Novel Ophthalmic Minimal Dead Volume Drug Delivery System

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Saving Money By Reducing Drug Waste

Members: Kyle Pfeffer, Rachel Grant, Victoria Triana
Advisors: Mark Hedgeland and Tom Meyer

DREXEL UNIVERSITY School of Biomedical Engineering, Science and Health Systems

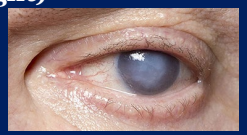
NOVARTIS

Problem:

- Age related macular degeneration (AMD) is currently treated by injecting anti-VEGF or gene therapy (in clinical trials)
- *Current injection techniques* create cost burden due to dead volume and create variable flow rates → **retinal tears, hemorrhaging, and cataracts (left to right)**

AMD

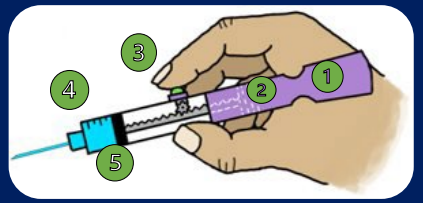
Healthy

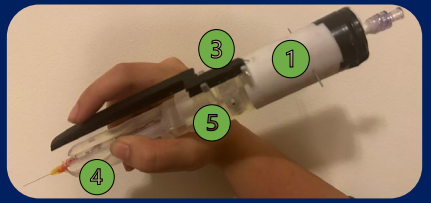


Need: *Develop a single-handed, in-office, drug delivery system with minimal dead volume and controlled flow rate*

Solution:

Pressurized custom 3D printed chamber with compressed air actuates piston to initiate flow when start/stop mechanism is engaged



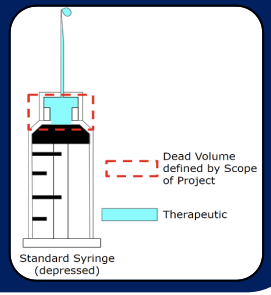


Components:

1. Pressure Chamber
2. Piston Chamber
3. Start/Stop Mechanism
4. Syringe
5. Dose Cradle

Design Inputs:

C1. Dose ≤ 100 uL
R1. Dead volume ≤ 10uL
R2. Average flow rate = 10-20 uL/s
R3. Dose accuracy ± 15%



Verification Testing:

A dose [100 uL] drawn up, administered into weighing boat, then weighed. Average flow rate (uL/s) and dose accuracy (%) based on 100 uL was recorded.

Requirement	P-Value		Pass/Fail?
	Lower	Upper	
R2. Flow Rate	0.006	<0.0001	PASS
R3. Dose Accuracy	<0.0001	<0.0001	PASS

Future:

Revisions:

1. Make design shorter
2. Injection mold parts

Impact:

1. Saves user over **$20,000 per injection**
2. Total cost to build current device = **$33.65!**
3. Allows for a **controlled flow rate**