1. OCCURRENCE, VIRULENCE AND PATHOGENICITY OF 
ESCHERICHIA AND SALMONELLA FROM KALES IN NAIROBI 
AND ITS ENVIRONS

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2. INTRODUCTION AND LITERATURE REVIEW

- Vegetables play a role in nutrition as healthy diets and contribute to the economy of many countries.
- Consumers are encouraged to eat more of these products.
- In Kenya vegetables are consumed regularly by nearly every household in rural and urban areas.
- In Nairobi the vegetable sector has developed within the city and surrounding areas with kale (sukuma wiki) being the most grown vegetable.
- Kale are contaminated by microbial flora along food chain (farm to the table)
3.

Sources of contamination

• Pre-harvest contamination sources:
  ➢ Feces
  ➢ Irrigation water
  ➢ Inadequately composted manure
  ➢ Wild and domestic animals
  ➢ Human handling
4.
Sources of contamination (cont.)

• Post harvest contamination sources:
  ➢ Feces
  ➢ human handling/cross-contamination
  ➢ harvesting equipments
  ➢ wash and rinse water
  ➢ transport vehicles and containers
  ➢ improper packaging
  ➢ wild and domestic animals
  ➢ Vermin and insects
5.
Sources of contamination (cont.)

• Post harvest contamination sources:
  ➢ Feces
  ➢ human handling/cross-contamination
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  ➢ wash and rinse water
  ➢ transport vehicles and containers
  ➢ improper packaging
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  ➢ Vermin and insects
6. Urban agriculture in Nairobi

- Use of waste water and ‘night soil’ in peri-urban agriculture in Nairobi is extensive and unregulated (Kang’ethe et al., 2007)
- 36% of the farmers in the city use sewage and waste water for irrigation subjecting the vegetables to contamination by human pathogens (Njenga et al., 2007)
- Farmers use untreated waste water to grow vegetables and have been reported to block the sewers to get the water
- Water samples from Nairobi rivers show fecal coliforms exceeds 1000FC/100ml recommended levels by WHO for unrestricted irrigation
- Potential health threats posed by use of polluted water has been raised but there is scanty information on specific pathogens (Hide, 2001)
7.
Possible vegetable contaminants

- Traditionally vegetables are considered low risk foods due to their low pH and natural barriers to pathogens.
- Currently increased disease outbreaks occur due to evolution of more pathogenic forms of bacteria that can now survive such conditions.
- The pathogenic bacteria of major concern are: *Salmonella*, *Shigella*, *Escherichia* and *Klebsiella*. In other countries, *Salmonella* and *Escherichia* (serotype O157:H7) are commonly isolated.
8.

**E. Coli and Salmonella**

- Coliforms are a good indicator of fecal contamination and poor hygiene.
- *Escherichia coli* has been used as a non-pathogenic indicator of enteric pathogens, such as *Salmonella*.
- Some strains of *E. coli* are virulent:
  1. Enterohemorrhagic (EHEC)
  2. Enteroinvasive (EIEC)
  3. Enteroaggregative (EaggEC),
  4. Enteropathogenic (EPEC), and
  5. Diffusely adherent (DAEC):
9. 

*E.Coli* and *Salmonella* (cont).

- The worst of these is EHEC, O157:H7

*Salmonella*

- There are more than 2400 known serotypes, grouped in the two species *bongori* and *enterica*
- Have been associated with animal products but has been isolated from many types of vegetables grown in contaminated sites
- Recently *Salmonella* and *E. coli* O157:H7 have been isolated with higher frequency from fresh farm produce
- There is limited data available on level of vegetable contamination by these pathogens in Kenya.
10. *Salmonella* and *Escherichia* in non-host environment

- Both *Salmonella* and *Escherichia* can survive well in the animal host.
- Outside the animal host they face limited nutrients, osmotic stress, large variation in temperature and pH.
- Non-host environment has been shown to lower pathogenicity of these microorganisms.
- However there is little documentation on this.
- There is, therefore, need to compare organisms isolated from kales and those from human origin with respect to their pathogenicity and hematological changes.