

**INRODUCTION**

**Issues to Address**

- Cost/accessibility of culturally appropriate and sustainable menstrual health products
- Ability to dispose of the pads in a safe and healthy way

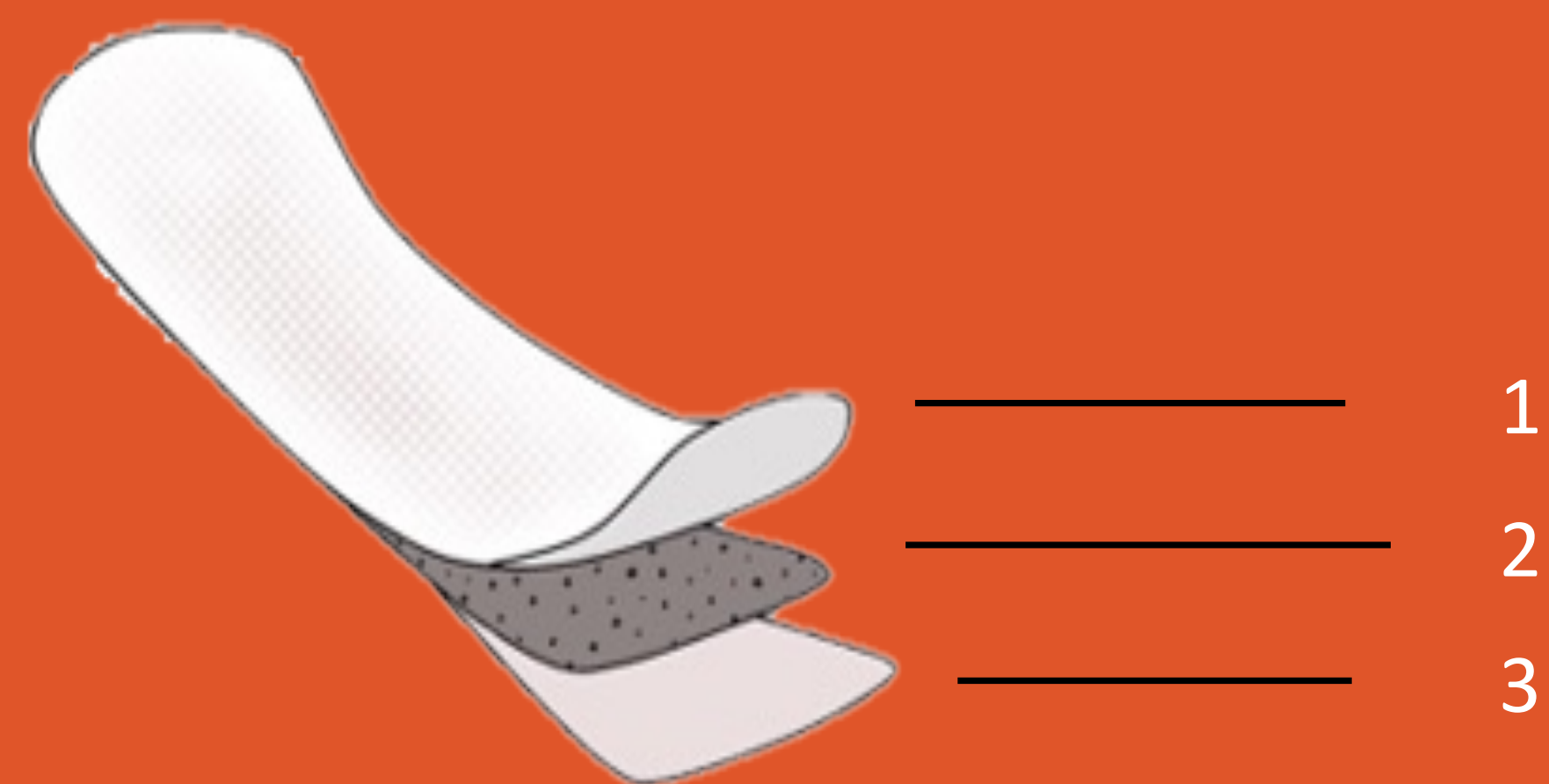
**Purpose**

- Develop a biodegradable menstrual pad that is affordable and effective through the use of superabsorbent polymers and other absorbent materials.

**Plan**

- Take the tested prototypes to a small village in Botswana, Africa to establish a menstrual hygiene program. This program will focus on educating young girls as well as providing them with the necessary supplies to develop healthy menstrual habits.

