



The intersection of water, societal, and human health disciplines

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What Does “Madi” Mean?

PureMadi’s mission is to prevent waterborne diseases through educating, training, and empowering resource-limited communities to produce and distribute an innovative point-of-use water treatment technology. Our work is based in the Venda region of Limpopo Province, South Africa, and “Madi” is the Tshivenda word for water.

PureMadi 4

Charlottesville, VA, February 6, 2015. PureMadi 4 was a night for the record books—literally! The organization proved that the fourth time’s actually the charm when it held its annual fundraiser in the beautiful Jefferson Ballroom of UVa’s Alumni Hall. The large, sold-out ballroom bustled with over 200 donors, celebrating another successful year of water filtration.

Among the attendees, PureMadi hosted two guests of honor who made the long trip from South Africa. Boas Thangoane Murauha, liaison between the Mukondeni Filter Factory and PureMadi, and Vho Certinah Khashane, manager of the Mukondeni Pottery Cooperative, visited the U.S. for the first time in order to share their personal experiences working with



PureMadi. During the technical program, Boas captivated the room with his humbleness and humor while everyone enjoyed a delicious dinner.



With PureMadi Board Member Jim Smith on the bass, the band 180 along with Hoos in Treble, an all-female UVA a cappella group, entertained the attendees again this year with upbeat music throughout the night. The annual silent auction and filter game helped PureMadi raise record donations of over \$40,000! A bidding-war over a basketball signed by the UVa Men’s team and a generous matching donation to the filter game ensured an exciting and successful event. Thanks to the generosity of all the donors, PureMadi was able to break ground and begin building its second filter factory in Hammanskraal, South Africa. We think this year will be our biggest event yet, so visit www.puremadi.org to book your tickets soon for PureMadi 5.

Announcing PureMadi 5!

The event returns to Alumni Hall on Friday, February 5, 2016.

2 Completion of Rotary Grant

In 2012, PureMadi was thrilled to receive a grant from Rotary International. In addition to funding, this opportunity opened the doors for partners—in the States and in South Africa. Our partners at the Rockingham County, and Kernersville Rotary Clubs have provided funding, attended our fundraisers, and helped us spread the word. The Louis Trichardt Rotary Club has provided on-the-ground assistance with oversight, materials procurement, and cultural guidance. The grant provided nearly \$40,000 worth of funding for an order of 1,100 ceramic filters, 600 bacteria tests for evaluation of filter performance in the field, marketing materials, training for oversight of the filter facility, uniforms for the filter facility employees, repair of the electric kiln, a new fence around the property to improve security, flooring for the facility, shelving for filter drying and storage.

Currently, our filter factory liaison, Mr. Boas Thangoane is overseeing the final stages of the production of 1,100 ceramic filters to be completed in early 2016. To date, we have produced over 2,000 filters and distributed them in the nearby village of Tshibvumo. The next batch of filters will be delivered to the neighboring village of Tshapasha. These two villages were selected to receive filters due to their assistance during the early stages of PureMadi and their seven-year partnership with the



Filters from the Mukondeni Pottery Cooperative and Filter Factory in Mashamba being loaded onto a truck.

University of Virginia and the University of Venda for research into water and health. Many households participated in PureMadi and MadiDrop surveys, health studies, and testing over recent years. Additionally, Boas worked with local contractors to design and install a new fence around the filter factory property. The Rotary Club of Louis Trichardt assisted us in identifying the contractors and oversaw the installation.

PureMadi would like to express our deepest gratitude to Rotary International for their assistance, partnership, and passion! We look forward to working together in the future!

Zain Halle and Hammanskraal

Over the last two years, PureMadi formed a partnership with Khulisa Social Solutions, a South African organization. We have been working together to open our second filter factory in Hammanskraal, located in the Gauteng Province of South Africa. Khulisa is an international non-profit organization established in 1997 and operates 26 offices around South Africa. We have been very fortunate to have had their help and guidance in forming community ties, identifying employees for the factory, and overseeing construction.

