

Campylobacter and Poultry Meat

The “New” Zoonosis

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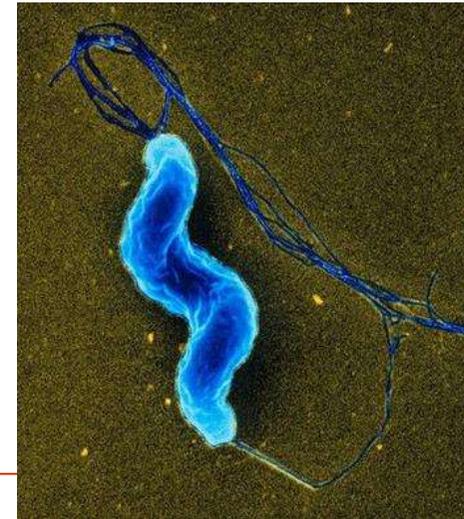
VOA Scientific Conference
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Campylobacter

Campylobacter & Poultry Meat

- Basic introduction to Poultry Industry
- Basic Introduction to Human Campylobacteriosis
- Campylobacter & the Chicken
 - Key Campylobacter on farm epidemiological considerations
 - Campylobacter vs. Salmonella
- Key Considerations:
 - On farm
 - Processor
 - Consumer
- Possible intervention strategies



Key Aim of Presentation

Understand the problem



Answers to the problem



“Important to understand the problem to evaluate the answers”

Broiler Chicken:



Broiler Chicken: MEAT Production

- 2 – 3 breeds worldwide
- A “FCR” Superstar (1.5)
- Unrivalled genetic performance and potential
- Sustainability / Carbon Footprint
- Short Broiler Lifecycle – A victim of his own success

Turkeys

Spent Hens



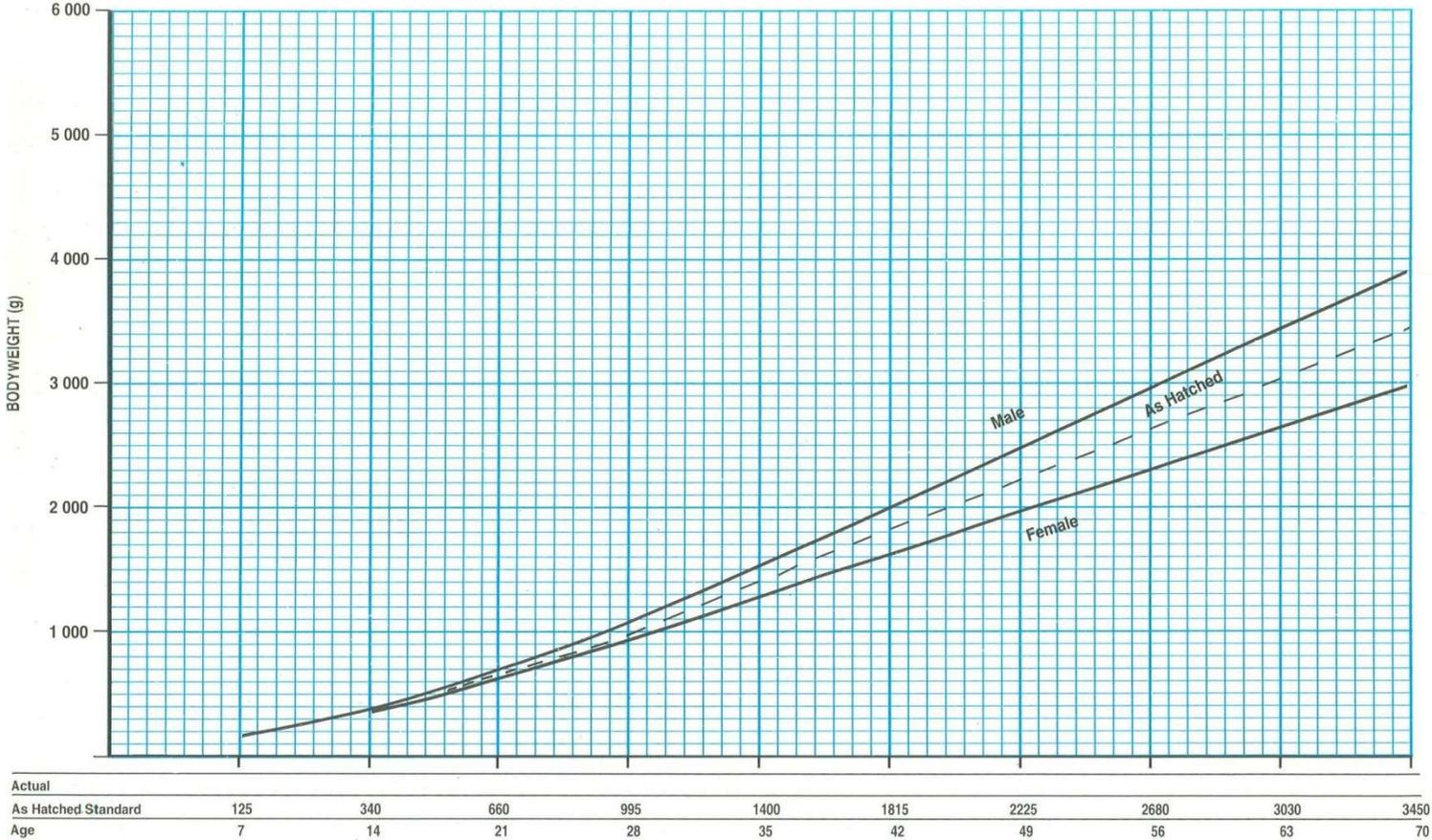
Eggs



Ross Broiler: Target Live Weight Gain (Ross 308)



