



Canadian Food  
Inspection Agency

Agence canadienne  
d'inspection des aliments

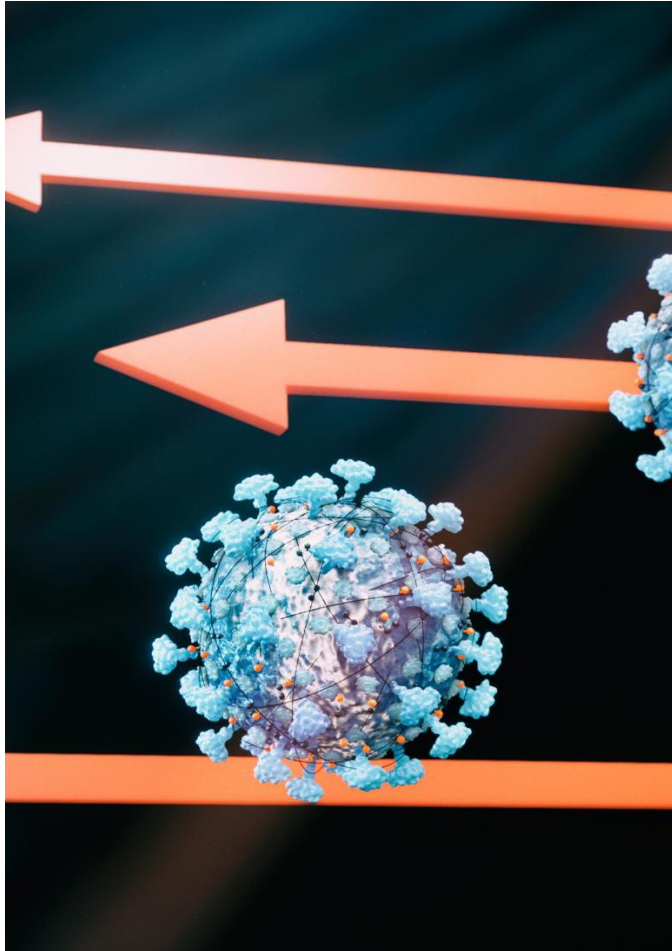
# Case Study: *Salmonella* in Frozen Raw Breaded Chicken Products

*Indo-Pacific Agriculture and Agri-Food Office*



Canada

# Chronological Timeline of Events



## **Whole Genome Sequencing Introduction**

WGS technology introduced in 2017 enhanced precision in identifying contamination sources and patterns.

## **Outbreak Investigations 2017-2019**

Investigations linked raw frozen breaded chicken to Salmonella outbreaks, prompting urgent public health actions.

## **Regulatory Measures by CFIA**

CFIA mandated control measures including cooking validation and testing to reduce Salmonella contamination.

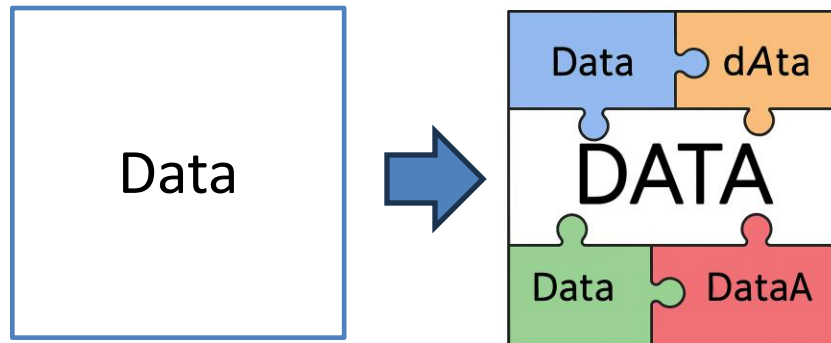
## **Improved Safety Outcomes**

Policy implementation led to a significant drop in contamination and salmonellosis cases nationwide.

