Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by susanaforum - 24 Aug 2011 09:24

To start a discussion on Peepoo bags (or "peepoo toilets", which is the preferred term by the inventor, Anders Wilhemson) in Kenya, I am starting with some questions from Patrick Onyango (GIZ, Kenya).

I am posting his e-mail below with his kind permission (posted by Elisabeth von Muench).

+++++++++

Dear Elizabeth,

Thanks for your email. Your concern for women and children especially with regards to use of public toilets in slums at night is right. However, Hagen and I had advised the lady from Sweden [Camilla Wirseen from Peepoople] from the beginning that the Peepoo even as a very temporary solution would raise both Political and environmental concerns:

1. Kibera in the long run has no space for disposal of large quantity of Peepo bags. No sustainable management of huge quantity is in place.

2. The bags would end up in our rivers the same way as the black polythene bags being used as flying toilets.

3. The kenyan elite and politicians would see it as looking down at the dignity of the people. So far it is low key and even the Ministry of Public Health and Sanitation has not shown any interest.

4. The Ministry of Public Health and sanitation (lead Ministry in Sanitation) is also of the opinion (as expressed by Chief Public Health Officer during the launch of CLTS on 11.5.2011)that some houses in Kibera must be demolished to create space for bringing sustainable services in the area. All short term solutions have failed.

Kenya has to take the example of Zambia. Legalize these settlement, plan them properly and bring in services, facilitated by Government. Otherwise the current game done by many uncontrolled players will continue without any impacts being felt by the slum dwellers.

With kind regards,

Patrick

++++++++

And Patrick also pointed out to me today:

++++++

By the way the Ministry of Public Health and Sanitation with the other major sector players are working on definition of what should be considered as a basic sanitation in Kenya. Peepoo bags are not even in discussion! But let us wait.

+++++++

What do you all think about this?

==========

Video of presentation about peepoos in emergency situations

Posted by muench - 18 Sep 2012 10:23

_____

Dear all,

I am excited to share with you the video of a presentation by Asa Angelino about peepoos in emergencies in Pakistan and Kenya.

Please see here:

susana.org/lang-en/videos-and-photos/res...mp;type=3&id=126

Or direct Youtube link here:

I think it is a very nice presentation, also good for people who have never heard about Peepoos.

You can see the powerpoint presentation slides here (she presented at the 16th SuSanA meeting):

susana.org/lang-en/meetings/16th-susana-...ing-stockholm-sweden

Asa Angelino (Peepoople, Sweden): Peepoo toilets in emergencies - Case studies from floods from Sindh, Pakistan and Kisumu, Kenya

It was the first time I got to see and touch that green plastic container thingy into which the Peepoo can be placed. I tried sitting on it (a bit higher than a potty) and it feels very sturdy and comfortable.

If you have any questions please put them here. I am sure Asa will be willing to answer your questions here.

Kind regards,

Elisabeth

(Dear Trevor, to answer your post avove: yes, there are holes in the sides. They are maybe 3 mm in diameter, difficult to see in the photos. Apparently that should be enough for aeration? But the compaction is a problem)

==========

Re: Video of presentation about peepoos in emergency situations

Posted by asaangelino - 09 Oct 2012 11:30

Dear Elisabeth,

Thank you for sharing the video of my presentation.

I am glad that you mentioned our Kiti (the green plastic container thingy). This is a new product that we have developed as a complimentary product to Peepoo. Kiti is used as Peepoo holder and the Kiti shown in the video is a long-term solution.

Peepoople has also developed a solution for emergency situations, Kiti Flat. Kiti Flat is foldable and

made in cardboard, which makes it great for transportation. Kiti Flat can be used approximately one month.

I would be happy to answer any questions that may come up after watching the video.

All the best,

Åsa Angelino

Peepoople

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by joeturner - 22 Feb 2013 10:21

_____

I have been reading the research on the peepoople website, and am interested to hear where these claims are proven:

Disease-producing pathogens which may be found in faeces are rendered inactivate within 2-4 weeks, depending on the surrounding temperature the peepoo brochure

Peepoo works as a micro-treatment plant sanitising human excreta shortly after defecation. Inside Peepoo there are five grams of urea. When the urea in Peepoo comes into contact with faeces or urine, a breakdown into ammonia and carbonate takes place, driven by enzymes that naturally occur in faeces. As the urea is broken down, the pH-value of the material increases and sanitisation begins. Within 2-3 weeks all disease-producing pathogens found in human faeces are inactivated, provided the temperature at some time during the day reaches 20°C. Peepoople website

As I said, I've read all of the Nordin papers on the peepoo website, and as far as I can see, they do not show this. In fact, at a constant incubation of 24°C, Enterococcus and Ascaris took 2.5 months to reach safe levels in feces sludge. Other research by the same team also considered a viral indicator, which took 8 months.

I must be missing something important, given this claim is made over-and-over again.