Ross Broiler – Live Weight for Age









UK Experience

Guardian Newspaper

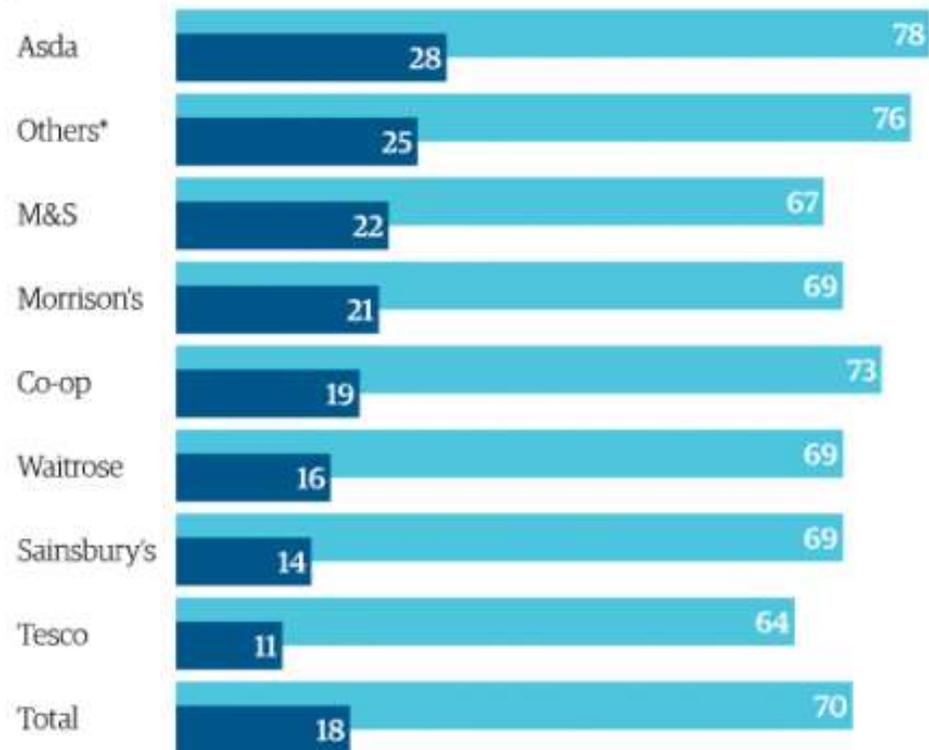
November 2014



Campylobacter testing The results

Overall prevalence of Campylobacter on chickens sampled in Q1 and Q2

Key | ■ Total contaminated, % ■ Highly contaminated, %



*INCLUDES LIDL, ALDI, ICELAND, CONVENIENCE STORES INDEPENDENTS, BUTCHERS ETC.

GUARDIAN GRAPHIC

SOURCE: FOOD STANDARDS AGENCY/PUBLIC HEALTH ENGLAND

It is the first breakdown of the results between the various supermarket chains, the FSA said.

A collection of other retailers, taking in smaller discount chains such as Lidl, Aldi and Iceland, as well as individual retailers and butchers, had a total incidence of 76%. However, 25% of the chickens from these shops had the highest levels of contamination, the worst apart from Asda, where the figure was 28%.



**One in three Brits at risk of
deadly food poisoning from
'killer chickens'**



**Irish woman's terrifying ordeal:
"I was paralysed from my neck to
my toes from bacteria in a
chicken. I couldn't move a
muscle."**



Chicken's off

2 in 5 supermarket birds full of deadly bugs



Ear to the Ground 2015 –
“Campylobacter – The Irish
Poultry Industry’s Dirty Secret”

Human Campylobacter related illness: Key Facts

- EU: 190,000 cases reported annually (2015)
- Predominately C.jejuni (C.coli & C.lari also)
- Total number of EU cases believed to be around 9 million annually (EFSA)
- Cost to EU Public Health systems estimated at 2.4 billion euro annually (EFSA)

- Most cases watery or bloody diarrhoea
 - Abdominal cramps / pain
 - Most common cause of appendicitis misdiagnosis

Immuno compromised patients

Guillain-Barre syndrome

Autoimmune complications (Reactive arthritis, inflammatory bowel disease)

Human Cases:

Source Attribution techniques:

Genotype (MLST)

Environmental sources vs. Patient

>50% Attributable to Poultry Meat*
(20-30 % EFSA 2014)

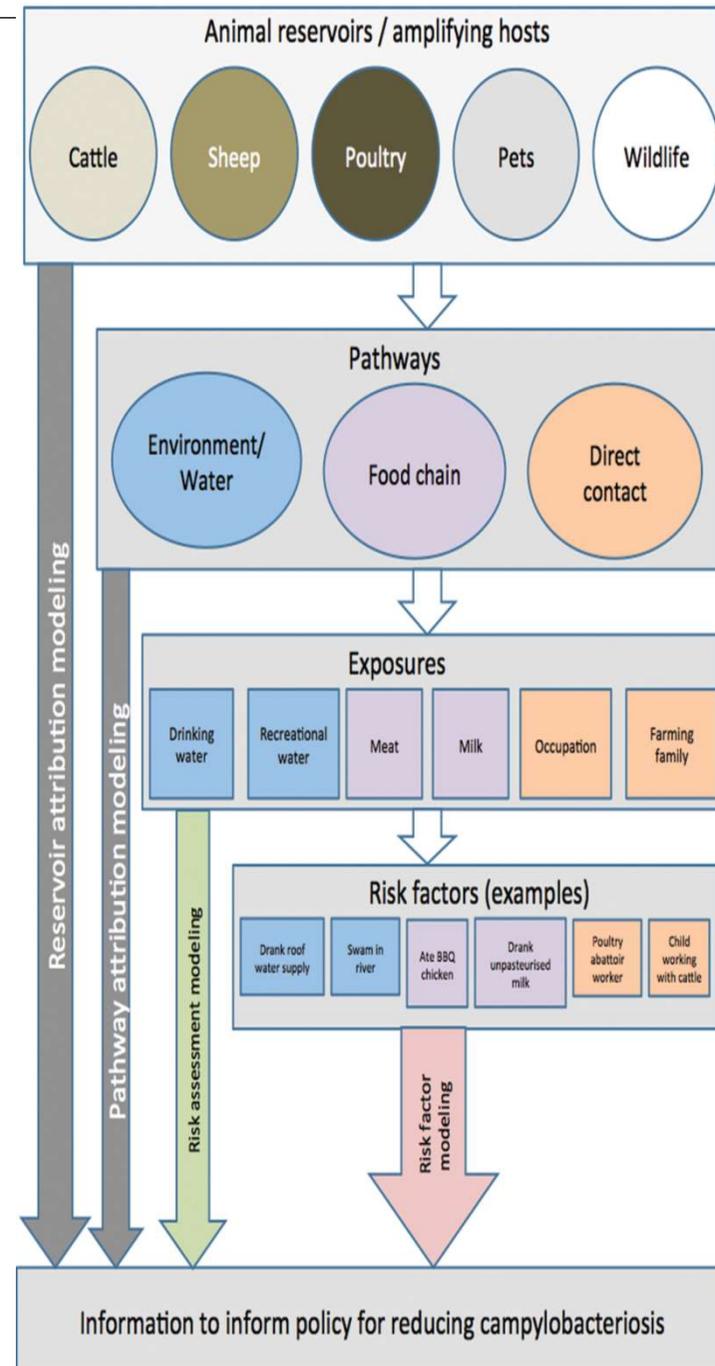
Importance of non meat sources:

