Irrigation Methods, Water Quality and Sanitary Issues

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MDHSS
Is it a real problem?
Sewage Contaminated Irrigation Water
A Major Public Health Program in the West*

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our cities and towns in the West dump their sewage untreated into nearby streams—streams used in many instances almost immediately to irrigate market produce. In less populated dis-
TYPHOID FEVER

AVERAGE ANNUAL DEATH RATE
- PER 100,000 1929-1931 INCLUSIVE

COUNTIES WITH GROSS CONTAMINATION
6.6

U.S.

4.5

COUNTIES WITHOUT GROSS CONTAMINATION
3.3

SCALE 100% OF UNIT

CHART 3
DIARRHEA + ENTERITIS UNDER 2

AVERAGE ANNUAL DEATH RATE PER 100,000 1929-1931 INCLUSIVE

COUNTIES WITH GROSS CONTAMINATION 40

U.S.

17.7

COUNTIES WITHOUT GROSS CONTAMINATION 10.

SCALE 40% OF UNIT

CHART 4
Map II—Diarrhea + Enteritis Under 2 Years

Average Annual Death Rate per 100,000 Population — 1929-31 Inclusive
Analysis of vegetables raised with sewage contaminated irrigation water has been made in the bacteriological laboratory of the Colorado State Board of Health. Even vegetables which are grown many miles below the source of pollution were found to reek with colon bacilli, and after thorough washing the colon bacillus index in many instances was too high to pass them as fit for human consumption. Mills, Bartlett, and Kessel have shown that pathogenic bacteria may persist on the surface of fruits and vegetables kept under moist conditions for 15 days or more. If these bacteria gain entrance through injured or decayed portions they may remain alive 7 to 42 days. These are the vegetables that come into our markets, are handled by our housewives, and eaten by our people.
What foods raised with sewage contaminated water should be avoided? Fruits, such as strawberries, which grow close to the ground; vegetables eaten raw, such as lettuce, cabbage, celery, green onions, carrots, radishes, and parsley. We have seen already that thorough washing cannot be depended upon to make them fit to eat. Cooking will destroy intestinal disease producing bacteria, but the handling by the housewife of the vegetables preparatory to cooking, or their presence in the refrigerator, may furnish an opportunity to transmit these bacteria to other foods. This is especially dangerous when articles of food intended for infant consumption are contaminated.
Irrigation water does not need to have the purity of domestic water unless it is used for domestic purposes, but it must be protected against gross contamination.
The solution is one of education. We, in this dry section of the United States, where irrigation is necessary, must separate our food from our feces,
It’s Just Water, Isn’t it?

- Irrigation water
  - Plants absorb more than just water
  - Difficult to remove 100% of debris
The KEY

Match

- Crop needs
  - For growth and food safety
- Water delivery method
- Water quality
Do you need to irrigate this crop?

average monthly precipitation

<table>
<thead>
<tr>
<th>Month</th>
<th>Inches</th>
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<td>1</td>
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Series 1
Irrigation Methods

- Spray
- Flood / Furrow
- Drip
- Pray for rain
Spray

- Common
- Water contacts entire plant
- Maintenance, spray heads
- Negative effect depends on source
Flood / Furrow

- Common in the south
- Less expensive
- Can be difficult to get even distribution
- Negative effect is dependant on source and type of plant
Drip

- Pricey to install
- Maintenance
- Great for conservation
- Negative issues depend on type of plant
Safer Vegetables

Fewer pathogens survive under subsurface drip irrigation

Sampling activities of soil and crop in a greenhouse
Water quality standards and treatment

Agricultural Water Quality Standards

Water quality standards for various agricultural uses in British Columbia are shown in Table 1.

<table>
<thead>
<tr>
<th>Water Use</th>
<th>E. coli</th>
<th>Fecal Coliforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation of crops eaten raw</td>
<td>&lt; 77 cfu/100ml</td>
<td>&lt; 200 cfu/100 ml</td>
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<tr>
<td>Irrigation general</td>
<td>&lt; 1000 cfu/100ml</td>
<td>&lt; 1000 cfu/100ml</td>
</tr>
<tr>
<td>Crop Washing</td>
<td>0 cfu/100ml</td>
<td>0 cfu/100ml</td>
</tr>
</tbody>
</table>

Source: BC Ministry of Water, Land and Air Protection / Health Canada
chlorine is present.

Figure 3  Schematic of Ultraviolet Treatment System

Figure 4  Ultraviolet Treatment Unit
Source

- Identify water sources and potential means of contamination
  - Surface water & springs
  - Private wells
  - Municipal supply

- Contamination from what?
  - Harmful pathogens
    - Ecoli, shigella, Hepatitis A, Salmonella
    - Warm blooded animals, livestock, wildlife, people
What to Use, What to Use

- Surface water is more vulnerable to contamination
  - Difficult to monitor and control
Karst Topography
A Better Choice

- Private well subject to construction and hydrology
  - Consider routine testing
  - Keep records of testing
Safe, But Practical?

- Municipal water less prone to problems
  - Testing already taking place
Testing?

- What to test for
  - Total coliform
  - E-coli

- Who can run the test
  - MDHSS State Lab in Jeff City
  - Some Local health Departments
  - Private lab

- Sampling method
More Potable Water?

- Non-Irrigation water
  - Cooling, wash water, ice, pesticide application and frost protection
Water Supply Protection

- Backflow prevention
  - Air gap
  - Devices
  - Separation

![Diagram showing wrong and right approaches to backflow prevention](image-url)
Water Supply Protection
Summary

- Irrigation methods
- Water sources
- Water testing
- Water supply protection