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
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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 polyactic 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 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 meet 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 (15-45 years) 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

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Figure 1
Figure 2
Saltwater vs. Blood Absorbency Ratio

Future Group Photo: