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Health through wellness



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# Indigenous Food Safety and Security: Community Adaptations in the Wake of Climate Pressures

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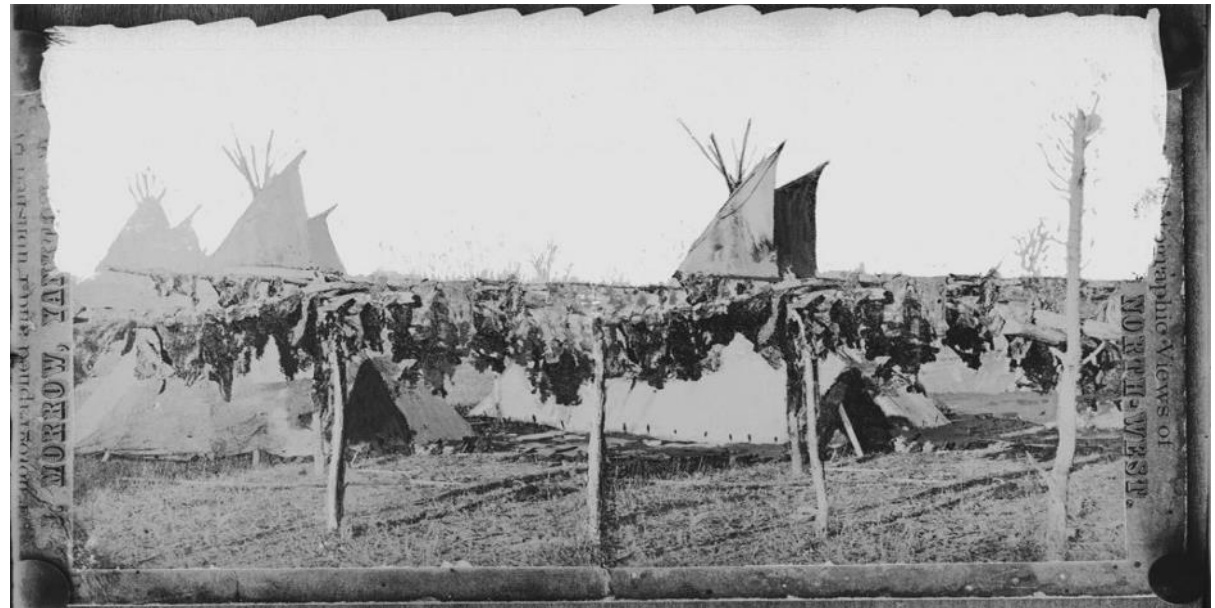
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## Introduction

“Traditional Foods” – land-gathered. AKA “country foods” or “wild foods”

- Nutritionally, economically, culturally, socially important to communities
- Linked to better nutrition and individual health vs. store-bought foods





## Context

Climate change, environmental, and social stressors can impact availability and accessibility of traditional foods

- Impact to lands and habitat of food sources
- Regulatory restrictions
- Loss of access to food sources
- Lack of resources to gather & process foods





## Purpose

Traditional food preservation practices have effectively controlled pathogens and prevented food spoilage

- Adaptations / different materials may introduce food safety hazards
- Climate change may reduce effectiveness of understood natural methods

Case studies: based on input & conversations with First Nations and Inuit communities, and environmental health professionals who work alongside them



## Case Study #1 – Smokehouse Construction



### Specific inquiry:

What are the risks associated with use of poly tarps and human-made materials in construction of smoking apparatus?

