

Antibiotic contamination of groundwater sources in Kisumu, Kenya: An emerging health threat?

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Background

- Pharmaceuticals classified as emerging pollutants (Fernandez et al., 2014; Mceneff et al., 2014) wastewater (Vergeynst et al., 2015), groundwater (Lapworth et al., 2014) and drinking water (Yan et al., 2014).
- Pharmaceutical products detected in groundwater- California (Miranda S. *et al.*, 2011)in Lisbon (Gaffney et al., 2016), levels ranged from 0.005 to 46 ng/L in raw water (no safe levels of exposure in the environment)
- Antibiotics- readily available (over the county); Quality of the antibiotics is not guaranteed; Tendency to self medicate
- Vulnerability of groundwater sources to contamination; level of aquifer. Often sole source of water for human use

Problem statement

- Risk of antibiotic resistance (mostly reported) (Most water related infections treated using antibiotics e.g. cholera). Tropical diseases like malaria, TB, HIV
- Endocrine disrupting properties of EOC- *Associated with development of malignant tumors* (Niemuth and Klaper, 2015)
- Mental disorders
 - Hypo- mania (mostly associated with exposure to quinolones) (Lambrichts et al., 2017) (Regenold WT, 2017) (Zareifopoulos and Panayiotakopoulos, 2017)

Research gap

- Information on contamination by pharmaceutical; Antibiotics is scarce (Aus der Beek et al., 2016; K'Oreje et al., 2016); yet important. Generally lack in Africa
- Sources of contamination are varied; wastewater, hospital disposal, poor disposal of unused antibiotics; Antibiotic use in animals

Research gap

- The human health effects of exposure to antibiotics; KAP due to use of GW
- Extensive research conducted on effects of exposure in aquatic life; limited research on effects on human health
- Upcoming studies point towards effects on mental health

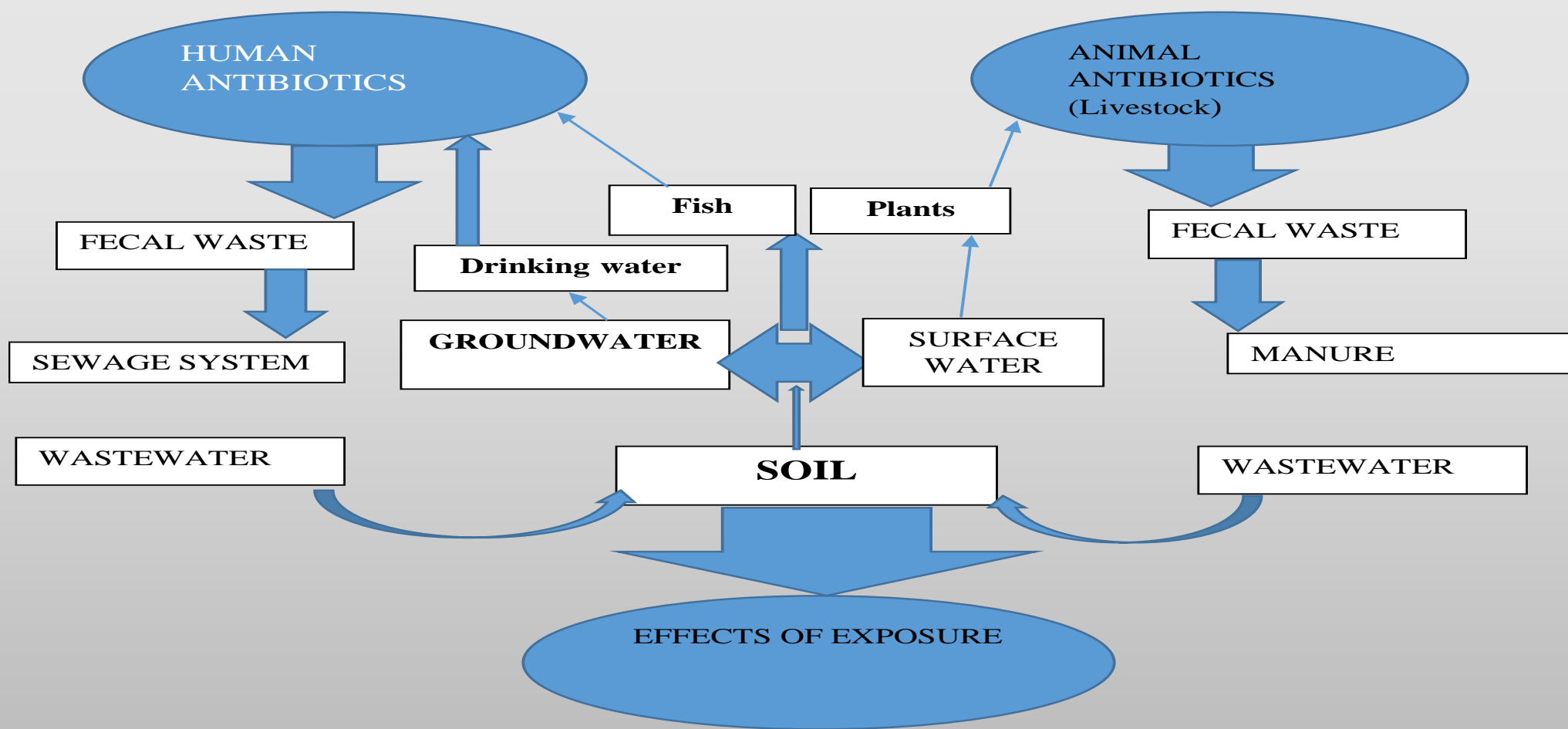
Research objectives

1. To determine the levels of Antibiotics in groundwater in Kisumu, Kenya;
2. To establish the sources of Antibiotic contamination of groundwater;
3. To estimate the environmental health risk of exposure to antibiotics in the environment.

Research methods

- Quantitative methods approach; Longitudinal
 - Mapping of groundwater sources
 - Water samples (Laboratory analysis (Magnetic Sector Mass- Spectrometry) of water samples for pharmaceutical)
 - Description of sources of contaminants
- Qualitative methods (dumping practices- in highly contaminated groundwater sources)
- Environmental Health Risk of exposure using a predictive model??

Conceptual framework (Source: Carvalho & Santos, 2014)



Thank you