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by joeturner - 26 Feb 2013 18:23

Just to update, I have been discussing these issues by email with Annika Nordin, who is part of the group that did the research in Sweden.

To paraphrase some of what she says, it appears that some of these claims are based on work which has yet to be published in peer-reviewed journals. But she agrees with me that the phrases I highlighted above are "too ambitious".

I'd go further and say that they are "at present, totally unproven".

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by annikanordin - 27 Feb 2013 23:50

I would appreciate to be correctly refered to from our email discussion.

You wrote:

"I am interested in this phrase on the peepoopeople website:

Within 2-3 weeks all disease-producing pathogens found in human faeces

are inactivated, provided the temperature at some time during the day

reaches 20°C."

To which I replied:

"the statment you found on the homepage is a too ambitious one and to be honest we cannot claim that ALL pathogens are inactivated since we have not studied them all. After reading your mail I have suggested rephrasing on the home page, thank you for bringing it up!"

The other phrase that you highlight (repeated below) I support:

Disease-producing pathogens which may be found in faeces are rendered inactivate within 2-4 weeks, depending on the surrounding temperature

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by joeturner - 28 Feb 2013 09:57

_____

I am going to reproduce below the email I sent to Annika and her response.

Annika, if you do not want this information here, I will remove it.

I wrote:

I am interested in this phrase on the peepoopeople website:

"Within 2-3 weeks all disease-producing pathogens found in human faeces

are inactivated, provided the temperature at some time during the day

reaches 20°C."

Please can you tell me the page and the paper where you prove this. I

have been looking at the papers on your website, but I have yet to find

any that prove all (measured) pathogens are killed at below 24°C at less

than 1.5 months. Ascaris eggs appear to be the most resilient, and even

at 24 degrees, appear to survive for more than 6 weeks.

In addition, please can you point me to the part where it shows that the

temperature is only required once a day, rather than at a constant

incubation.

Annika replied:

the statment you found on the homepage is a too ambitious one and to be honest we cannot claim that ALL pathogens are inactivated since we have not studied them all. After reading your mail I have suggested rephrasing on the home page, thank you for bringing it up!

Ascaris is often the critical organism for the sanitisation at ambient temperatures in general and also the case for the ammonia sanitisation and thus the Peepoo sanitisation, as you mention. However, I still think that ammonia santisation is one of the most promising options to inactivate Ascaris eggs. In Nordin et al. 2009 we investigated the effect from faecal treatment with urea and in inactivation in urine. The highest dose investigated was 2% urea on wet weight basis. In the Peepoo the urea treatment dose is dependent on the faecal weights that enters the Peepoos which currently contain 5 gram of urea. In Vinnerås et al. 2009 we modeled what faecal loads that may be critical for the sanitisation in the Peepoo and found that at 24 deg C a faecal load above 100 g may be critical for the sanitisation in the Peepoo since 610 mM NH3 is found to be the lowest concentration to have sanitisation in 28 days with the assumption that a 3log10 reduction is accuried. This is higher NH3 concentrations compared to the mean value of 230 mM from 2% urea at 24 deg C which inactivated 2log10 of Ascaris eggs in roughly one month *Figure 1b*. Currently models for Ascaris inactivation in relation to ammonia and temperature is tuned by more studies made by Jorgen Fidjeland, SLU.

This is however assumptions and labstudies and analyses from the field have proven higher rates of Ascaris reduction than what was assumed from the above studies. This results are not published yet but in brief Ascaris eggs were most persistent compared to the present parasites and Peepoos sanitised with respect to Ascaris eggs faster than what we assumed which may be due to lower Ascaris egg concentrations than the assumed 1000 per g faeces and higher ammonia concentrations, probably due to some urine in the Peepoos.

A paper investigating the ianctivation in urine at constant temperature compared to diurnal temperature variation is currently in press and a way to encounter for high faecal loads the temperature could be to increase temperature which can have a major effect on e.g. Ascaris eggs. Since the inactivation in the Peepoo will depend on the combination of pathogen concentration, faecal load and storage temperature we aim at producing a control chart with suggested control of parameters to get a fulfilling sanitisation in

all circumstances. At mean temperatures below 20 deg C its adviceable to get as high peak temperatures as possible by placement in sun etc.

Organisms to investigate further is human viruses. Rota virus commonly infecting children and adenovirus which is assumed to be more persistent towards ammonia sanitisation compared to RNA viruses is highly interesting for further studies. Reo and adenovirus inactivation in faeces in relation to ammonia is currently investigated and they appear to be inactivated faster than Ascaris eggs.

To which I replied

Vinnerås et al. 2009 says "the target inactivation at 24 C was not achieved within the range of concentration studied. Estimated concentrations of 1,300 and 610 mM NH3 were necessary for target inactivation within 2 and 4 weeks respectively" - which implies some uncertainty and extrapolation, given that the concentration was not within those you studied.

