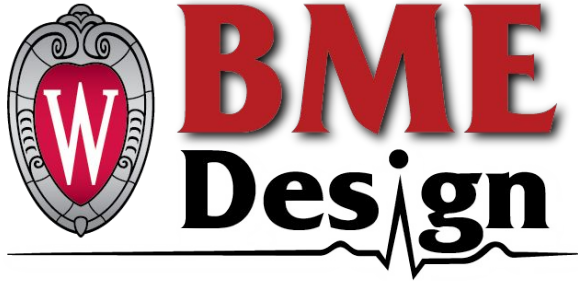


# Non-Invasive Cervical Cancer Screening

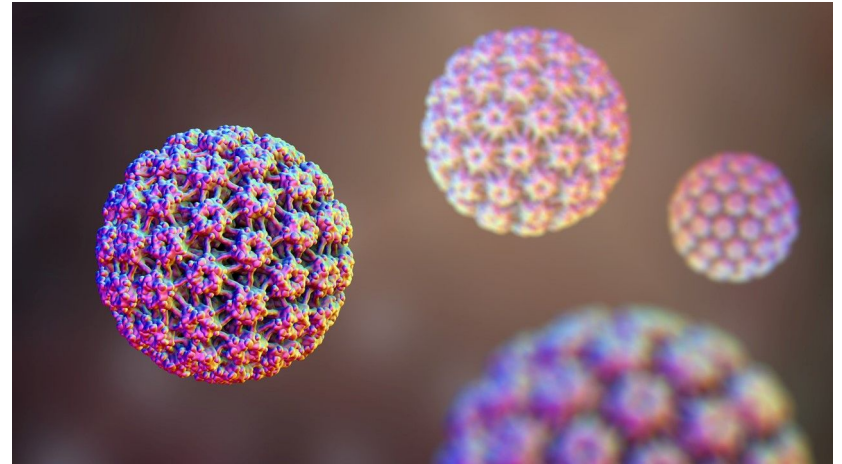


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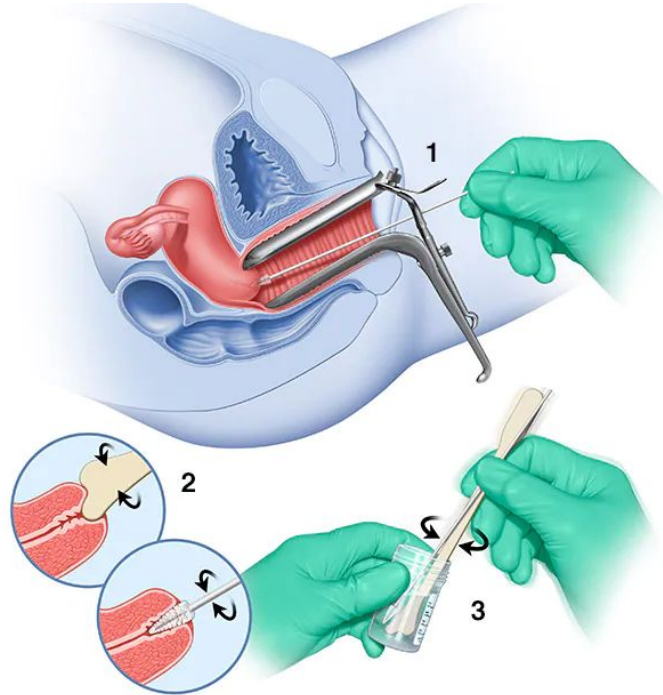
# Human Papillomavirus (HPV) and Cervical Cancer

- HPV is the most common sexually transmitted infection
  - 200 different types, but only 40 can infect the genital areas
- Persisting infection of certain strains of HPV can lead to cervical cancer
  - HPV 16 is linked to approximately 50% of cervical cancers worldwide
  - HPV 18 is the second most important
- Cervical cancer is one of the most common cancers in women



*Figure 1: Computer generated model of HPV*

# Current Cervical Cancer Screening Procedures



- Pap smears
  - Provider inserts speculum to visualize cervix
  - Provider then uses a wooden or plastic scraper and/or cervical brush to collect cell sample
  - A cytopathologist then examines the cell sample under a microscope

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Figure 2: Step-by-step illustration of a Pap smear test

# Problem Statement

- Cervical cancer is one of the most treatable cancers when diagnosed early
- Current screening methods must be performed by medical professional
  - Not easily accessible in developing countries
  - Uncomfortable experience
- Discrete, self-collected urine sample test
  - Cost-effective screening option
  - Culturally sensitive screening option
  - Easily accessible screening option worldwide