Water

Rural / Urban (children <5) **

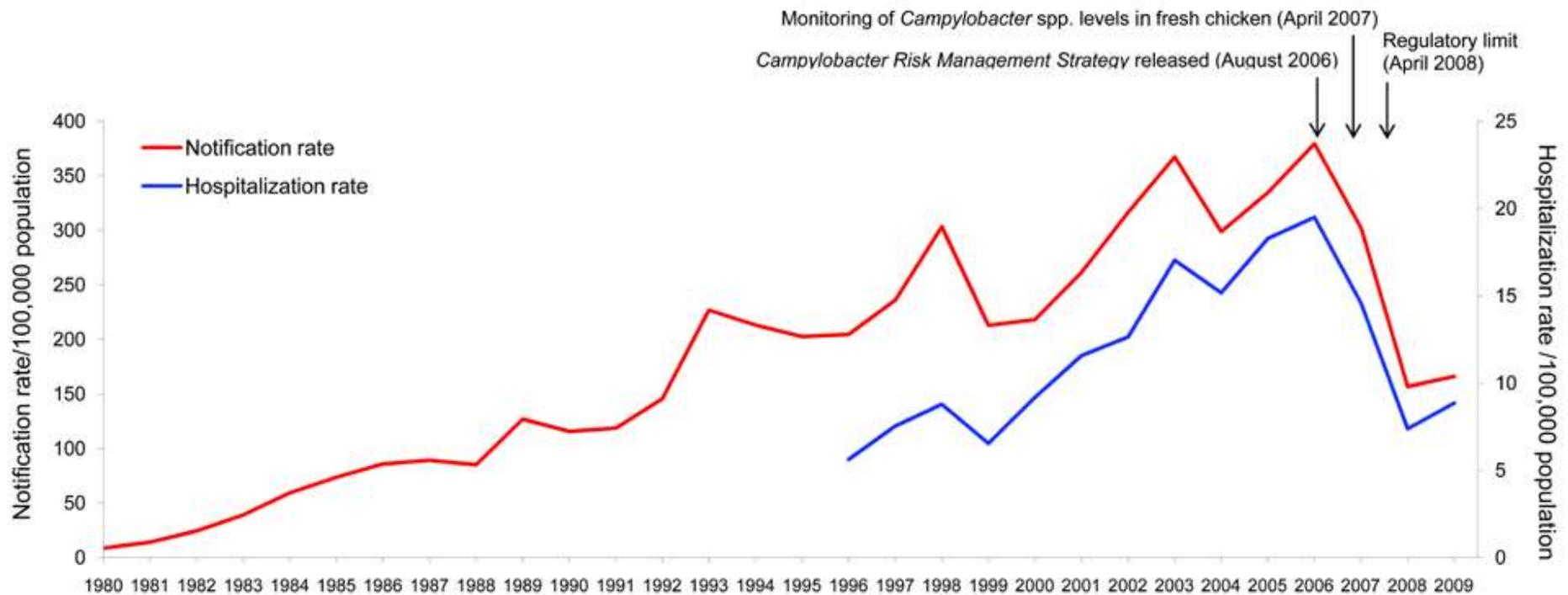
* NZ (Sear A 2011)

** NE Scotland (Strachan C 2014)



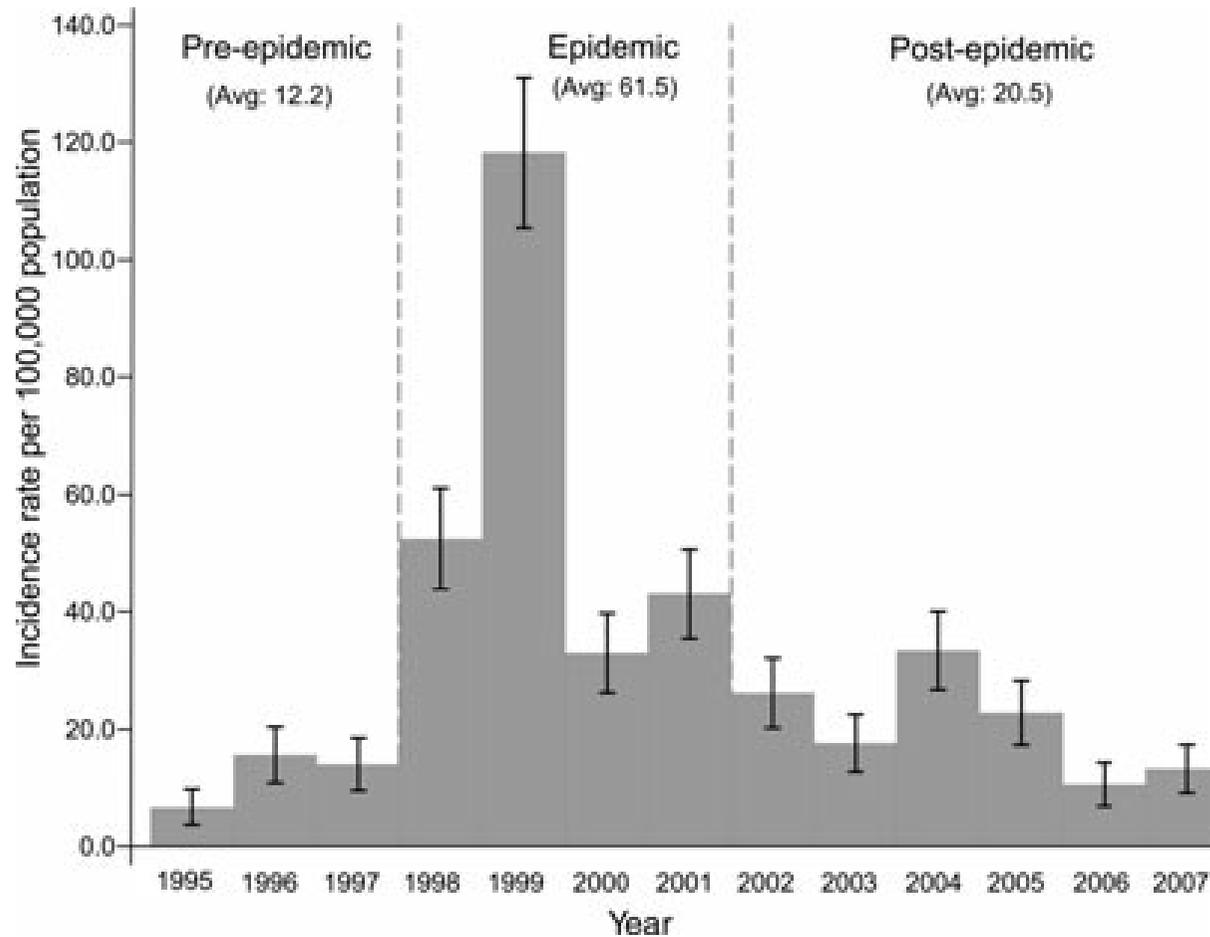
Successful Intervention strategies are possible:

New Zealand: (University of Otago Wellington NZ Sears A 2011)