- Lit search showed absence of info
- Expanded scope to include considerations of PAHs in all smoking activities



## Case Study #1 – Smokehouse Construction

### Polycyclic aromatic hydrocarbon (PAH) health impacts

- Acute (nausea, vomiting, eye & skin irritation, difficulty breathing)
- Long-term (kidney/liver damage, DNA damage)



### Correlation between smoking & PAHs

- Meats directly in path of smoke have higher PAH levels
- Fully-smoked meats have higher PAH levels
- Hot smoked small fish have much higher levels of benzo(a)pyrene





# Case Study #1 – Smokehouse Construction

## Recommendations

- Increase distance between smoke & food
- Slightly (vs. fully) smoke
- Avoid use of treated lumber & galvanized metal
- Remove oil and preservatives from metal used for racks
- Ensure proper ventilation to reduce worker exposure



## Case Study #2 – Gardening & Tires as Planters

Gardening can increase nutritional sustainability at community level

- Reduces reliance on expensive / unattainable store-bought produce

Concerns that garden beds may be constructed out of non-traditional, easily-accessible materials



**Specific Inquiry:** What are the public health risks associated with using tires as planters?





## Case Study #2 – Gardening & Tires as Planters

Health concerns from using tires as planters:

- Literature neutral on risk of using whole rubber tires as planters
- Ground/chipped tires may produce greater risks (greater surface area for leaching)
- Zinc from wires within tires (not rubber itself) is greatest public health risk
  - Dependent on pH of contact water

Additional public health risks from tires:

- Still water a breeding ground for mosquitoes
- Tires havens for rodents/wasps/other animals
- Flammable tires could cause air quality / ash pollution





## Case Study #2 – Gardening & Tires as Planters

### Recommendations

- Use only whole tires
- Check regularly for exposed wires
- Poor-condition tires should be replaced OR coated with sealant
- Replace soil in tires annually; after 5 years → flowers only!



## Case Study #3 – Greywater for Crop Irrigation

- Climate change may create drought conditions in some areas
- Some communities already facing inadequate water quantity / lack of water for domestic use
- Greywater (non-sewage wastewater) & rainwater alternative means of irrigation that reduce stress on potable water supplies



**Specific Inquiry:** what are the public health risks associated with consuming crops grown using recycled water?



## Case Study #3 – Greywater for Crop Irrigation



### Public health concerns with reused water

- **Blackwater (sewage) never recommended for reuse → High risk for human infection**
- **Rainwater may contain contaminants from capture/distribution infrastructure (lead, copper, pathogens)**
- **Greywater & rainwater can lead to contamination of plant crops → Including uptake of contaminants into edible plant tissue**



## Case Study #3 – Greywater for Crop Irrigation

### Recommendations

- Drip irrigation (small amounts of water at root level) = lowest risk of contamination
- Tomatoes & fruit trees more suitable for recycled water irrigation than lettuce & spinach
- Assume contamination of greywater & rainwater and treat appropriately
- All water for domestic use should be tested regularly

*Note: BC, Alberta, & National Plumbing Code don't differentiate between greywater or restrict its use to toilets, urinals, etc.*



## Case Study #4 – Wind & Sun Drying

Traditional form of preserving food in climates with low humidity and high ambient temperatures

Desire to continue this method

- Climate change may change effectiveness of traditional techniques



**Specific inquiry:** what are the food safety risks associated with wind & sun drying?



## Case Study #4 – Wind & Sun Drying



### Food Safety Considerations

- Food spoilage due to inadequate preservation
  - Inadequate salting
  - High humidity = mould before drying complete
- Contamination from chemical / microbial sources
  - Use of spoiled fish
  - Toxic metal contamination
- Pest & animal attraction
- Unhygienic processing & drying
  - Lack of air-tight packaging



## Case Study #4 – Wind & Sun Drying

### Recommendations

Use of solar dryers (indirect solar radiation) will reduce many risks

- Remove food from direct contact with atmosphere
- Reduce contact between meat and insects
- Regulate humidity
- Reduce dust contamination / toxic metal accumulation



*BUT - initial cost & materials an impediment;  
unclear viral inactivation efficacy*





## Case Study #4 – Wind & Sun Drying

### Additional recommendations:

- Hygienic practices during preservation
- Use of potable water to clean fish
- Adequate salting
- Air-tight packaging
- Keep products on racks / off the ground

### Food dried using traditional processes has higher nutritional quality

- Higher protein
- Lower fat
- Lowest saturated fatty acids

*BUT, oven-dried food has reduced lipid content, increased vitamin A, longest shelf-life*



## Case Study #5 – Treated Timber Planter Boxes

Similar to tires - most abundant, easily-accessible materials would be used to build planters

Community near active rail line:

- Access to many treated railroad ties

Research also highlighted treated timbers as similar concern



**Specific inquiry:** What are the public health risks associated with consuming crops grown in planters constructed from railroad ties or treated timbers?