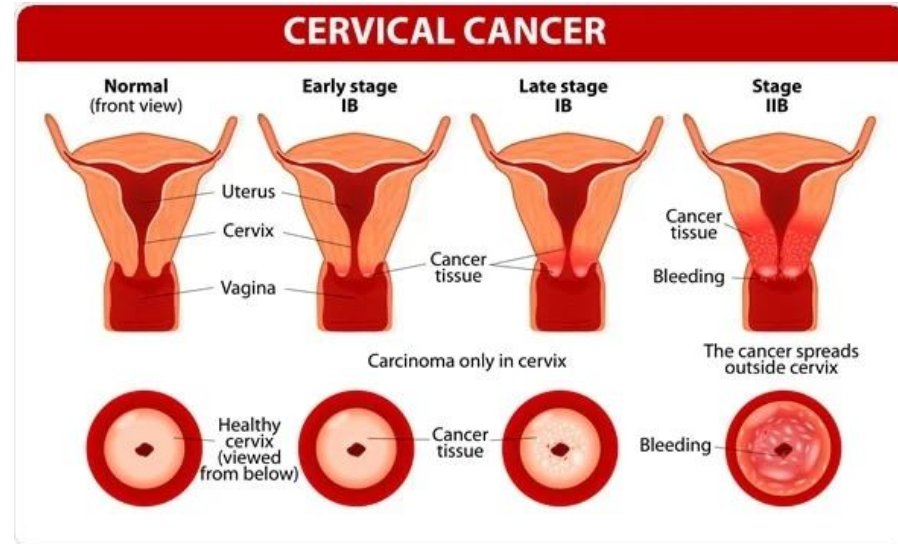


Figure 3: Cervical cancer stages illustration

# Product Design Specifications



Figure 4: Women in rural western Africa

- Client Requirements
  - Cost between \$3-5 USD
  - Accessible to demographic
  - Easy to use
  - Provides clear results

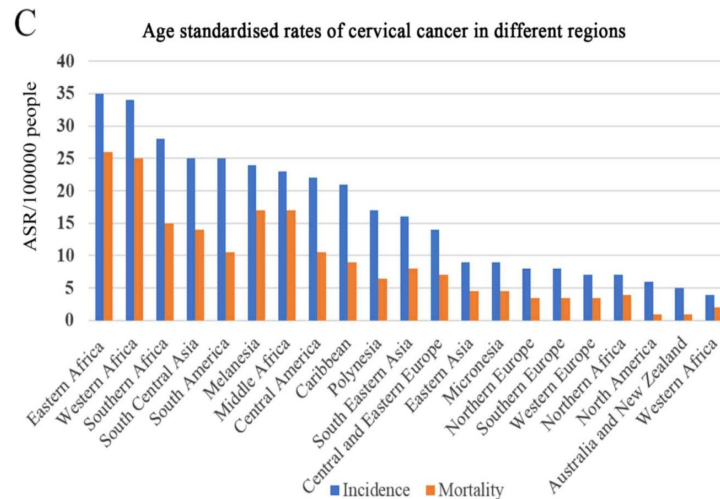


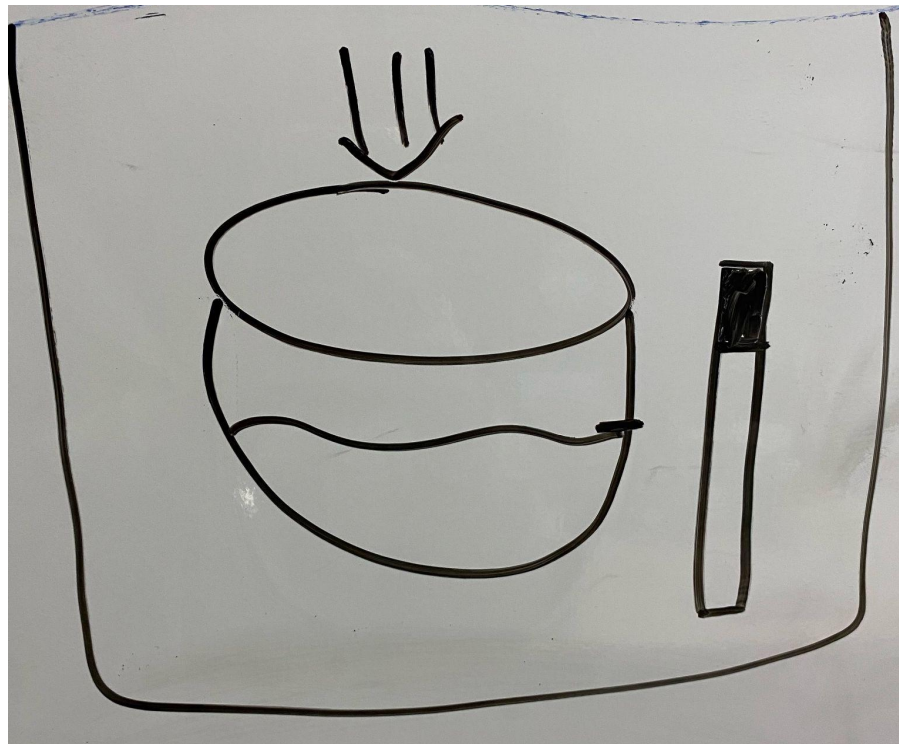
Figure. 5 : Incidence and mortality based of cervical cancer on geographic location