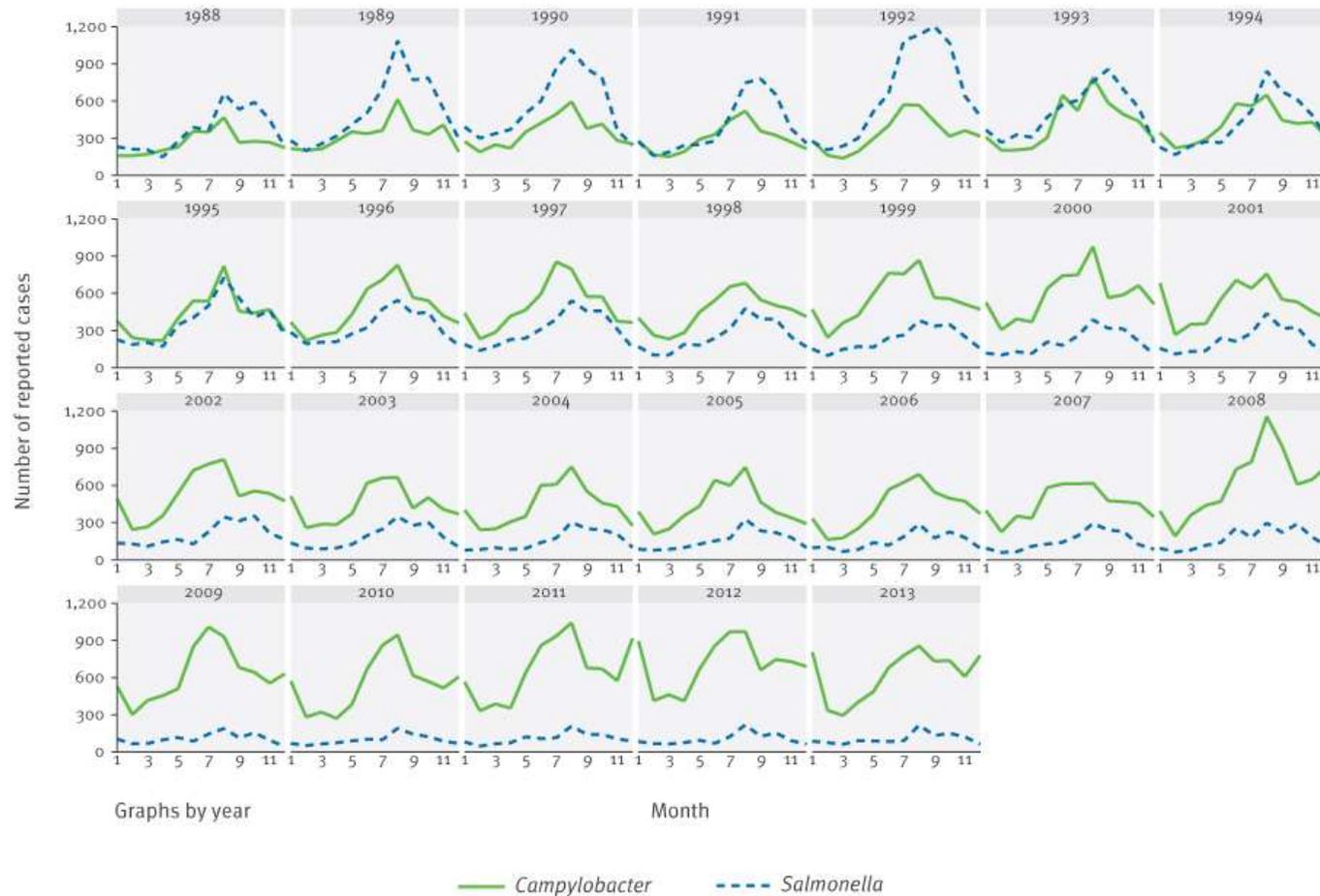
Successful Intervention Strategies are possible:

Iceland: Reiersen. J 2010 Icelandic Food & Veterinary Authority



Note: Compare incidence rate with NZ post intervention strategy

Human Campylobacter: Surveillance Data



Inverse trends of *Campylobacter* and *Salmonella* in Swiss surveillance data, 1988–2013
Eurosurveillance, Volume 21, Issue 6, 11 February 2016

Questions?

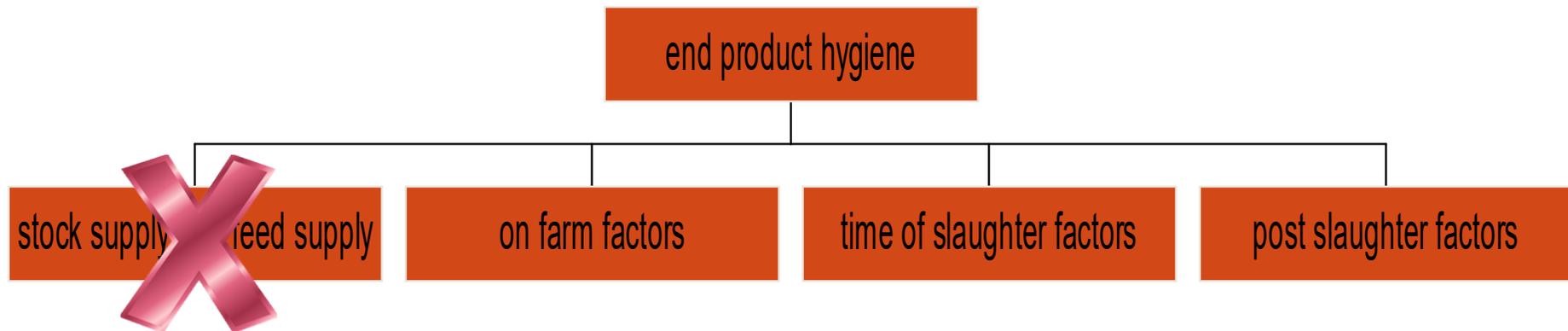
Excellent ROI & UK **Salmonella** Success story



Why does Campylobacter remain such a problem in Irish Poultry Meat?

Is Industry adequately addressing the problem?

Why can legislators not effect greater improvements?

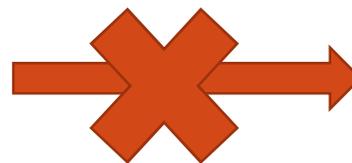


- **Campylobacter Epidemiology in the Chicken**

- Some positives
- Some Negatives
- Very straight forward BUT Very difficult
- **Very different from Salmonella**

Stock Supply:

- Vertical Transmission (via Egg) is NOT a significant component of this problem
 - Very susceptible to desiccation
 - Albumen very hostile environment for Campylobacter
 - Has been isolated in Hatcheries (PCR) but not cultured
 - Genotype variation in isolates: Breeder flocks vs. Progeny flocks (MLST)
- Day Olds largely resistant to colonisation for first 10 days of life
(Unique feature of Campylobacter ecology)
 - Gut physiology
 - Maternally derived immunity



Stock Supply:

- Salmonella story starts much further up the production pyramid
- All controls therefore can be focused upon a relatively small number of farms

(Commercial Broiler farms only)

- Small number vs. other industries (100's vs. 1000's)
- All in All Out operations
- Short production cycle (7 weeks)



Stock Supply:

- **Day olds are not a source of contamination**
- **First 10 Days Broiler Chick quite resistant to colonisation**
- So why the problem?



