

A new compostable menstrual pad with BioSAB AzuraGel™ can improve women's lives in Botswana.



Innovations in Materials Science for a Transformative Menstrual Health and Hygiene Product

Mar Brasted-Maki, Alyssa Rogers, Heoniya Sharabarin, Lillian Nomie, Brooke Aduviri, Carter James

¹Oregon State University School of Chemical, Biological and Environmental Engineering

²Oregon State University School of Biological and Population Health Sciences

Mentors: Dr. Skip Rochefort¹ and Dr. Sunil Khanna²



Introduction

Issues to address

- The environmental impact of **disposable pads**
- The **lack of access** to products that are **hygienic, culturally-appropriate, affordable, and sustainable** In low- and middle-class countries

Purpose

- **Improve** performance of current biodegradable pads by adding biodegradable superabsorbent polymer

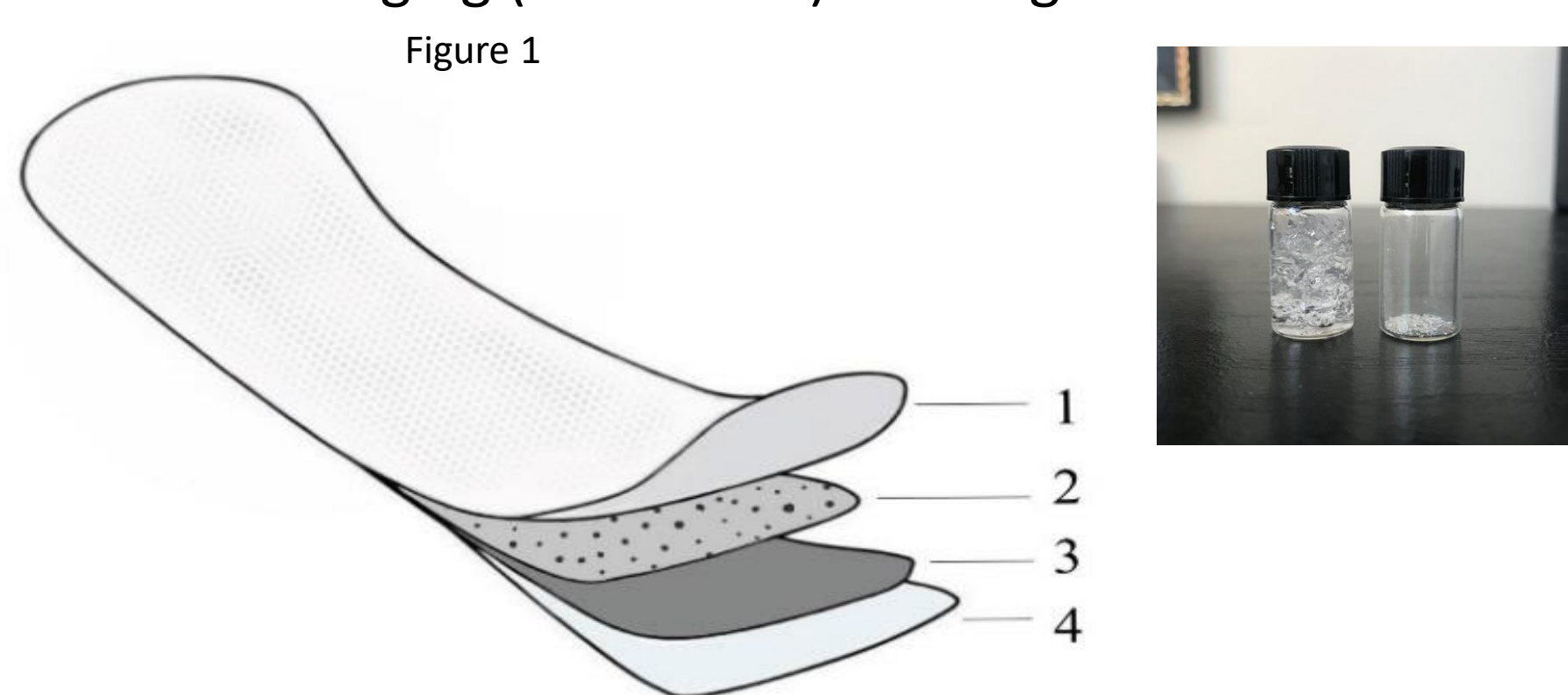
Plan

- Take our **transformative prototypes** to a village in **Botswana, Africa** to establish a menstrual hygiene program for young girls to try out the product

