Surveillance to action: The third-generation cephalosporin-resistant *Salmonella* from poultry story

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) is a national integrated surveillance program that collects, analyzes, and communicates trends in antimicrobial use (AMU) and antimicrobial resistance (AMR) along the food chain, from food animals, retail meat, and people across Canada.

This year, **2022** marks **20 years** of excellence in providing **antimicrobial resistance** and **antimicrobial use** surveillance data.

2002-2004

Health risks and public health impact

CIPARS observed a **concerning** increase in **third-generation cephalosporin (3GC) resistance** in ***Salmonella*** **Heidelberg** recovered from **poultry and sick people**

Ceftiofur (a 3GC used in **animals**) resistance, confers resistance to **ceftriaxone** (a 3GC used in **people**)

3GCs are **Category I** antimicrobials – **very high importance** to human medicine

S. Heidelberg is a **common serovar** in Canada and can cause **invasive infections**

2005-2007

Industry's call-to-action and voluntary policy change

The **extra-label drug use (ELDU)** of ceftiofur in broiler chicken hatcheries was possibly driving **3GC resistance** in ***Salmonella*** isolated from **poultry and sick people**

A **voluntary withdrawal** of **ceftiofur use** in Québec chicken industry (hatching and day-old chicks) occurred from 2005 to 2007

Health Canada's Veterinary Drug Directorate also **modified ceftiofur drug label** to advise **against ELDU**

Resulted in **decreased 3GC resistance** in retail chicken and sick people ***Salmonella*** isolates and ***E. coli*** isolates along the food-chain

2008-2012

CIPARS data and policy impact

CIPARS data was cited at the American Congressional Hearings (2010) supporting a **link between antimicrobial use in food-animals** and **negative impact on human health**

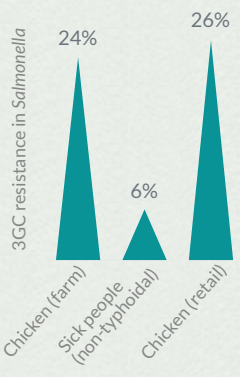
CIPARS data was used by the US-Food and Drug Administration to **prohibit certain ELDU of cephalosporins** in the US

2013

Ceftiofur use and ceftriaxone resistance

In 2013, **re-emergence of 3GC resistant *Salmonella*** from sick people and retail chicken isolates was observed

31%
of flocks reported use of ceftiofur on farm



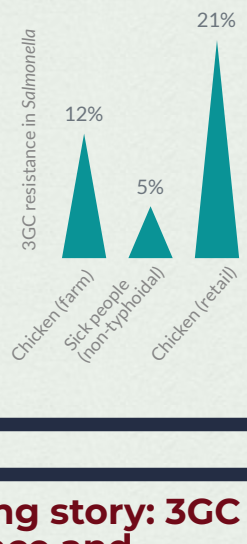
2014

Poultry industry intervention

The Canadian poultry industry **stopped** using **3GCs** for **disease prevention**

Reduction in ceftiofur use resulted in a **decrease** of ceftriaxone resistant human and chicken isolates

6% **(-25%)**
of flocks reported use of ceftiofur on farm, in 2014



2015-2017

Ceftriaxone resistance in non-typhoidal *Salmonella* and generic *E. coli*

Since 2015, **no ceftiofur use** in broiler chicken flocks has been reported

Ceftriaxone resistance **decreased** in *E. coli* and *Salmonella* isolates from chickens and chicken meat

A **continued decrease** in ceftriaxone resistant chicken and chicken meat and human isolates were linked to the ceftiofur ban

2018

A shifting story: 3GC resistance and serovars

In 2018, the **continued decrease** in ceftriaxone resistance in *Salmonella* serovars in **sick people** was observed

But... the **majority** of these resistant isolates were serovars **Infantis**, followed by **Heidelberg**

In **chickens and chicken meat**, most ceftriaxone-resistant *Salmonella* isolates were ***S*. Kentucky**, followed by ***S*. Heidelberg** and ***S*. Infantis**

There were **some increases** in ceftriaxone resistance in **2018** compared to 2017, most notable in ***Salmonella*** isolated from **on farm chickens**

2019-ongoing

Continued surveillance

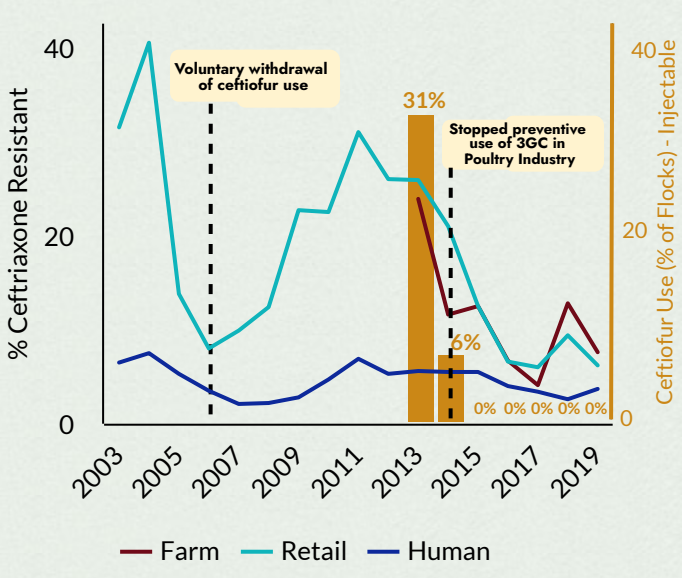
Overall, there has been a desired **decrease** in **3GC resistance** trend; **low** level ceftriaxone resistance remains

However, while not as frequent compared to other serovars occurring in people, **S. Kentucky** is likely acting as a **reservoir** for these resistant genes

Use of other antimicrobials may also maintain resistance due to co-selection of genes

The poultry industry has committed to **removing the preventive use** of other types of antimicrobials that are **important to human medicine**

Figure 1. Reduction in reported use of ceftiofur on farms and changing resistance to ceftriaxone in *Salmonella* (all serovars) from sick people and chicken sources



Key points

CIPARS surveillance data identified a concerning trend, which led to government action (label warnings), a voluntary industry intervention and actions in another country

The reduction in ceftiofur use and associated decrease in ceftriaxone resistance compared to pre-2014 data in chickens and humans is a good example of a successful intervention to limit antimicrobial resistance

Low level ceftriaxone resistance remains despite reduction in antimicrobial use, possibly caused by some bacteria and serovars maintaining resistance genes

A change in antimicrobial use, even with those of lesser importance to human medicine, may result in a shift in resistance trends

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