On Farm Factors:

- Birds from Day 10 onwards are VERY susceptible to colonisation
- Infective dose <40 CFU
- Resides mainly in Mucosal layer (transient invasion of intestinal epithelial cells)
- Massive “plume” of colonisation within 48 hrs
- Mathematical modelling: 95% - 100% of birds colonised 4.4 days*
- Up to 10^9 CFU / g faeces

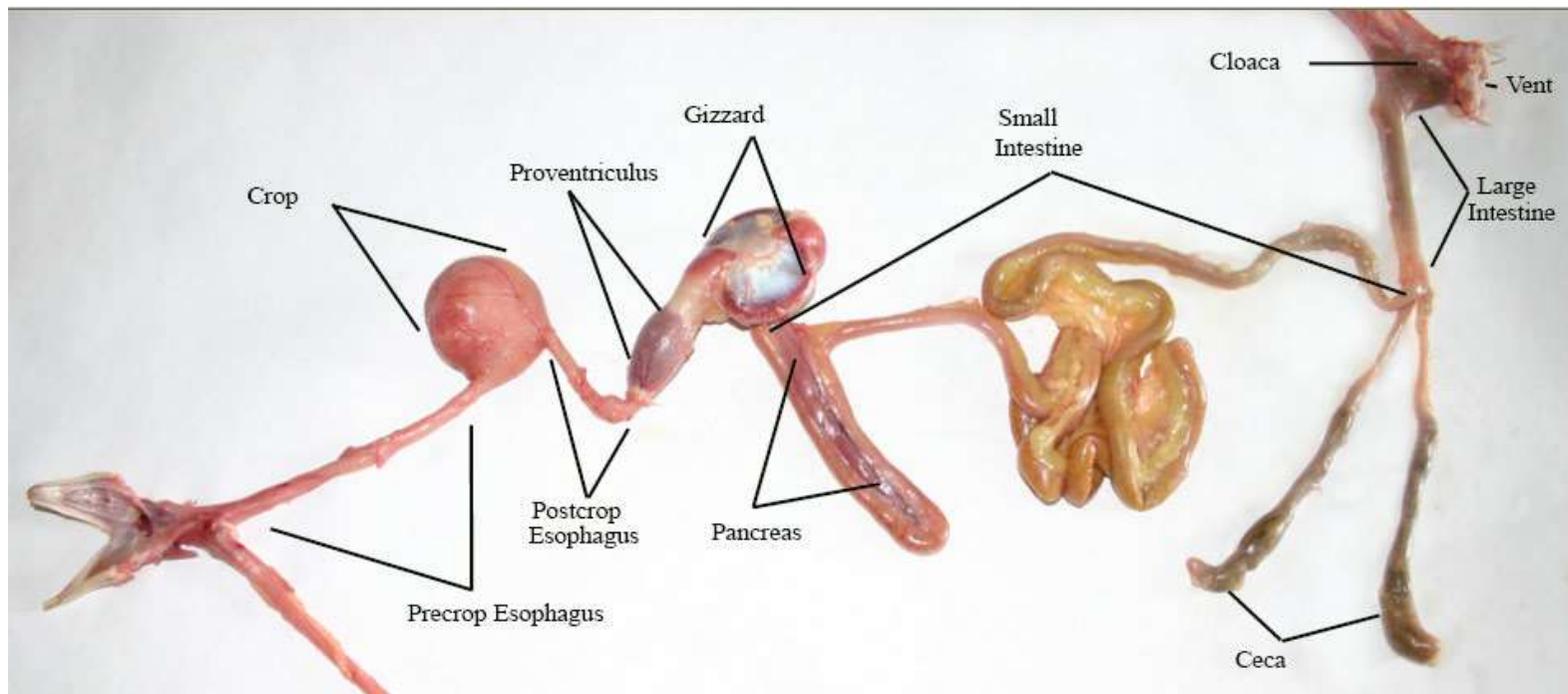


* Van Gerwe T et al 2009

Campylobacter & the Avian Digestive Tract:

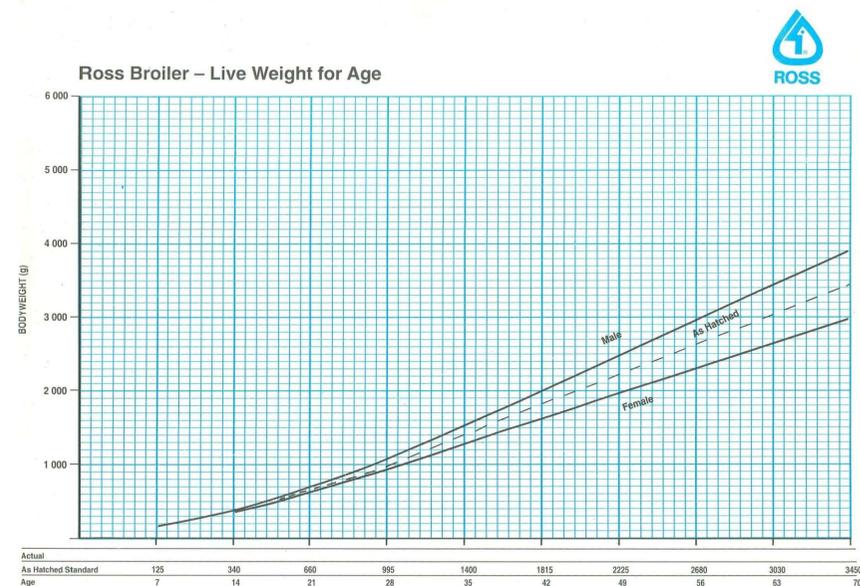
C.jejuni & *C.coli*

Faecal / Oral route



Campylobacter & “Older poultry” (Layers, Turkeys etc.)

- Progressive host response
- Not true to say a flock will ever truly become Campylobacter free
- **However**
 - Very significant decreased degree of colonisation
 - CFU's much reduced
 - < 20 % Colonisation rate (vs. 95 -100%) *
- Spent Hens
- Turkeys (C.Coli)
- **Broilers too Short Lifecycle**



* Humphrey S et al 2014.

Environment:

Survival & Background Infection Pressure:

Campylobacter ubiquitous in Wet Temperate climate

Not relatively species specific (Poultry tailored) unlike Salmonella

Ireland



Saudi Arabia





* Danish Source Attribution study

Stock Supply:



- Currently NO commercially effective vaccination for poultry (Unlike Salmonella)

Genetically promiscuous & poor antigen expression

Transient invasion of intestinal mucosa

Lifecycle of target birds very short

On Farm Factors: Broiler Farm Inputs / Possible points of entry

- Chicks
- Feed
- Housing
- Rodents
- Water
- Wild Birds
- Other Poultry,
- Livestock & Pets
- People
- Litter
- Insects
- Hatchery
- Equipment & Vehicles



- Chicks
- Feed
 - Heat treatment
- **Housing**
 - Disinfection of site
 - Importance of Terminal hygiene
 - Turn around times – **Big Problem**
- Rodents



- **Water**
 - Wells / Surface water contamination
 - In Line Biofilms
- Wild birds
- Other Poultry
- **Other Livestock**
 - Multispecies farms
 - *Campylobacter* spp. not “poultry specific”



- **People**

- Most common source of entry
- Strict Entry & Exit procedures must be followed each and every time
- Change of footwear / protective clothing
- House specific and dedicated equipment
- Use of Ante Rooms / Change Over barrier

Problems:

- Difficult to really impress upon farmers
- Very Difficult in practice
- Farmer Profile



- Litter
- Insects *
 - Fly control paramount importance
 - Fly screens
 - Seasonal Increase over summer months
 - Fly screens (30% decrease Norway)



- Hatchery

- Equipment & Vehicles

- Thinning
 - Are consumers ready to pay?
- Supermarkets Policy?