Our work with Khulisa has been made possible by Mr. Zain Halle. Mr. Halle began volunteering with Khulisa in 2007 while completing his degree in Psychology and Criminology, and began working with Khulisa in 2008. He managed the Hammanskraal regional office until 2013.

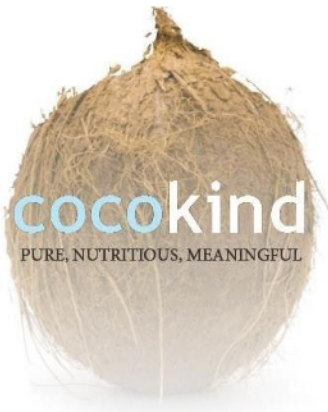


In 2014, Mr. Halle and PureMadi President Rebecca Kelly negotiated and entered into a Memorandum of Understanding for the two organizations to work under as they developed the second filter factory. In the summer of 2015, Mr. Halle provided oversight to the construction of the second filter factory and support to the student teams who traveled to South Africa. He will also help initiate marketing efforts in the Hammanskraal area once the factory construction nears completion. We are all very much looking forward to getting the second factory up and running, and we thank Mr. Halle and Khulisa for helping us achieve this goal!



Construction of the new filter factory.





Cocokind Sponsorship

PureMadi is excited to announce its partnership with Cocokind that began just after PureMadi 4 last year!

Cocokind is a certified organic and socially conscious skincare line centering on virgin coconut oil and superfoods. As a socially conscious company, they donate proceeds to give clean water, food, and education to children in need. They have chosen to sponsor PureMadi as their clean water charity and will donate a portion of their sales to us each year. They are in 800 stores around the country, and you can order their products online as well. Check them out at www.cocokind.com.

Special thanks to Graham Sadler for helping to foster this partnership!

Ceramic Filters 101

Ceramic filters have been developed over many years by a number of different groups. They represent a “point-of-use” water treatment technology. In other words, they are used to treat water in the home right before consumption. These technologies have been recommended by the World Health Organization (WHO) for resource-limited regions of the world, particularly when water supplies are of unknown quality.

Ceramic filters can be manufactured and sold locally in developing world settings. The raw materials are clay, sawdust, water, and something called “colloidal silver.” Clay, water, and sawdust are mixed in appropriate proportions by hand or in a mechanical mixer. The mixture is then compacted into the shape of a pot using a filter press. The filter press does not require any electricity and typically can be manufactured locally.

The pressed filters are then air-dried for 2-3 days and then fired in a kiln (a high temperature electric or wood-

fired oven) at a temperature around 900 °C. During the firing process, the clay hardens into a ceramic and the sawdust combusts, leaving behind narrow pore channels that will allow for the slow passage of water.

After firing, each filter is tested in two ways to ensure that the flow rate is satisfactory for household use and that there are no macropores that might allow passage of waterborne pathogens or suspended particles. After passing these tests, a colloidal silver solution is painted onto the inside and outside surfaces of the filter. Colloidal silver is an aqueous suspension of silver nanoparticles. The nanoparticles lodge in the pore space and disinfect the water as it passes through the filter. So, turbidity and pathogenic microorganisms are removed by a combination of physical filtration and silver disinfection.

Ceramic filters have been shown to be highly effective at purifying water and improving human health outcomes. Furthermore, by teaching local residents how to manufacture and sell them, the money spent on filters stays in the local community and provides economic stimulus for development.



Partnering with ERM: PureMadi Applies for \$25,000 Grant

PureMadi hopes to partner with the Foundation of the Environmental Resources Management (ERM) Corporation to help complete our second filter factory in South Africa. ERM is a leading global provider of environmental, health, safety, risk, and social consulting services. The ERM Foundation is managed entirely by its employees and supports environmental initiatives and activities around the world with practical and fundraising support including the provision of matching funds and pro

bono time. Their activities align with low carbon emissions and climate change, conservation and biodiversity, clean water and sanitation, and environmental education. A grant from ERM would allow PureMadi to complete the infrastructure for our second ceramic filter factory in Hammanskraal, South Africa. We hope to be operational in 2016. Special thanks to Jeff Gibbons who is both a member of ERM and an alumni of the UVA Civil and Environmental Engineering Department for pursuing this partnership!

