ECOSAN SYSTEMS THAT ACCOMMODATE ANAL WASHING

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When it comes to anal-cleansing, the world can be divided into two major groups–the washers and the wipers. Washers strictly use water either manually or if available from a hand-held shower head, tap or bidet. Generally speaking, manual washing requires about 1 - 2 litres of water per defecation.

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The topic of anal-cleansing, however, is not well studied and little formal data is available regarding people's actual habits. But there are some regions of the world where anal-washing dominates such as South Asia, the Middle East, and various countries in Africa, Southeast Asia and Central Asia. The vectors of and effects of poor hygiene are better represented in the clinical literature relating to bacterial, viral and parasitic infections, diarrhea and other diseases. This short multi-authored communication deals with the question–what ecological sanitation systems exist for communities that practice anal washing? But it also deals with a series of implicit questions as follows:

ANAL-CLEANSING PRACTICES IN GENERAL

- What sorts of anal-cleansing habits do people have? Men, women, children?
- What are the implications regarding hygiene including hand hygiene?
- Do wipers also use water?
- What amounts of water do strict anal-washers use?
- What methods are used in anal-washing e.g. finger-contact cleaning and rinsing, splashing, spraying, etc.
- Are strict wipers less hygienic than washers, knowing that wiping leaves a dermal residual?
- Is more frequent bathing or showering a factor in the overall hygiene?
- How has PHAST covered anal-washing and what changes are necessary to build in ecosan options?
- What about school sanitation–is there a component in the training that deals with anal-cleansing?

DESIGN IMPLICATIONS

- How can dry and dry vault ecosan toilets be adapted to function to accommodate the use of significant amounts of water (1 - 2 liters per defecation) in anal-cleansing.
- What are the implications of strict anal-washing regarding toilet design for both squatting and pedestal toilets?
- What designs exist e.g. pour flush, flush, bidet, open pit, etc?
- And what about the collection and treatment implications?
- What is required to accommodate washing in the cases of dry toilets and UD dry toilets?
- This should include both soak away (urine and washwater), source separation with reuse (immediate in evapotranspiration bed and urine storage).
- What are the options for water-borne ecosan applications such as large-scale wetlands?

CASE HISTORIES

- How successful have the ecosan installations for washers been?
- What adaptations have been necessary on the part of the user (e. g. moving to wash station and having to inform new users)?
- What happens in the dry vault when too much water is added by uninformed users? (e. g. the central cone is flattened, cockroaches and flies increase, odour lingers)

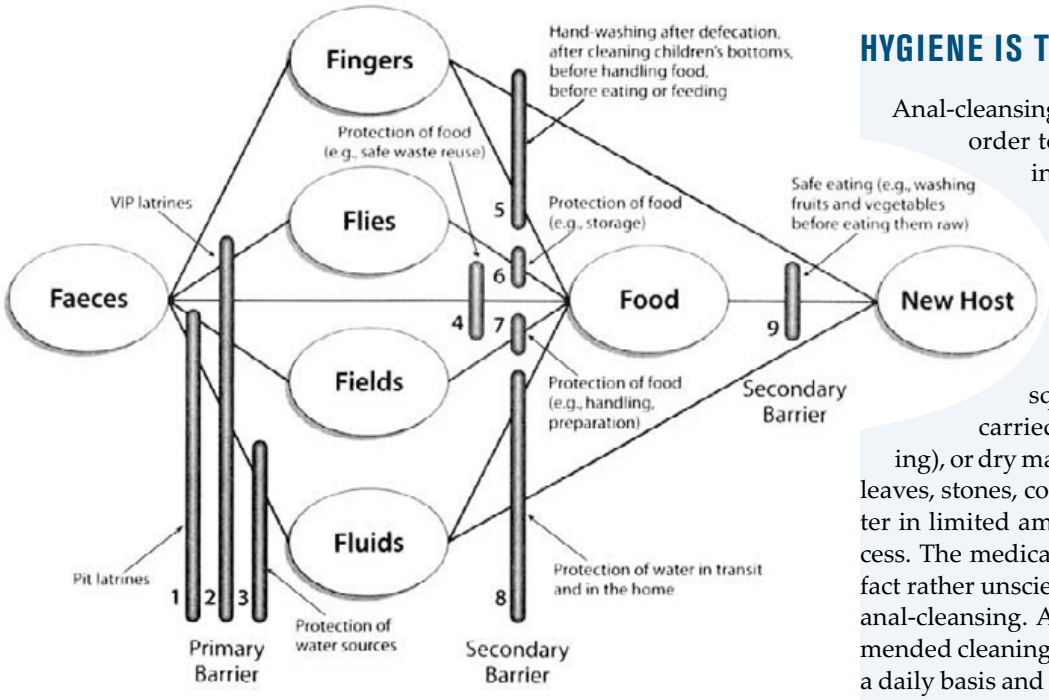

Fig. 1:
FAECAL-ORAL ROUTES OF TRANSMISSION AND BARRIERS CREATED BY HYGIENE PRACTICE (ALMEDON ET AL. 1997)

- What about public ecotoilets -is it possible to introduce such toilets?
- West African experience shows that washers are also interested in collecting and reusing source-separated urine and faeces. While the experience in South Asia tends towards wanting to soak away urine and anal-washwater either mixed or separately.
- What are the case histories from West Africa, the Middle East, South Asia, SE Asia and Central Asia?

This communication is based on the input from a few projects in West Africa and South Asia and should not be interpreted at this juncture as being a systematic survey.

SOME OBSERVATIONS ON ANAL-WASHING HABITS IN SOUTHERN INDIA (FROM SCOPE)

1. Anal-cleansing by hand is the general custom practiced in most countries where squatting pour-flush latrines are the most popular toilet model.
2. On an average two to three liters of water is used for each time in anal washing.
3. Women wash from the front and men from the back.
4. Children generally are washed by their relatives, most often by the mother or sister.
5. No one teaches the children how to wash. They learn by practice in the course of time.
6. There is a vital need for teaching children proper hand washing habits.
7. In most houses, toilets are not used for washing of hands.
8. Anal-washing is considered better and more hygienic than wiping.
9. Generally open or spot defecation is carried out close to where water is available, i.e. tank (barrage), river, etc.
10. Generally people take a bath following defecation in the nearby water source e.g. river or pond.
11. Open defecation is usually followed by bathing in the river or tank.

HYGIENE IS THE PRIMARY FOCUS

Anal-cleansing is necessary following defecation in order to remove faeces from the anal opening. The amount of faeces remaining for cleaning is dependent on the physical consistency of the stool which in turn is determined by the composition of the foodstuffs ingested but it can also be determined by the physics of the body position, squatting or sitting. Anal-cleansing is carried out using water alone (anal-washing), or dry materials used for wiping such as paper, leaves, stones, corn cobs, etc. Wipers may also use water in limited amounts to complete the cleaning process. The medical literature is rather informal and in fact rather unscientific when it comes to the subject of anal-cleansing. As late as only 24 years ago it recommended cleaning of the perianal skin be carried out on a daily basis and following each defecation in order to prevent "pruritus ani" or perianal dermatitis; and that pruritus is caused by inadequate anal cleansing or obsessive cleaning (Alexander-Williams, 1983). As late as the year 2000 this was questioned claiming that pruritus is probably not caused by traces of faecal material in tissue crevices (Rohde, 2000) and wet cleansing is a source of skin irritation. Either way, the fact remains that people carry out anal cleansing in various ways resulting in different hygienic conditions for both the individual and his or her surroundings. What is curious, however, is the paucity of rigorous scientific research into this question that in fact has major implications on public health and hygiene. That about 1.4 billion humans are infected with round worm *(Ascaris lumbricoides)* (WHO, 2004) is a major concern for hygiene specialists, thus making anal cleansing one of the more relevant issues.

As reported by Shojaei et al. (2006), poor personal hygiene by food handlers frequently contributes to outbreaks of food-borne illnesses caused by *Staphylococcus aureus* and gram negative bacilli such as *Salmonella*

Fig. 2:
ECOPAN WITH ANAL WASHING AND URINE COLLECTION (PAUL CALVERT)

spp., *Shigella* spp., *Campylobacter jejuni*; enterotoxigenic *E. coli* as well as viral agents such as hepatitis A, and Norovirus. Worm infections such as round worm *(Ascaris lumbricoides)*, hook worm (*Anclyostoma duodenal* and *Necatar americanus*), tape worms and pin worm are spread through poor hygiene practice. Prevention of bacterial, viral and parastic infections originating from faecal contamination of mainly water and food can be carried out using various barriers as outlined in the so-called "F-diagram" (Fig. 1).

Hygiene promotion as described in the LSHTM handbook Hygiene Evaluation Procedures (Almedon et al., 1997) is an absolute necessity in order to reduce spreading of communicable diseases arising from poor personal hygiene. Hand-washing with hand-soap is particularly effective even when using contaminated water (Luby et al., 2001).