Module Drawer “Post Wash” (Italy)

Partial Slaughter episodes “Thinning” removed in Iceland for this reason

M&S UK – No “Pre harvested” flocks accepted.

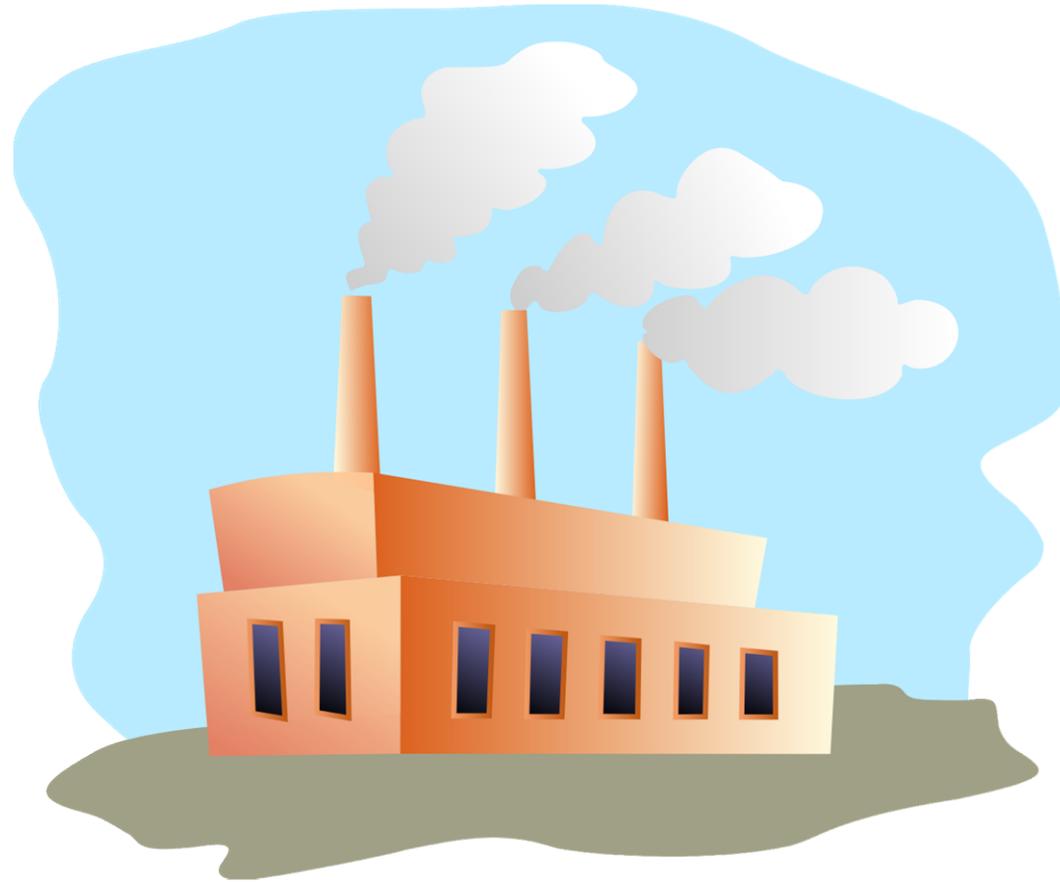


On Farm Factors: Summary

- **Important take home message for all Primary Producers:**
 1. Average biosecurity measures will have no significant effect
 2. Measures which address Salmonella / AI / ND / will not be effective
 3. Control plan / intervention strategies totally unique from that of Salmonella
 4. Biosecurity requires all day every day approach
 5. Insects as Vectors contribute to summer spike
 6. Some farms can achieve significantly better outcomes (<50%)
 7. Not necessarily the most modern farms that do best
 8. Effort more important than cheque book – on most farms capital investment requirements are secondary to improvements in work practices.

Processing Factors:

- Poultry processing has some inherent difficulties:



Cattle: E.Coli 0157







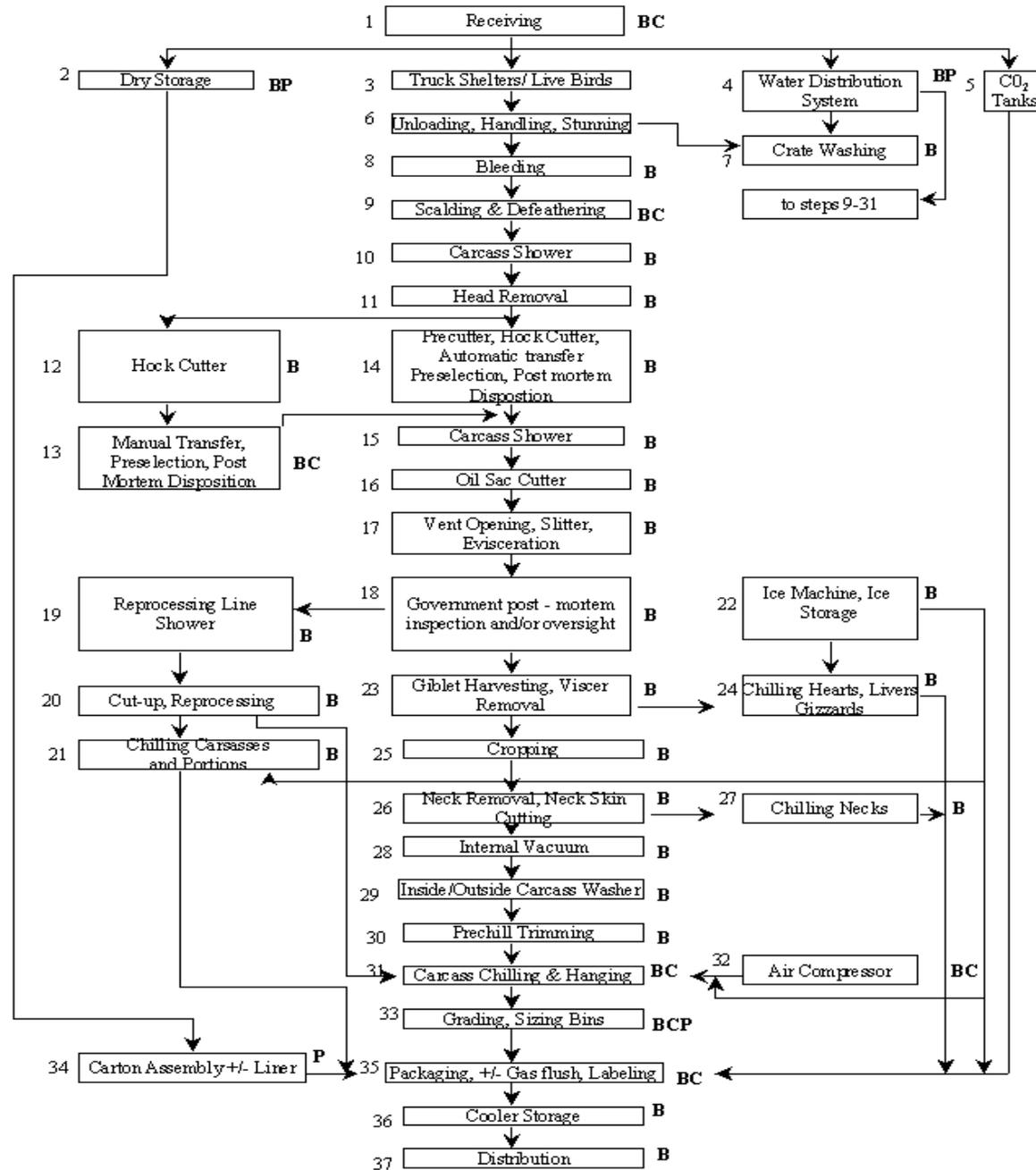


Poultry Slaughter & Processing

- Inherent Differences & Difficulties
- Processed as “Skin On”
- 12,000 per hour typically



**Process Flow Diagram
Poultry Slaughter
Chilled Ready to Cook Whole Chicken**





















The Future?