# WGS Elevates Surveillance Precision

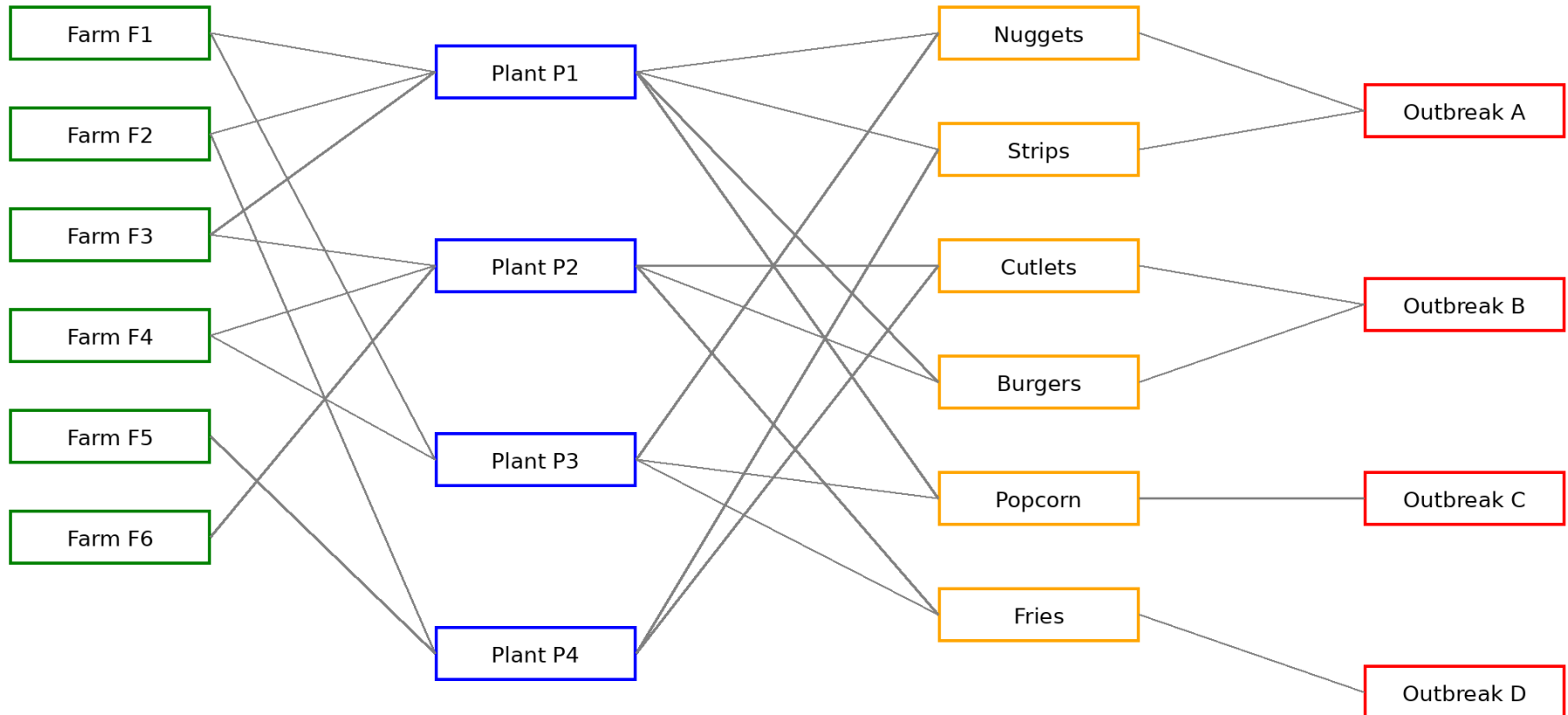
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In May 2017, Government of Canada began using **whole genome sequencing to help identify and respond to outbreaks**. It was decided to start with Salmonella isolates currently in the system, both clinical and non-clinical.



- Revealed multiple concurrent outbreaks
- Exposed the national scale of contamination
- Prompted coordinated federal response
- Enhanced traceback accuracy

# Better understanding of product traceback & connectivity



# Food Safety Investigation

## Integrated Surveillance Network

The system integrates data from farms, processing plants, and retail to monitor Salmonella in frozen raw breaded chicken products. [**FoodNet Canada**]

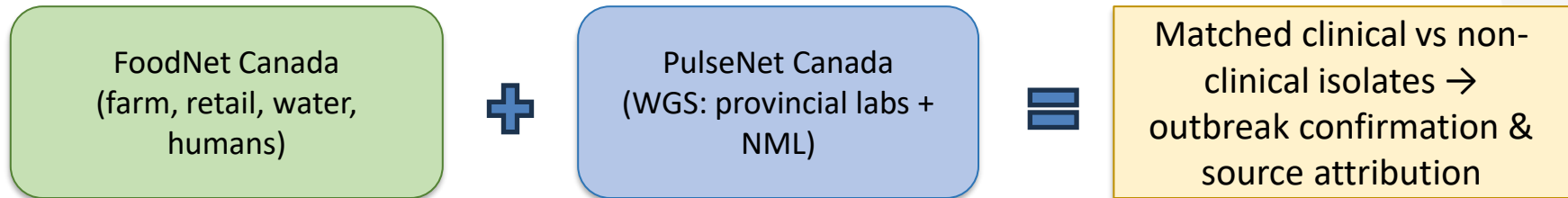
# Food Safety Investigation

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## National WGS Network

Whole-genome sequencing by PHAC allows high-resolution matching of clinical and non-clinical isolates to identify outbreak clusters. [**PulseNet Canada**]



# Food Safety Investigation

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## Traceback and Regulatory Action

From Public Health interviews, CFIA traces implicated products back to processing plants and lots, enabling recalls and targeted public health interventions. **[Food Safety Investigation]**

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## Epidemiological & FS Investigation Evidence Integration

Case histories, consumption patterns, and purchase data strengthen traceback accuracy and support outbreak response decisions.

