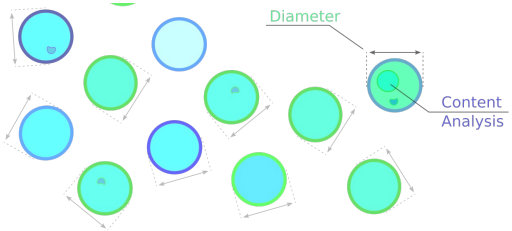
Alternative Designs Considered

Enzyme with Gentle Agitation

Enzyme and Microfluidic Device



Hydrogels with gentleMACs dissociator



Design Matrix

	Weight	Enzyme and Gentle Agitation		Enzyme and Microfluidic Device		Hydrogel Matrix with the gentleMACS Dissociator	
Cost	10	5/5	10	3/5	6	4/5	8
Ease of Fabrication	15	5/5	15	3/5	9	4/5	12
Duration of Dissociation Process	20	3/5	12	4/5	16	5/5	20
Cell Viability	20	2/5	8	4/5	16	5/5	20
Effect on Cell Surface Markers	25	4/5	20	3/5	15	5/5	25
Ease of Use	10	5/5	10	3/5	6	4/5	8
TOTAL	100		75		68		**93**

gentleMACs dissociation + Hydrogel

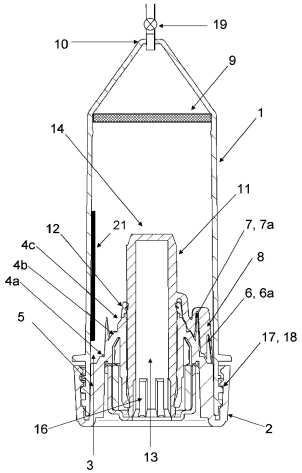
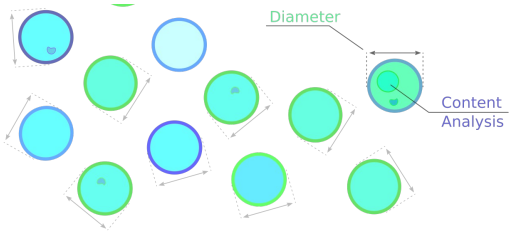
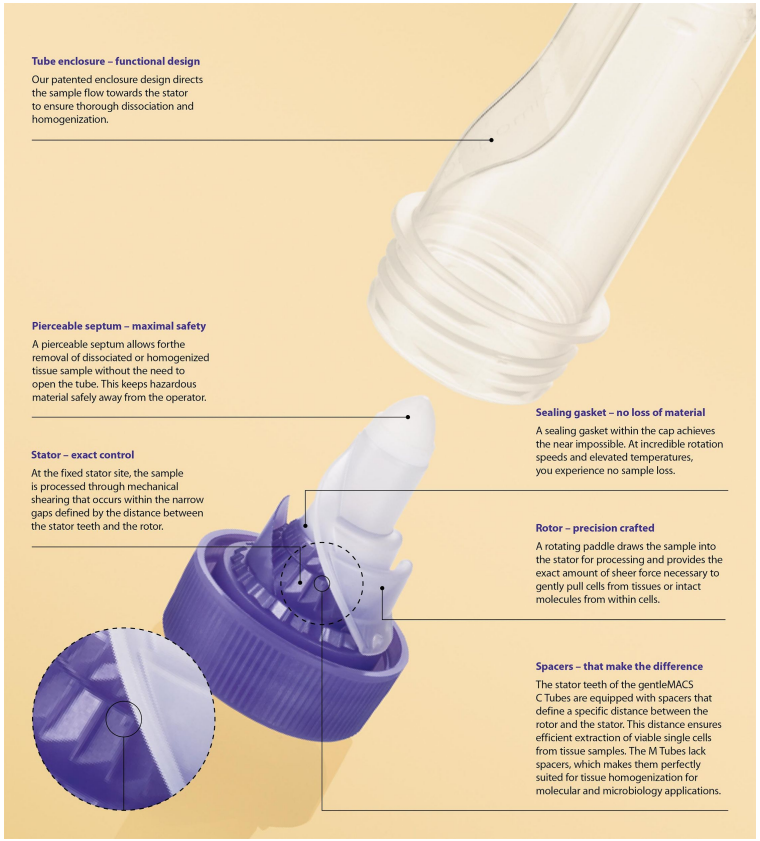


Fig. 1



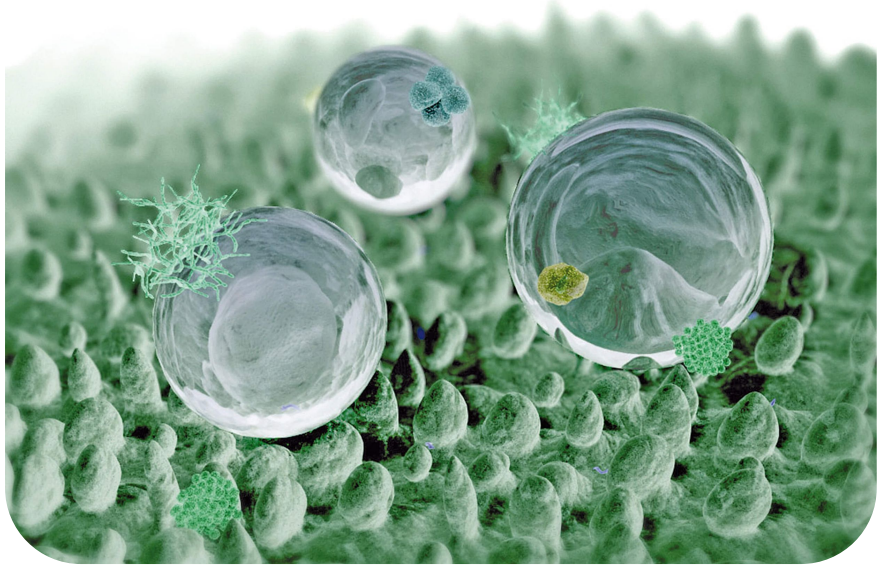
gentleMACs Dissociator

Established but limited



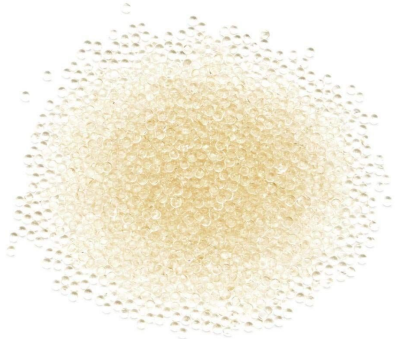
Hydrogel Selection Criteria

- Hydrogel composition
  - Material
    - Natural: Alginate, Chitosan, Agarose
    - Synthetic: PEG+Monomers, PHEMA
  - Cross linking
    - Stiffness
    - Swellability
- Size of beads
  - Inertial force application
  - Contact level



Future Work

- Additional Research
  - Determination of ideal hydrogel
  - Enzyme selection
  - gentleMACs settings
- Create or purchase hydrogels
  - Miracle-Gro/ “Water Beads”
    - Polyacrylate
- Prototype hydrogel system



References and Acknowledgments

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Questions / Comments?