Campylobacter control in the processing plant

- 2073 /2005 Micro regulation currently under review
 - To date Campylobacter has not featured in this regulation. This will **NOT** Continue indefinitely
 - Commission actively looking at this regulation currently specifically with a view to introduce Campylobacter as a marker organism for PHC
 - Proposal is for neck flap sampling from Carcasses after chilling
 - Proposed “Corrective Action” for positive results

“Improvements in slaughter hygiene and review of process controls, origin of animals and of the biosecurity measures in the farms of origin” *

* Continuation of “farm to fork” approach

DAFM / Industry Pilot Project

- **“Improvements in slaughter hygiene and review of process controls, origin of animals and of the biosecurity measures in the farms of origin”**
 - DAFM currently working with industry on a Pilot project to provide objective feedback on farm biosecurity measures.
 - Anticipating the implementation of review of on farm biosecurity measures
 - Parameters included in On Farm Pilot Project

Terminal Hygiene Audit

Biosecurity assessment during production

Campy status (Financial Incentive)

Other on farm parameters

Results in an “On Farm Score” every 8 weeks which can be trended

Very encouraging results – Objectifying the problem is required to effect improvement

Additionally demonstrating consistent superior performance possible

League Table?

Farm to Fork Approach

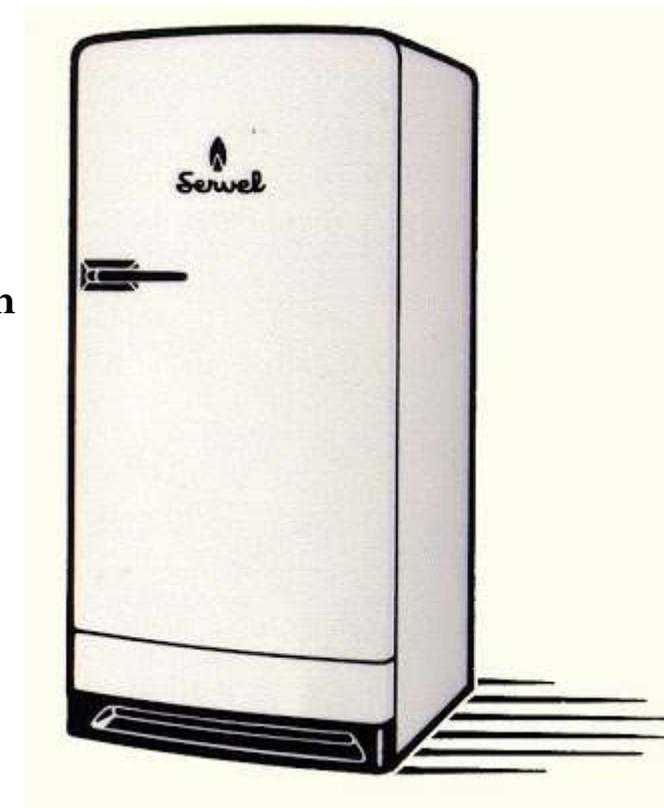
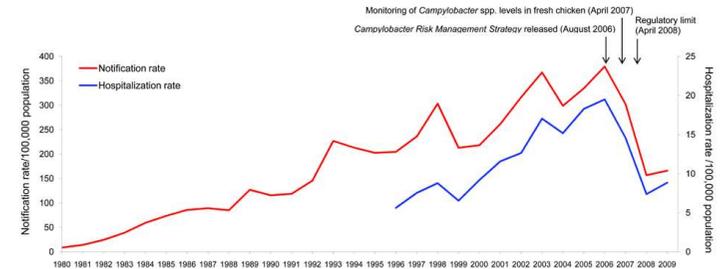
- Typically EU has sought to address food safety via holistic approach
- Very different to approach elsewhere (USA)
 - Much higher reliance upon processing aids
 - Post slaughter intervention strategies
- Campylobacter **WILL** require components of both approaches:
 - Farm to Fork on farm approach
 - Enhanced processing aids

Processing Aids / Intervention Strategies

- Some “easy” intervention strategies

Freezing:

- **Iceland / New Zealand / Norway Approach**
- All +ve sent for freezing
- Applicable in UK & ROI Markets?
- Consumer expectation for fresh chicken?
- **Avoiding may no longer be an option?**



Processing aids

Crust freezing

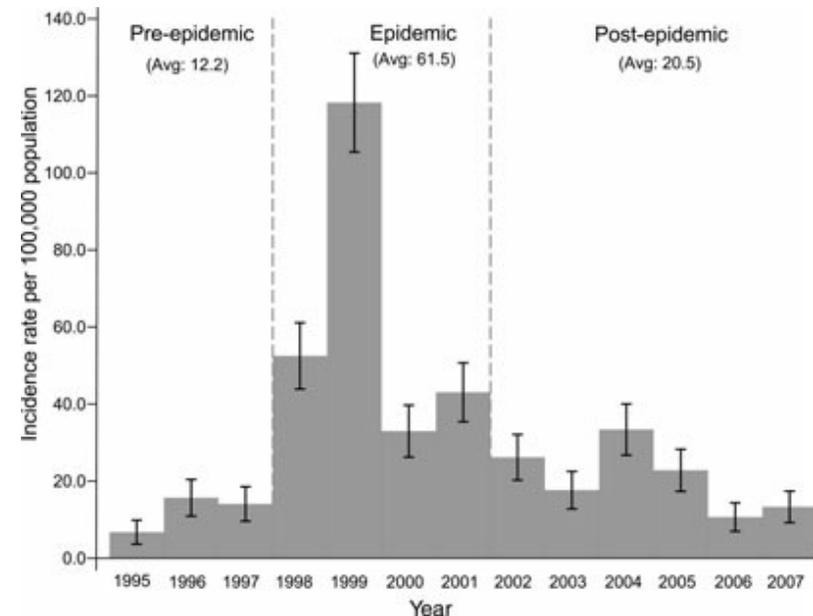
Rapid Freezing of surface / skin

Meat can still be sold as fresh

Effective reduction in Campylobacter

Consumer acceptance issues?