Functional Components of Prototype

1. A **wicking poly(lactic acid) (PLA) topsheet**
2. A **transformative, biodegradable superabsorbent biopolymer** (BioSAB AzuraGel™ fermentation based absorbent polymer or Zeba starch based absorbent polymer) interspersed in a thin sheet of nonwoven cellulose
3. A water-resistant but compostable backing, made of a **ceramic coated cellulose sheet**
4. An FDA approved **water-based adhesive** to attach to the undergarment.

Note: Packaging (not shown) - biodegradable PLA



Performance Testing

Absorbency tests

- The **absorbency ratio** shows **milliliters of liquid** absorbed per **gram of absorbent core** before the sample leaked
- Figure 2 shows absorbency performance of an expensive but biodegradable brand, **Natracare**, as compared to generic brand **Always** and the suggested **prototype**

Future tests

- The **wetback test** has been developed to test how wet a pad will feel to the wearer's skin
- Other tests suggested by the **European Disposables and Nonwovens Association (EDANA)** include (1) how well a pad **adheres to undergarments** and (2) how **fast** a pad **absorbs liquid**; the prototype will be evaluated according to both parameters
- All tests will be performed using **Zeba** and **BioSAB AzuraGel™ superabsorbent polymer** in turns
- All tests will be performed with both **saltwater** and **blood**

Future work on Prototype

- Decisions on **compostable components** will be finalized
- The pad's **biodegradability** will be assessed with an **ASTM standard test**
- Detailed **performance testing** will ensure a high quality product

Manufacturing

- **1500 pads** will be needed for the study
- Upper and lower dies (to shape pads) will be designed through SolidWorks, prototyped through a **plastic 3D printer**, then built in **aluminum** by the CNC mill
- The aluminum dies will be attached to a **manual press** and used to seal together the materials of the pad
- **Set-up a lay-up line** and a **pressing line** in the Polymer lab, staffed by the **undergraduate Menstrual Patch Team**

Composting

- All materials in the prototype meets **standard composting requirements**
- Composting requires **air, moisture, green matter and nitrogen** (i.e: grass, blood meal, animal manure), **dry matter and heat**
- In Botswana, native grass, used biodegradable pads, and cow manure can be used as compost green matter
- At 12-16 inches underground, **worms** also help break down organic matter
- Composting is ideal for homes and/or community centers in Muanatlala; with proper education, composting will be both **viable** and **discreet**
- **HIV** is present in the Botswana community and may be a concern for some
- When exposed to temperatures greater than 25°C, the HIV virus becomes **inactive** and can no longer reproduce
- After about a week the virus **dies completely** and is **no longer infectious**



Future Work in Muanatlala, Botswana*

- Muanatlala is a rural community in central Botswana (4,951 residents)
 - Dr. Sunil Khanna is part of a **participatory and empowering partnership** with the community to understand the people and their health care needs
 - Menstruation remains **highly stigmatized**
 - 80% of women (15-45years) indicated that commercial menstrual pads are either **unaffordable** or **unavailable**
 - Nearly **30%** of the school-aged girls **miss school** because they do not have access to menstrual products
 - The proposed **education program** will supply women with pads and teach them how to use and dispose of them in a 2 hour workshop
 - **Focus group discussions** and **structured interviews** will be used to assess the success or failure of the pad
- *A proposal for Bill and Melinda Gates Foundation *Grand Challenges Explorations 25* was submitted for this project

Acknowledgements

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Zoom Group Photo:



Figure 2 Saltwater vs. Blood Absorbency Ratio