Your doctoral thesis suggests that at 2% the minimum sanitation time is 2.5 months at 24 degrees C, but I think you're [now saying] that the average bag will contain more than 2%. McKinley et al (2012) suggest that considerably longer time periods are needed, though I'm not sure how to directly compare their results with yours.

Either way, I can't see that you can make a claim about pathogen destruction at 20 degrees when you've a) not been making measurements at that temperature, and the temperature effect between 14 and 24 degrees is quite profound (from your thesis) and b) it isn't clear how the amount of urea in the peepoo bags relates to your findings above and c) the optimum breakdown was not even found within the urea concentrations you were measuring. As it stands, even if the phrase only refers to the breakdown of Ascaris, the claim that storage between 2-3 weeks inactivates all eggs is not proven. Also it isn't even clear from page 75 of your thesis that 3log10 reductions would guarantee to meet the WHO standard.

I look forward to reading the field studies, as it would be highly surprising if there were a higher rate of pathogen destruction in the field compared to controlled conditions in a lab. Most aerobic fecal composting assumes that material is not uniformly treated, so I would be interested to see how you know that your bags are consistently treating all of the contents.

Table 5 of Nordin et al 2009 seems to suggest that viral indicators take longer to break down than

Ascaris. Why would your new results be so much faster?

I have also been reading Fidjeland's Masters thesis, which is interesting, and look forward to reading more work from him in due course. This appears to suggest that if the urea concentration is 3% rather than 4%, the risk of infection of unprotected workers is above acceptable limits. Also as far as I can understand what he is studying, the system is a secondary treatment over 60 days, which is a lot longer than the 2-3 week claim.

Generally, I have to tell you that I am disappointed in the way your science has been used to market peepoo bags. There is far too little microbiology in WASH and sanitation, and I dislike it when claims are made which are not actually proven.

Your results seem strong, but they appear to have been ambitiously interpreted to sell the intervention. At best, it appears that the proof of the system has yet to be published in peer reviewed journals, at least to the extent to which it is being marketed.

As far as I can see, until someone actually does the experiment at ambient temperature with the maximum reaching 20 degrees C with a urea loading of 1,300 mM NH3, the suggestion that all pathogens (or even all measured pathogens) are destroyed in 2-3 weeks is not proven. As it stands, this claim is based on an extrapolation.

I don't understand why anyone would make that claim without actually being able to point to an experiment where they directly measured the results, even if it was currently unpublished. Ideally nobody would ever make marketing claims based on unpublished or extrapolated results. I can't see that happening in pharma science, so why is it appropriate here? These bags are already being used on a large scale based on this claim.

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by JKMakowka - 20 Mar 2013 11:32

_____

Maybe a bit off topic as a reply, but has there ever been any though put into making plastic-bag toilets as convenient to use as a regular toilet?

I think I remember somewhere a system that used a twisting mechanism to close off a part of a plastic tube as a sort of "flushing" mechanism, but it seems that ideas could be still improved upon.

For example a simple heat fusing PE sheet mechanism similar to those machines that fill milk into plastic bags could be probably quite easily included into a toilet seat. All you would need to do is replace the roll of (biodegradable) plastic sheet from time to time and bring the container with nicely packaged and smell free plastic bags to your local composting service provider.

It would need a battery or a power supply for the heat fusing and the unrolling though, but I don't think that would be a major issue as this could be marketed as a SuSan solution to middle class families.

Plastic bags only containing urine could also be separated individually by the service provider, or a second mechanism with a urine diversion in the toilet could produce only urine bags.

Any thoughts on this?

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by JKMakowka - 21 Mar 2013 09:09

To illustrate my point, a video of such a milk packaging machine:

youtu.be/y3A54pLPG0E

It first makes a tube out of the plastic sheet from the roll and than fuses nice packages (like this: i01.i.alibaba.com/img/pb/212/711/267/1284...alibaba-web7_679.jpg
) from it. Overall it is a pretty simple machine that could be probably modified into a relatively cheap "high tech" toilet.

With transparent biodegradeable plastic one could also easily identify the urine only bags and use or sell them after some storage as convenient small scale liquid fertilizer packs.

Edit: with smart placement of the plastic sheet (and folding mechanism) in the toilet bowl it would also be a "self cleaning" toilet as the parts that get dirty always end up inside the bag. A toilet that doesn't smell and never has to be cleaned (except the outside) is thus a very beneficial side effect!

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by rahulingle - 05 Apr 2013 16:15

Hey Julius,

apart from the problem of plastic pollution, I find it a very interesting idea.

here is another video for a manual plastic bag sealer

Maybe you could propose it in the next Reinvent the toilet challenge.

cheers

==========

Re: Peepoo bags in Kenyan urban slums: experiences, ideas and research

Posted by JKMakowka - 05 Apr 2013 17:59

Ahh, nice. That confirmed my guess that it could be easily run off standard batteries.

The idea is hereby free to use by anyone. I will not claim a patent on it

Would be great if someone would pick it up.

==========