# 2017-2019 *Salmonella* Outbreaks

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- In May 2017, **whole genome sequencing** allowed identification and investigation of multiple national outbreaks of *Salmonella* linked to consumption of frozen raw breaded chicken products.
- Frozen raw breaded chicken products: non-intact (ground, chopped, formed) raw chicken which is breaded and par-fried. They are not fully cooked.



# Food Safety Investigation

- Domestically produced retail brands, none exported
- Illnesses across all 10 provinces and 3 territories
- Products had long frozen shelf lives—typically 8–12 months
- Each recall likely involved tens of thousands to hundreds of thousands of packages, consistent with national distribution footprints

14 frozen raw breaded chicken products were recalled

- Chicken strips
- Chicken cutlets
- Chicken nuggets
- Chicken burgers
- Chicken fries
- Chicken popcorn

# Food Safety Investigation

## Insight into Consumer Behaviour

Illnesses due in part to inadequate cooking/handling by the consumer at home despite the presence of cooking instructions.

## Public Communications

- Public Health Notices - PHAC's repeated notices informed consumers that frozen breaded chicken is raw and requires thorough cooking.
- Food Recall Warnings - CFIA issued recalls identifying affected products and urged consumers to discard or return recalled items safely.
- Media Alerts - Coverage by CBC News & Social Media platforms spread awareness by reporting outbreaks and clarifying unsafe handling misconceptions.
- Product Labelling – Industry enhanced raw product warnings and cooking instructions on packaging.

# Food Safety Investigation

*Despite food recall warnings and education, continued to see hundreds of Salmonella illnesses amongst Canadians*



## **Had to Shift to Preventive Regulation**

to require industry to prevent Salmonella through upstream manufacturing controls.

# 2018 Industry Notice and 2019 Mandate

## **Shift in Risk Management**

Policy shifted Salmonella control from consumer cooking to mandatory source-level manufacturing controls.

## **Targeted Product Types**

The mandate focused on non-intact products like nuggets and strips due to higher contamination risks.

## **2018 Regulatory Notice**

CFIA issued a 2018 notice warning manufacturers about upcoming Salmonella control regulations for frozen breaded chicken.

## **2019 Mandate Implementation**

Starting April 2019, manufacturers must apply validated control measures to reduce Salmonella to non-detectable levels.



# *Salmonella* control options in frozen raw breaded chicken products

Option 1: A cook process that has been validated to achieve a 7-log reduction in *Salmonella*

Option 2: Implement a *Salmonella* testing program for the raw chicken mixture to demonstrate it has no detectable *Salmonella*.

Option 3: Implement a *Salmonella* hold-and-test program for finished frozen raw breaded chicken products.

Option 4: Variation for partial kill + Option 2

# Post-2019 Public Health and Industry Outcomes

## Significant Reduction in Salmonella

Salmonella prevalence in frozen breaded chicken **dropped from 28% to 2.9%** after the 2019 mandate.

## Decrease in Human Illness

Salmonellosis cases linked to these products **declined by approximately 23%** nationwide, improving public health.

## Industry Compliance and Technology

Many manufacturers adopted industrial ovens to fully cook products, meeting regulatory requirements effectively.

## Regulatory Framework Success

The 2019 policy aligns science, regulation, and industry practices as a model for food safety intervention.

# Helped Us Better Understand:

## **Outbreak Overview**

From 2017 to 2019, 16 Salmonella outbreaks linked to raw frozen breaded chicken caused 285 cases in Canada.

## **Consumer Misunderstanding**

Many consumers wrongly believed these products were pre-cooked, leading to undercooking and increased infection risk.

## **Advancements in Detection**

Whole genome sequencing (WGS) introduced in 2017 improved outbreak detection and source tracing dramatically.

## **Regulatory and Industry Challenges**

Investigations revealed industry control issues and led to regulatory efforts for better safety standards.

# The Use of Whole Genome Sequencing

Whole genome sequencing enabled Canada to identify multiple *Salmonella* outbreaks linked to frozen breaded chicken products by:

1. Providing precise **genetic fingerprints** that linked cases with high accuracy
2. Connecting **geographically scattered cases** as part of the same outbreak
3. **Matching** human cases to contaminated food products
4. Distinguishing **multiple independent outbreaks** rather than one recurring issue
5. Supplying **decisive scientific evidence** that prompted national regulatory intervention

*WGS did not just improve outbreak detection — it directly shaped federal food safety policy.*