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Title	Guidelines for the safe use of urine and faeces in ecological sanitation systems
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Author(s)	Caroline Schönning and Thor Axel Stenström
Address	Swedish Institute for Infectious Disease Control SE-171 82 Solna, SWEDEN
Telephone	+468 4572449
Fax	+468 318450
Mobile	+468 3606034
E-mail	caroline.schonning@smi.ki.se
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Guidelines for the safe use of urine and faeces in ecological sanitation systems

The definition of Ecological Sanitation has been, and is still, debated. The main characteristics are however often considered to be safe containment of excreta, treatment to produce a safe fertiliser and reuse/use of the excreta. To fulfil its claim of “closing the loop”, at least part of the nutrient containing excreta need to be utilised. In order to promote reuse as a sustainable option, hygiene issues need to be considered. Within the EcoSanRes programme (www.ecosanres.org) guidelines for the safe use of urine and faeces have been developed. These guidelines need to be disseminated in order to raise general awareness of hygienic risks and to generate a common knowledge on how to handle the risks in ecological sanitation systems.

General recommendations include application of urine diversion in ecological sanitation systems. To divert the urine will have several benefits including a decrease in smell and attraction of flies, less risk of leaching from the collected excreta and easier handling of the remaining faecal fraction, compared to if urine and faeces are mixed. All these aspects will directly or indirectly result in less risk for disease transmission. Since urine contain the majority of the plant nutrients nitrogen, phosphorous and potassium as well as micronutrients, it should be considered as a valuable fertiliser. The excretion of pathogens in urine involves low risks compared to the possible faecal contamination that may occur. In order to inactivate enteric pathogens that may be present in the urine from this contamination, storage is recommended before it is used on agricultural land. The recommended storage period is dependent on temperature and on what crops to be fertilised. On the household level, the urine can however be used directly, assuming that a one month period passes between fertilisation and harvest (consumption).

The faeces will be less cumbersome to handle if they are not mixed with urine. There will be less risk of spilling and leaching from toilets are avoided, rendering a safe guard for the groundwater. Depending on the soil conditions, the faeces will be more or less beneficial to use in agriculture. Even if not applied directly to crop producing land, they need to be treated to avoid further transmission of enteric pathogens, including bacteria, viruses, protozoa and helminths. A primary treatment will occur directly in the toilet, through storage or by addition of alkaline material such as ash or lime. The efficiency of this primary treatment is however difficult to predict and its purpose is mainly to decrease risks in the subsequent handling of the material. Addition of alkaline material will also involve a further decrease in odour and attraction of flies and may improve the aesthetics. Composting is often mentioned as one alternative, but a well functioning compost process is difficult to achieve within the toilet. Therefore it is mainly recommended as a secondary treatment on a larger scale. Other

secondary treatments include alkaline treatment by the addition of lime or urea, long-term storage or incineration. The purpose of the secondary treatment is to significantly decrease the densities of pathogenic microorganisms and achieve a product that is relatively safe to use in agriculture. However, faeces is always recommended not to use on vegetables, root crops or fruits that will be consumed raw.

The proposed guidelines include both detailed recommendations for treatment options and more general considerations for ecosan systems, as well as practical recommendations for how to decrease the risk for disease transmission when utilising excreta in agriculture. The guidelines will be further elaborated on in risk assessments and epidemiological follow-up studies, which will be included as an integral part of the presentation.