- Test should provide at least 70% accurate results
- Biocompatible and non toxic
- Should not be biodegradable
- Product should be single use

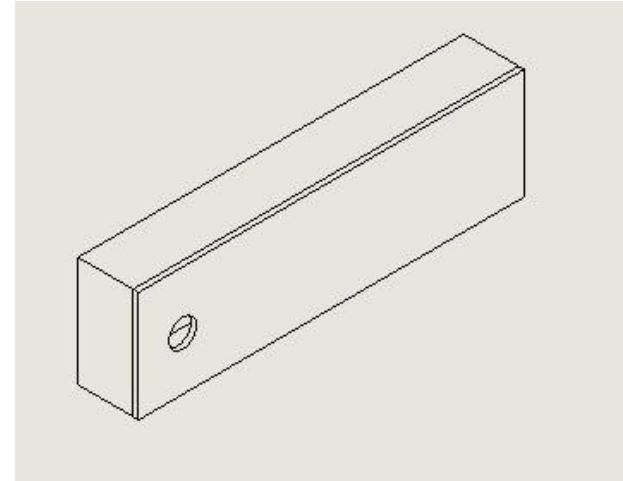
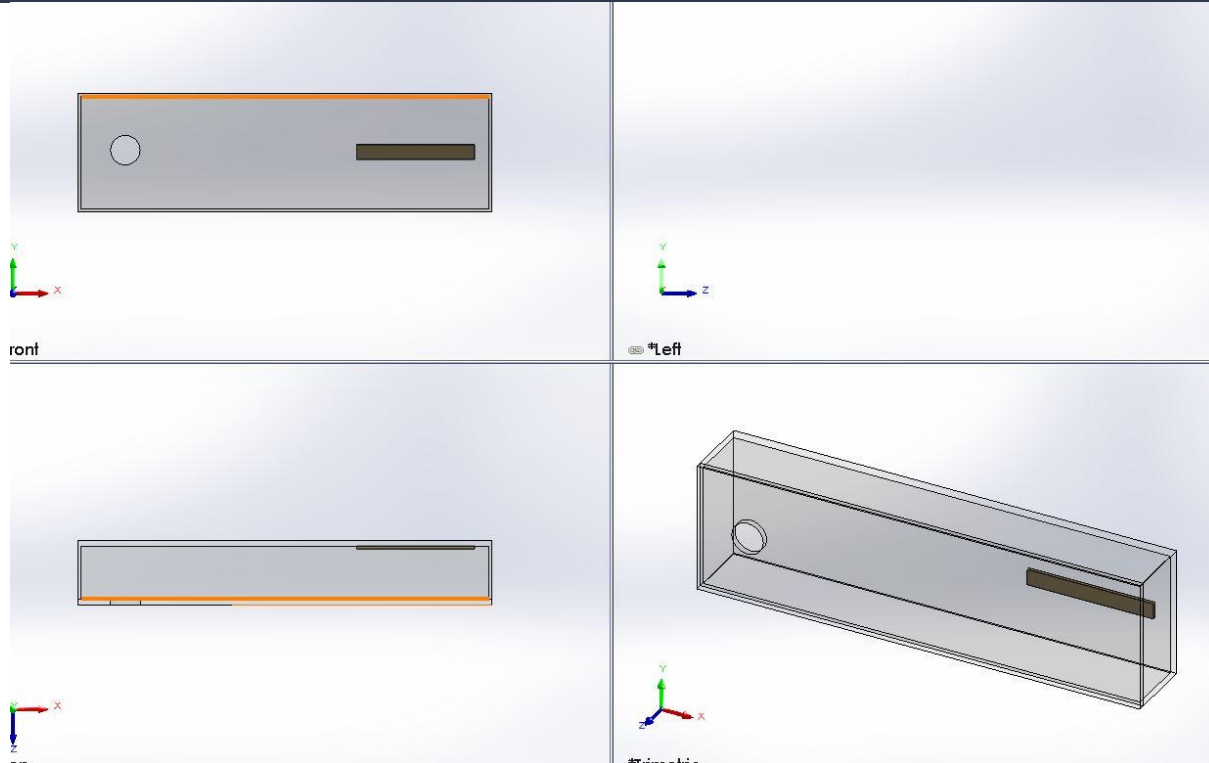
# Design Matrix (Sample Type)