POUR-FLUSH PIT LATRINES DOMINATE

Pour-flush pit toilets are the most common sanitation solution in the rural areas of India and in many other countries in South Asia where anal washing is a mainstay. Western model toilets (pedestals) are preferred by economically progressive families normally in urban areas, hotels, public offices, airports, stadiums, etc. Septic tank models are mostly found in urban areas where there is no centralized underground drainage or sewage system.

The blackwater from these toilets is drained to a leach pit several meters deep and when the pit becomes filled with the collected sludge it is closed and a new pit is dug. Septic tanks (that don't leak) fill up and are emptied by pumping into a mobile tank wagon or vehicle. Since there is seldom capacity to treat the blackwater it is generally disposed of in an unhygienic manner in deserted areas, river beds, tank beds, roadsides, resulting in wholesale contamination. Pour flush toilets in general become dysfunctional in high water table areas or during the rainy season when the pits and the septic tanks fill with storm water. Pour flush and flush toilets however are the most popular in areas of the world that practice anal washing. What then is the experience thus far in accommodating anal washing in dry toilets– something that is almost a necessity in high water table or drought stricken areas.

ANAL WASHING USING URINE-DIVERTING DRY ECOSAN TOILETS

In order to help improved sanitation in the rural and village sector, dry toilets have been introduced during the last two decades in Southern India. Several popular toilet designs using urine diversion have been introduced. The first one promoted by Paul Calvert of Trivandrum, Kerala was a double-vault toilet with two drop holes for faeces built into the cement slab (see Fig. 2). The anal washwater and urine were collected in a central pot and then piped to a small evotranspiration bed containing plants. Special care has to be taken to educate the user about anal washing in urine-diversion dry toilets. The user should be told that he/she should use only a minimum amount of water and ensure that the water does not enter the drop hole. A lid is placed over the drop hole before anal-washing. The more the quantity of water used increases the chances that water will enter the drop hole, getting mixed with faeces slowing the dehydration and sanitization processes. The breeding of cockroaches, flies, etc. are enhanced if the vault is not kept dry.

Fig. 3: **THREE-IN-ONE SQUATTING PAN DEVELOPED BY SCOPE IN TAMIL NADU**

Newer models (eg Calvert's Ecopan www.eco-solutions.org/ecopan.html) are prefabricated plastic pans that are fitted into the slab, thus requiring less building time. These have been successfully introduced in both India and Sri Lanka.

SCOPE'S 3-IN-1 SQUATTING MODEL

In the household ecosan toilet model designed and promoted by SCOPE in Tamil Nadu, the urine, faeces and washwater are each collected separately. Urine is piped into a mud pot with holes which is diverted to the kitchen garden beside the toilet. Faeces are collected in the dry vaults below. Each vault is dry-composted over six to seven months and the contents used for soil conditioning. Washwater is collected in a separate bowl to the back of the pan and led into a filter bed which feeds into the adjacent garden.

In all cases there is a need for special-usage tutoring. The user has to apply ash after defecation to promote dehydration and sanitisation of the faeces, close the lid over the drop hole and then wash the anus with a limited quantity of water. The common mindset that anal-washing requires a 10-liter bucket of water has to be changed. The ecosan toilet is rather new and many people are still used to "flush and forget" toilets using three to four litres of water for anal-washing and about six to eight liters of water to flush the faeces to the septic tank or underground drainage sewer. The ecotoilets do not require such excessive volumes of water for anal washing. The habit of using a bucket of water each time greatly increases the chances of water entering the drophole in an ecosan toilet. The user needs to be properly informed that much less water is required and that