## Case Study #5 – Treated Timber Planter Boxes

### Food Safety Considerations

- PAHs, arsenic, copper, chromium, creosote, boron, PCBs can leach into soil
  - Migration of PAH high in hot weather
  - Less migration of PAH when ties weathered
  - Correlation between PAH levels in plants & ties
  - Copper, chromium, boron leaching in subsequent years
  - High levels of creosote in ties after 75+ years of use
- Root crops grown in contact with contaminated soils = greatest metal consumption
- Black yeast grow & thrive on ties (especially + creosote) → harmful to humans



## Case Study #5 – Treated Timber Planter Boxes

### Recommendations

- Contamination decreases with distance from treated material
- Install a barrier between soil & treated material
  - Paint bottom of treated timbers
  - Heavy plastic liners in garden beds
- Creosote impacts plant growth: avoiding use can improve food quality/yields



## Case Study #6 – Hydroponics

Identified as a way to reduce reliance on expensive imported produce in northern & remote communities

Climate change could impact traditional means of transporting foods (e.g. ice roads) leading to more stressors on food systems



**Specific inquiry:** What are the food safety risks associated with growing crops hydroponically?



## Case Study #6 – Hydroponics

### Food Safety Considerations

- Uptake of contaminants into hydroponically-grown plants
  - Originates from irrigation water
  - Includes Salmonella, norovirus analogues, microcystin-LR, Hepatitis C, pharmaceuticals
- Contamination of seeds can = contamination of mature plants





## Case Study #6 – Hydroponics

### Recommendations

- Consider your crop (tomatoes shown to be low risk of contaminant uptake – distance from root to fruit)
- Use clean irrigation water & frequent water quality testing
- Follow good agricultural practices
  - Healthy workers; toilet facilities; pest reduction
- Use organomineral nutrient solutions when irrigation water is poor



# Recommendations

## Physical Interventions

Reduce contact points with contaminants

- Increase distance between food & smoke sources
- Dry foods away from contaminant sources, on racks / off ground
- Use hygienic practices when handling/packaging foods
- Use only whole tires, watch out for exposed wires
- Rotate soil in garden beds made of tires, treated timbers, railroad ties
- Avoid close contact between treated materials & soil in garden beds
- Avoid use of treated materials after 5 consecutive years





# Recommendations

## Chemical Interventions

Remove contaminants themselves

- Avoid use of treated lumber / galvanized metal in food processing
- Remove oils & chemicals from surfaces used in food processing
- Treat irrigation water & disinfect tools
- Adequately salt food products
- Use potable water for cleaning food items
- Avoid creosote-treated items
- Use organomineral nutrient solutions for hydroponics when irrigation water poor



# Recommendations

## Technological Interventions

Use of equipment to reduce risk

- Drip irrigation to reduce evaporation & avoid contamination of fruits
- Install ventilation systems to reduce PAH exposure & provide safe work environment
- Water quality testing for hydroponics & irrigation water
- Solar dryers to reduce dust, lower toxic metal accumulation, regulate humidity when drying foods



# Thank You!

*Indigenous Food Safety and Security: Community Adaptations in the Wake of Climate Pressures* can be found at: <http://bit.ly/2EyLqtG>  
[www.ncceh.ca](http://www.ncceh.ca) || [www.ccnse.ca](http://www.ccnse.ca)  
[www.fnha.ca](http://www.fnha.ca)

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