SEWAGE REUSE FOR IRRIGATION IN ATHI RIVER TOWN: ITS IMPLICATIONS ON PUBLIC HEALTH

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ABSTRACT

Lead, cadmium, selenium and arsenic were the selected indicators of toxic heavy metals which were determined using atomic absorption spectroscopy (AAS) in sewage being reused for irrigation in Athi River town of Kenya. Coliform counts and *Escherichia coli* were also determined in the same sewage as indicators of pathogenic bacterial agents. Lead and cadmium were further detected in soils and in a selected number of food crops under sewage irrigation. The pH of both soils and sewage was also tested as the main factor that determine the availability of these toxic heavy metals to the crops. Similarly, the activities of the pathogenic microbiological agents were deduced with respect to the temperatures of the sewage.

In general, an average of twenty samples per parameter were taken. The levels of toxic heavy metals were found as follows: lead (0.17 ppm), cadmium (0.04 ppm), selenium (0.009 ppm) and arsenic (0.008 ppm) in sewage. But in soils the average levels of lead and cadmium were 0.44 μg/g and 0.13μg/g respectively, the crops analysed were selected as root crops (cassava, sweet potato & arrowroots), leaf crops (kale & spinach) and fruit (or seed) crops (beans, tomatoes & maize). These analyses were done on dry weight basis on their edible parts only.

The average levels of lead found in these crops were 0.06μg/g, 0.1μg/g and 0.05μg/g for root, leaf and fruit crops respectively. Similarly, the mean levels of cadmium in root, leaf and fruit crops were 0.016μg/g, 0.03μg/g and 0.02μg/g respectively. Coliform counts was > 300 counts per 100 ml. in all sewage samples. These samples also gave positive indication of the presence of *Escherichia coli.*

These levels of toxic heavy metals found in sewage were not significantly different (at 95% C.I.) from those of World Health Organisation/Food and Agricultural Organisation health guidelines considering the fact that the sewage on reuse had not been given any preliminary treatment. Levels in soils and crops found were within the natural environmental levels and therefore expected to pose little or no health problems.

But the levels of pathogenic bacterial indicators were found to be quite high. These levels coincide with those found in places where incidence of water related epidemic outbreak of diseases had been recorded. It was therefore, in order to relate any pathogen-related disease outbreak in the area to such levels. But in contrast, the past public health records in this Athi River town do not show any significant diseases outbreak related to sewage farming: a fact that seems to agree with the farmers claims that they do not have any health problems related to the irrigation activities reusing the sewage. Yet, observations made indicated that even basic recommendations for sound health practices are not being followed. Therefore, conclusive explanation of these contrasting results calls for further research in relationship to the pathogenic micro-organisms and the conditions that make them endemic in a society. However, for this research, it should be sufficient to say that the less intensive reuse of sewage for farming, the currently low population density in the region and the high temperatures with less rainfall might account for low occurrence of expected diseases outbreak.

But with the now increasing population and the need for an alternative source for water supply, reuse of sewage (which is about 1 million litres per day in Athi River) should not be disregarded entirely during this environmental awareness age on the basis of the menace of pathogenic microbiological agents. Moreover, a spectrum of technical solution are available. Further research is required on adaptation of a synthesized low cost and acceptable technology for the treatment of sewage for reuse in farming in developing nations.