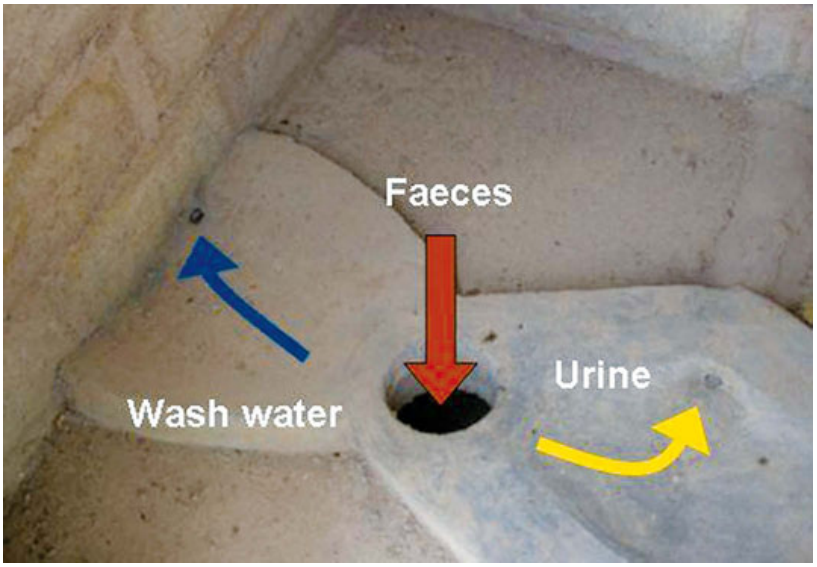

Fig. 4:
DESIGN FOR DISCHARGE OF ANAL WASH WATER FROM URINE DIVERTING DRY VAULT TOILETS IN BURKINA FASO

ash is to be applied to the faeces following each defecation.

When family relatives visit a house with an ecotoilet, they have to be instructed about the application of ash, covering the drop hole with the lid and washing with a minimum of water. At the same time they need to be told that they should wash their hands properly after use outside the latrine.

URINE-DIVERTING DRY ECOTOILETS FOR PUBLIC USE

SCOPE has also successfully constructed two community compost urine diversion toilets in Musiri near Tiruchi in Tamil Nadu. Both the toilets have gently sloped pipes for urine so as to ensure the free flow of urine. The user is told that while applying ash he/she should see that it is not falling inside the urine bowl. This will ensure that the ash will not clog the urine hole or urine pipe. About 200 liters of urine is collected in these public toilets per week and with arrangements with local farmers, the urine is used for watering plants like banana after dilution at a 1:10 ratio. The Tamil Nadu Agricultural University at Coimbatore is entrusted with the task of researching the storage properties and application of urine as liquid fertilizer to different plants. Additional training is required when it comes to fixing of the pipes connecting the urine hole to the urine pot and wash water hole to the filter bed, underneath the squatting slab. These community compost toilets have been functioning well for the past one year after some initial problems caused by users unaware of the required practices.

SCOPE has also installed one individual household ecosan toilet in the first floor of a house in Musiri and this too is functioning well.

ECOTOILET MANUFACTURING

Concrete slabs designed by SCOPE are now produced by over 100 trained masons in different locations in Tamil Nadu. A red oxide finish is applied to give a better aesthetic look as well. Fiberglass pans are also made commercially and supplied to individuals and community toilets. Ceramic urine diversion toilets have also been developed but their commercial production is yet to commence, awaiting for a minimum order of 500 units.

Fig. 5:
DESIGN FOR A SEATER URINE DIVERTING DRY VAULT TOILET. ONE SEAT FOR URINE AND FAECES (RIGHT SIDE) AND ONE FOR ANAL WASHING (BURKINA FASO)

SCOPE has constructed one ecosan urine diversion toilet in a grade school where urine will be collected and used for irrigating cashew trees. The unit has only two toilets but 20 urinals since in educational institutions during class hours most students use only the urinals and only very few the toilets. The students will be given training in the usage of the urinals and toilets.

Thus far SCOPE has constructed over 900 ecotoilets of which 500 are in and near Musiri and 400 in Tsunami-affected coastal sandy belt areas on the east coast of Tamil Nadu, India.

CASE STUDY AND EXPERIENCE FROM CREPA COUNTRIES IN WEST AND CENTRAL AFRICA

CREPA is an interstate African institution working with ecological sanitation in 10 west and central African countries. At several of the project sites, the toilets must be adapted to anal washing. There are several examples in the CREPA network of how the anal wash water can be discharge separately from the toilet cabin, and how it can be taken care of. The water is discharged from the cabin separately and is then either infiltrated into the ground or reused in an evapotranspiration bed or a mulch bed so that plants or trees can benefit from the water and nutrients.

EXPERIENCE FROM SRI LANKA IN POST-TSUNAMI INSTALLATIONS

Several hundred urine diverting dry toilets (UDDT) have been installed in Sri Lanka following the Tsunami in reconstruction projects by Action Contre La Faim, Australian Red Cross, American Red Cross, Practical Action, International Federation of the Red Cross

Fig. 6 + Fig. 7: **ANAL WASHWATER DRAINED TO A SOAKAWAY (LEFT) AND EVAPO-TRANSPIRATION BED (RIGHT) IN MALI**

(IFRC) and other organizations. One such initiative was the model village in the northern district of Jaffna where16 families shared 5 toilets and use ash, soil and sand as additives to faecal collection chamber. Urine is diverted together with the anal wash water to a dispersion plant bed where plants like banana, papaya, tomatoes and coconut are planted. In some project locations the users have by themselves planted plants with larger foliage or with q high leaf area that are more suitable to the plant bed, to enhance evapotranspiration (e.g. leafy vegetables, banana, and cannas or *Cannaceae*).