**FUNCTIONAL COMPONENTS**



1. Cotton top sheet (UNITIKA model UO305/A25)
2. Absorbent core-TENCEL™ cotton and hemp fibers with embedded SuperAbsorbent Polymer (Zeba™)
3. Compostable garbage bag (Glad®)

**FUTURE PROTOTYPE WORK**

Current areas of focus for improving our prototype include:

**Absorbent Core:**

- We are researching and conducting preliminary tests on hemp material for the middle layer given its sustainable and biodegradable properties.

**SuperAbsorbent Polymer (SAP):**

- Zeba ( a biodegradable SAP) is used in our current prototype, but we plan on testing: AzuraGel™ ( a biobased biodegradable SAP) and Sumitomo Seika ( a non-biodegradable SAP used by many feminine hygiene products marketed as eco-friendly.)

Prototypes will be tested to **four performance parameters**, from the European Disposables and Nonwovens Association

1. **STRIKETHROUGH**-how fast a pad absorbs liquid
2. **ABSORBENCY**-how much liquid a pad can hold
3. **WETBACK**-how wet a pad feels to the skin
4. **ADHESION**-how well a pad stays in place when stuck to an undergarment



**MATERIAL SCIENCE IN MENSTRUAL HEALTH AND HYGIENE**

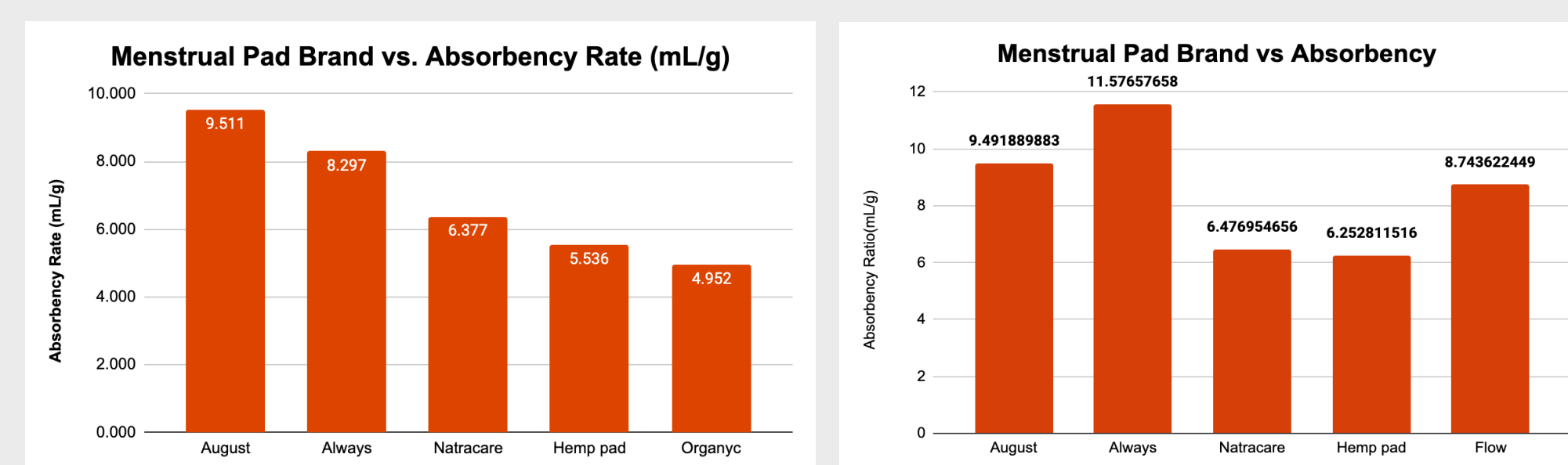
**MHH Team Members:** Brooke Aduviri, Kate Bandettini, Nyssa Engebo, Isabel Griffin, Sydney Nash, Isabel Howard  
**Advisors:** *Dr. Skip Rochefort (CBEE) and Dr. Sunil Khanna (OSU Global Health)*

**ABSORBENCY TESTS**

- Absorbency tests quantify how much liquid can be absorbed by different SAPs and PLA topsheets.
- 2 mL of liquid is added to the pad and given 60 seconds to absorb, the pad is rotated for 15 seconds and the process is repeated until dripping point.
- The absorbency rate is found by dividing the volume of liquid absorbed by the original mass (mL/g).
- A 1wt% saltwater has been used in all sample tests.
- We recently began using cow's blood in tests and will continue retesting our samples with cow's blood to gather more accurate data

**Feminine Hygiene Products on the Market**

- We researched and purchased feminine hygiene products on the market to test their absorbency as a benchmark.
- We tested many brand names, but also found products that have components, such as Sumitomo Seika SAP and hemp based materials, that we are interested in integrating into our final product.