- Safe but blemishes on skin



Processing aids

Radiation (UV)

Very effective

Consumer acceptance ?

- Acceptable for Water

Cost?



Organic acid wash

Widespread use in USA

Acetic / Lactic Acid

Very effective “hurdle”

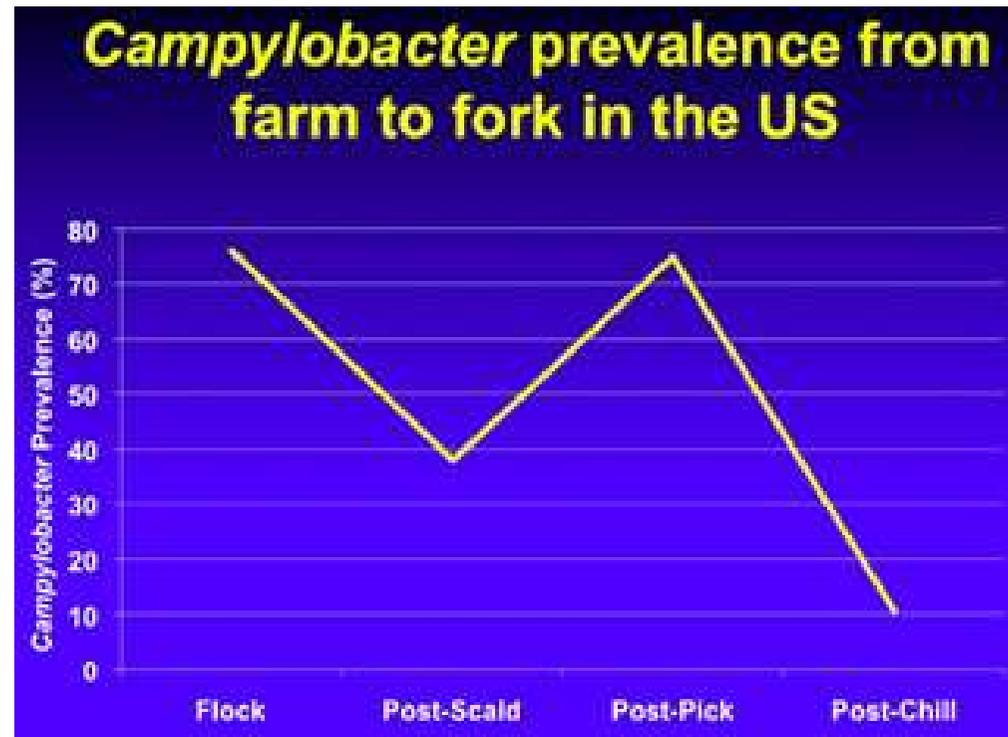
Consumer Acceptance?

Political considerations:

- Current barrier to trade
- **Brexit?**



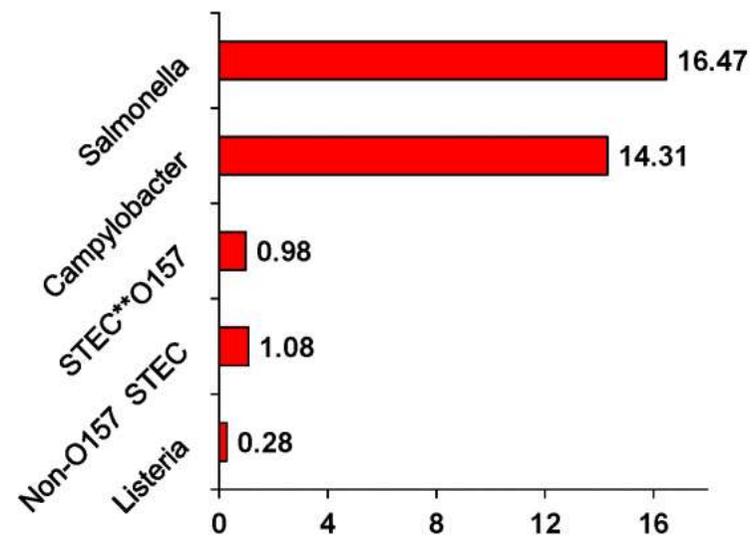
USA: Organic Acid Wash & Campylobacter



Gingerich E 2013 American Association of Avian Pathologists (AAAP) Annual Meeting.

USA: Foodnet Zoonosis Data 2011

Incidence of Foodborne Illnesses – 2011*



*Table 2b. FoodNet –Incidence of Laboratory-Confirmed Infections by Year 2011. <http://www.cdc.gov/foodnet/data/trends/tables/table2a-b.html#table-2b>. Accessed August 1, 2012.

**Shiga toxin-producing *Escherichia coli*

Processing aids

- **Sonic Steam**

Promising results as a further “hurdle”



Processing aids

Cook in the bag technologies

Partial consumer acceptance

Whole chickens only

Cost?

Is this the best we can do?



Consumer behaviour: “Irish Mammies”



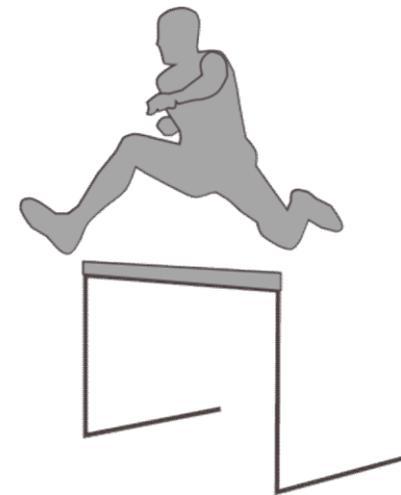
Source FSA Wales: "Don't wash your chicken" Campaign

Consumer behaviour



On Farm Measures & Processing Aids (Summary)

- Improvements will be brought about by a combination of approaches
- For on farm measures to add substantially to the solution this will require financial incentive / penalty by industry
- On farm measures associated with additional “hurdles” is current approach
- On farm measures: Biosecurity / Terminal Hygiene is key
 - What worked for Salmonella WILL NOT work for Campylobacter
 - Inherent difficulties for Irish Industry
 - Climate
 - Mixed Farms
 - Turn around times
 - **Some farms can achieve significant improvements**



Where to next:

- Legislative changes to 2073/2005 will present challenges for ROI & NI
- Improvements in source attribution techniques?
- Unlikely “Biosecurity measures at farm level” will address the of the totality of the issue
- Some very effective intervention strategies *: **Industry acceptability?**
 - Freezing
 - Thinning removal
 - Organic Acid Washes

* Industry (Processors & Retailers) / EU regulators will have to consider above

- Economic considerations for industry
- Brexit
- Industry led “Farmer League Tables”?

Summary

- Multi component solution
 - On farm measures (Biosecurity & Current Pilot Project)
 - Processing aids
 - Hurdle approach
 - Modifications at EU Level (Micro regulations)

- **Key Drivers going forward:**

Continued Media attention?

Continued focus of retailers?

Advances in Source Attribution techniques

EU Regulators

ROI Campylobacter stakeholders report due Q2 2017



Thank you for your attention



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