Each vault is used for six months and then left to dehydrate and sanitize for six months. The users find this process of changing from one chamber to the other every six months easy as it is registered in their calendar instead of waiting until the chamber is full. The emptied material is neither compost nor a dehydrated mass but something in between. The excavated material is used for the plants by adding to the soil in the plant bed itself.

USER INSTRUCTION

To assist the users in using the toilets, technical officers and hygiene promoters (mainly women) visited the communities almost every day during the first week of usage. Discussions were initiated to understand the usage pattern and suggestions to change behaviour to suit the usage of UDDT were discussed. One family was advised to deliberately misuse the toilet and discuss the consequences with the community. It was noticed that this particular toilet had flies breeding in the faecal chamber. Then the community was asked to find a methodology to solve this problem, with the locally available knowledge. The community added an increased volume of dry sand to the vault, plus neem *(Azadirachta indica)* leaves which act as insect repellent. They dried the leaves and burnt them inside the vault. By doing this the community understood the importance of keeping the chamber dry and also learnt the mechanism of controlling insects. Moreover, some of them began adding fresh neem leaves to the vault when there was a suspicion of flies, mosquitoes or cockroaches.

ADAPTING ANAL WASHING IN DRY TOILETS IN JAFFNA

There were instances when the community in Jaffna discussed the splashing of rinse water into the dry vault during anal washing. The community itself came with a suggestion for double vault toilets where one vault is always sealed. They suggested facing towards the open drop hole as the splashed water would then be aimed in the opposite direction towards the closed hole The communities also suggested closing the lid after defecation, before anal cleaning as a method to avoid wash water entry into the vault.

Anal cleansing is the only habit of personal hygiene in Sri Lanka, although people have adopted wiping after washing. The practice of anal cleansing is transferred from parents to children. It was also observed that the users used the left hand for anal cleaning, which they do not use for any action that would be intended for hand-mouth contact. Surprisingly there had been no instances of diarrhea in this community during the monitoring period of the first six months from the day of commencement of usage of UDDT. It was also noted that the anal cleaning water used is less than 2 liters per defecation. Individuals carried water into the toilets in small containers less than 2 liters in size. A pot for ash, soil or sand was placed in every toilet. Recent development is the usage of a hand shower for anal washing. Informal interviews with people using such showers shows that hands are not used in this practice.

CONCLUSIONS

Anal washing is not restricted to specific religions or countries of the world. Little data is available in fact as to what people's habits really are but there is knowledge about the general trends. Much progress has been made over recent years in the improved design and demonstration of ecotoilets adapted to anal-washing in mainly rural and peri-urban areas where onsite treatment can be carried out. Examples of such projects are in West African countries, Palestine, India, Nepal, Bangladesh, Sri Lanka and the Philippines. Major progress has also been made in the use of large-scale wetlands to

treat black and greywater from communities in Syria and Jordan. This communication reported on experience from West Africa and South Asia. Changes in the habits of the users is central to the success of the use of the dry ecotoilets. Less water is used for anal-washing in dry toilets than in flush or pour-flush systems, and the dry vault must be kept dry. This is done easiest by placing a lid over the drop hole prior to washing. Anal wash water is discharged into evapotranspiration beds with plants, adjacent gardens, mulch beds or into leach pits. In some cases urine and washwater are discharged together. These dry toilets are of particular relevance in areas where water tables are high and where there is a shortage of water.

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OTHER LINKS OF INTEREST

- www.schoolsanitation.org/BasicPrinciples/AnalCleansing.html
- http://en.wikipedia.org/wiki/Anal_cleansing
- http://practicalaction.org/practicalanswers/product_info.php?products_id=131
- www.gtz.de/de/dokumente/en-ecosan-tds-02-b1-dehydration-toilets-double-vault-ud-2005.pdf
- www.lboro.ac.uk/well/resources/well-studies/full-reports-pdf/task0324.pdf
- www.permanente.net/homepage/handbook/healthwisehandbook/ch_04/ch_04#rectal_problems.htm
- www.eob.alvsbyn.net/principlesEOB.htm