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Bacteria-contaminated lettuce threatens health: a call for improving safety in Ghana.

Quarcoo G, Boamah Adomako L.A, Abrahamyan A., Armoo S, Sylverken, A.A, Addo M.G, Alaverdyan S, Jessani N.S, Harries A.D, Ahmed H., et al. What is in the Salad? *Escherichia coli* and Antibiotic Resistance in Lettuce Irrigated with Various Water Sources in Ghana.
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Escherichia coli is a bacteria that causes diarrhoea and can be found in humans, animals and the environment.

Key Messages

- Lettuce irrigated with water from various sources in the north and south of Ghana was contaminated with multi-drug resistant *Escherichia coli (E.coli)*.
- There is thus a need to inform and educate vegetable farmers and consumers on the potential risks of handling and/or consuming contaminated lettuce.
- There is a need to limit lettuce contamination through improved hygienic farming conditions and safety monitoring and this includes the setting of thresholds for *E. coli* in freshly harvested lettuce.

What is the problem and why is it important?

Safety of the environment in which vegetables are grown, marketed and consumed is paramount to protecting human health as most are eaten raw. Lettuce in Ghana is often irrigated with water from open drains and streams, which are contaminated with human and animal waste due to poor sanitation infrastructure.

Such water may contain antibiotic-resistant bacteria which can spread to humans via direct contact or consumption of lettuce—so-called "farm-to-fork" transmission.
This study assessed antibiotic resistance in locally grown lettuce.

How did we measure it?

On a monthly basis between January and May 2022, mature lettuce samples were collected randomly from five farms located in the north

and south of the country. A total of 125 composite samples were analyzed using quality-controlled laboratory procedures.

Colony Forming Unit per gram – CFU/g

Antibiotics are classified into three groups:

Access - first and second choice antibiotics.

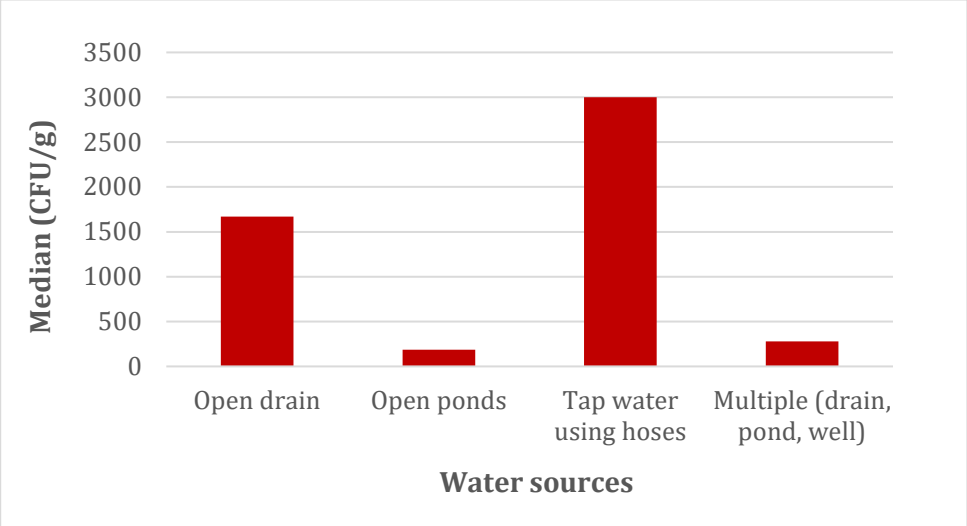
Watch - antibiotics for specific infections.

Reserve – 'last resort' antibiotics for multi-drug resistant infections.

What did we find?

- *E. coli* was present in all lettuce samples, with the highest counts in those irrigated with water from open drains (1670 CFU/g) and tap water connected to hoses (3000 CFU/g).
- Antibiotic resistance ranged from 22% to 77% for the Access group, from 49% to 70% for the Watch group and was 59% for the Reserve group of antibiotics. 82% of *E. coli* were multi-drug resistant.
- 48% of *E.coli* isolates analyzed showed a high capability of developing resistance to antibiotics (extended-spectrum beta-lactamase).

Figure. *E. coli* counts in lettuce irrigated from various water sources.



Implications

- The presence of antibiotic resistant *E. coli* in lettuce highlights the risk to humans of difficult to treat diarrheal infections and outbreaks. This can lead to increased costs to the individual patient as well as to the health care system. It can also lead to death.
- This risk can be mitigated jointly by the Food and Drugs Authority, the Ministries of Agriculture, Sanitation and Water Resources, and the Public Utility and Regulatory Commission by:

  a) *Informing* vegetable farmers and consumers about resistant bacteria in lettuce and the associated health risks.
  b) *Educating* the community on the importance of thoroughly cleaning vegetables with water and then disinfecting with vinegar or mild chlorinated water.
  c) *Protecting* vegetable farmers by encouraging and supporting the use of protective wear (e.g. gloves and gumboots).
  d) Implementing the following *actions*:

- Using drip or furrow methods for irrigation which reduces contact of lettuce with contaminated water and soil.
- Assessing tap water quality in the distribution network to investigate the reason for high *E. coli* counts.
- Setting thresholds for *E. coli* in fresh lettuce to allow better safety monitoring.