Categories	#1 Blood		#2 Saliva		#3 Urine	
Prior Detection (30)	3/5	18	3/5	18	4/5	24
Ease of Obtaining Usable Sample (25)	4/5	20	3/5	15	4/5	20
Comfort (20)	2/5	8	5/5	20	4/5	16
Ease of Collection (15)	2/5	6	5/5	15	4/5	12
Storage Requirements (10)	2/5	4	5/5	10	4/5	8
Total (100)	56		78		80	

# Design 1: Strip Dip

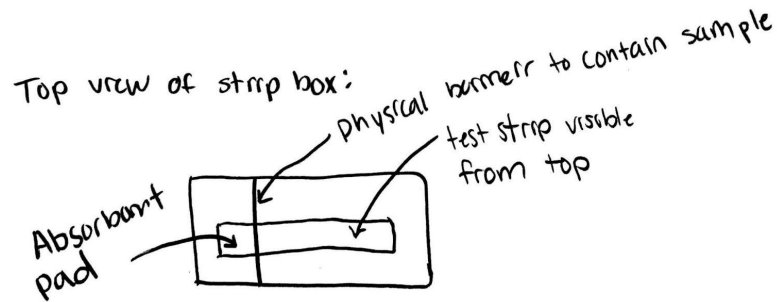
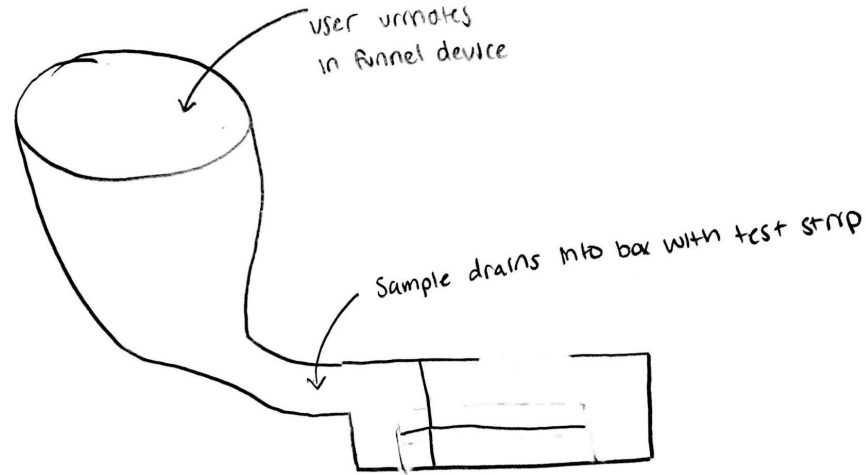


# Design 2: Drop Tests

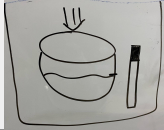






# Design 3: Funnel Device



# Design Matrix (Collection Device)

Categories	Designs #1 Strip Dip 	#2 Drop Test 	#3 Funnel Device 			
Ease of Use (30)	3/5	18	4/5	24	5/5	30
Cost (25)	5/5	25	3/5	15	2/5	10
Ease of Fabrication (20)	5/5	20	4/5	16	2/5	8
Sample Containment (15)	3/5	9	5/5	15	2/5	6
Efficiency (10)	4/5	10	5/5	10	3/5	6
<b>Total (100)</b>	82		80		60	

# Future Challenges

- Finding an Accessible Biomarker
  - let-7d-3p and miR-30d-5p
  - HPV antibody
  - HPV16/18 - E6 oncoprotein
- Cost Considerations
  - Goal of \$3-5 sale price
- Sample collection device modifications



Figure 7: Image of one step in the process of DNA extraction

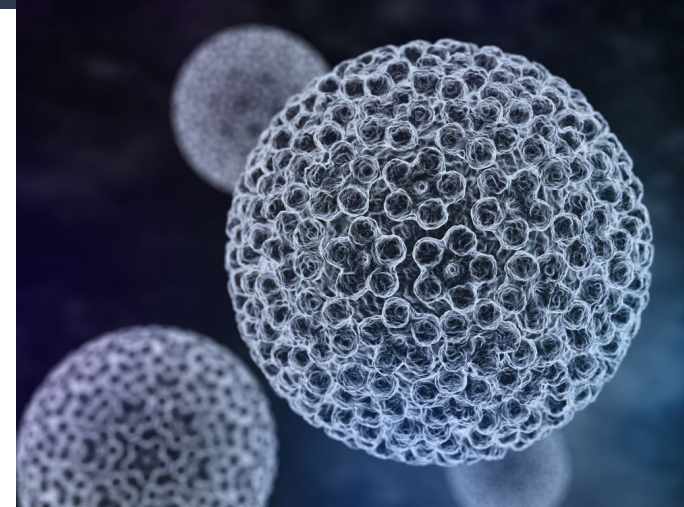


Figure 6: Image of HPV antibody

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