4 Technology Improvements

In a recent investigation during the summer of 2015, we conducted a study on incorporating a new method of silver application to ceramic filters. This study was performed at the PureMadi Mukondeni Pottery Cooperative in Limpopo Province, South Africa. Currently, ceramic filters are made by mixing sawdust, water and clay. The mixture is pressed into the shape of a filter and then fired. After passing a pressure test and flow test to ensure quality, a silver nanoparticle suspension is painted on the inside and the outside of the filters.

The new method is still in the testing process so the details cannot be explained yet, but with the help of the local potters and the JPC team (consisting of UVA students Max Barab, Alice Burgess, Matthew Smith, and Anna Wallace) filters were made using the new method. Two sets of filters were produced, those made with 0.3 grams of silver (the same silver mass used in the paint on method) and those with 1.0 grams of silver.

Graduate student Kathryn Nunnelley tested the filters at the University of Venda, (located in Thoyondou, South Africa) in Dr. John Odyio's and Dr. Amidou Sammie's labs. Control filters (fabricated by the original production method of painting on silver nanoparticles) were compared against the new filter sets—those with 0.3 grams of silver solution, and those with 1.0 grams of silver. The tests took place over a period of 12 days, during which the students measured coliform bacteria removal efficiency. To complete the testing, four liters of contaminated water from a local stream were poured into the top reservoir of each filter. The water percolated and gathered in the lower reservoir over a 12-hour period. Samples were collected and tested for total

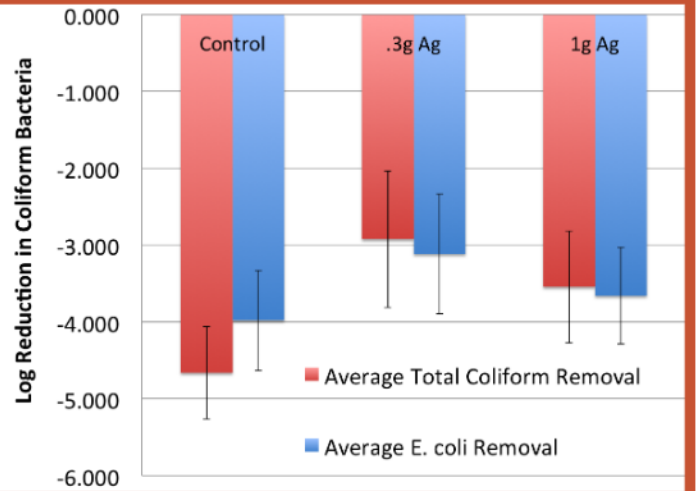


Figure 1. This plot shows the average log removal of total coliform bacteria and *E. coli* by conventional control filters and filters fired after mixing with new silver method (0.3 and 1.0 g as Ag).

coliform and *E. coli* removal using membrane filtration. To calculate results, the log of the effluent concentration (C) was divided by influent concentration (C_0). Results are displayed in the plot above. The error bars represent one standard deviation above and below the mean and show there is no statistical difference between using the paint-on method and the new silver method of incorporating 1 gram of silver prior to firing.

The new method would be easier to manufacture as the painting step would be omitted from the production process, and the new silver could be purchased in country, rather than shipping from the United States. Additionally, it is possible that larger volumes of silver could be added to improve the performance of the filters without increasing filter cost. On the downside, because silver is applied *prior* to firing, filters that do not pass the quality control tests will be disposed of, thus wasting the silver. Currently, filters are painted with silver solution after they have passed the two quality control tests. Further laboratory tests are being conducted at the University of Virginia to expand this data set, but these results show promise for an improvement to the filter technology.



To Donate to PureMadi:

Please visit www.PureMadi.org and click on our "Donate" link.

All donations are fully tax deductible.

PureMadi is operating as a 501(3)(c) not-for-profit organization under the umbrella of the UVA Fund managed by the University of Virginia Alumni Association. All donations go to PureMadi's activities in South Africa.

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