**Saltwater Absorbency vs Cow Blood Absorbency**

**WETBACK TEST**

- Wetback tests show how quickly liquid is absorbed into the pad and how it may feel to the skin.
- The wetback test involves adding water or cow's blood and letting the pad sit, then weighing a filter paper before and after placing it on the wet pad with a weight on top of the paper.
- The mass change of the filter paper indicates how much liquid has not been absorbed by the pad
- We are conducting wetback tests on different topsheet materials on the market to see which stays the driest.

**COMPOST TESTS**

- All materials we plan on using have met the standards to be described as biodegradable and compostable.
- Depending on the depth of the compost(12-16 inches), worms can also help to break down organic material.
- HIV becomes inactive after leaving its host and being exposed to temperatures above 25 degrees Celsius(a healthy compost pile ranges from 57-71 degrees Celsius). While the environment damages the virus almost immediately, it still takes a week to fully die and no longer be infectious.

**Procedure**

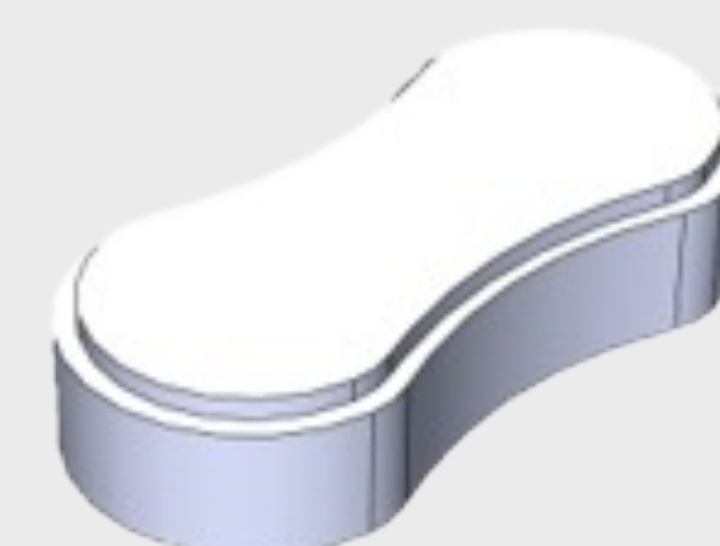
- We place pads in mesh bags, and bury said bags in Styrofoam containers filled with dirt and monitor the humidity over time, checking on the pads biweekly to see how they are breaking down.
- First, we established environments by placing soil in Styrofoam containers.
- We then added 5 mL of blood or DI water(depending on what bin the pad was going into) to the top of the pad and weighed the sample to find the initial mass. The pad was then placed in a mesh bag and labelled with its brand and purpose.
- This is repeated for all pads on interest, then the mesh bags are placed within the soil with at least 100 mm of depth.
- Water is added until the soil is saturated(roughly 2000 mL)
- The soil is checked weekly to ensure humid conditions are maintained, while the pads are checked biweekly to monitor degradation.

- Check out our booklet showing pictures with the breakdown of the pads over time!



**MANUFACTURING**

- We have designed dies on SolidWorks to shape the pads and 3D printed prototypes.
- We plan to manufacture them from aluminum with a CNC mill once we have a final design.
- We will attach the aluminum dies to a manual press to seal the contents within the pad.



**FUTURE WORK IN MAUNATLALA, BOTSWANA**

- Maunatlala is a rural community in Botswana, with about 5,000 residents.
- Dr. Sunil Khanna is working in a participatory and empowering partnership with the community to better understand the people and their health care needs.
- Menstruation is highly stigmatized within the community.
- HIV is prevalent in the community and should be taken into consideration.
- 80% of women surveyed(15-45years) said that commercial pads are either unavailable or unaffordable.
- Approximately 30% of the girls in school miss school monthly because of lack of availability of menstrual health products.
- Composting, with proper education, can provide both a viable and discreet way for young women to dispose of their menstrual pads in both homes and community centers in Muanatlala.
- For successful compost, one needs air, moisture, green matter and nitrogen, and heat, all of which are readily available in Botswana. The native grass and cow manure works well as green matter.
- While supplying these women with menstrual pads, we would also provide them with a 2-hour workshop to teach them how to use and dispose of the products.
- After the study is completed, we will hold focus groups and structured discussions to assess the viability of the pad and improvements that could be made.
- We have two students travelling to Botswana this summer to do preliminary work, Kate Bandettini and Isabel Griffin.



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