The acquisition of ciprofloxacin resistance in travel-associated and home-acquired *Campylobacter jejuni* infection:
a case-case comparison.

The Campylobacter Sentinel Surveillance Scheme Collaborators, UK

(I.A. Gillespie, S.J. O'Brien, J.A. Frost)
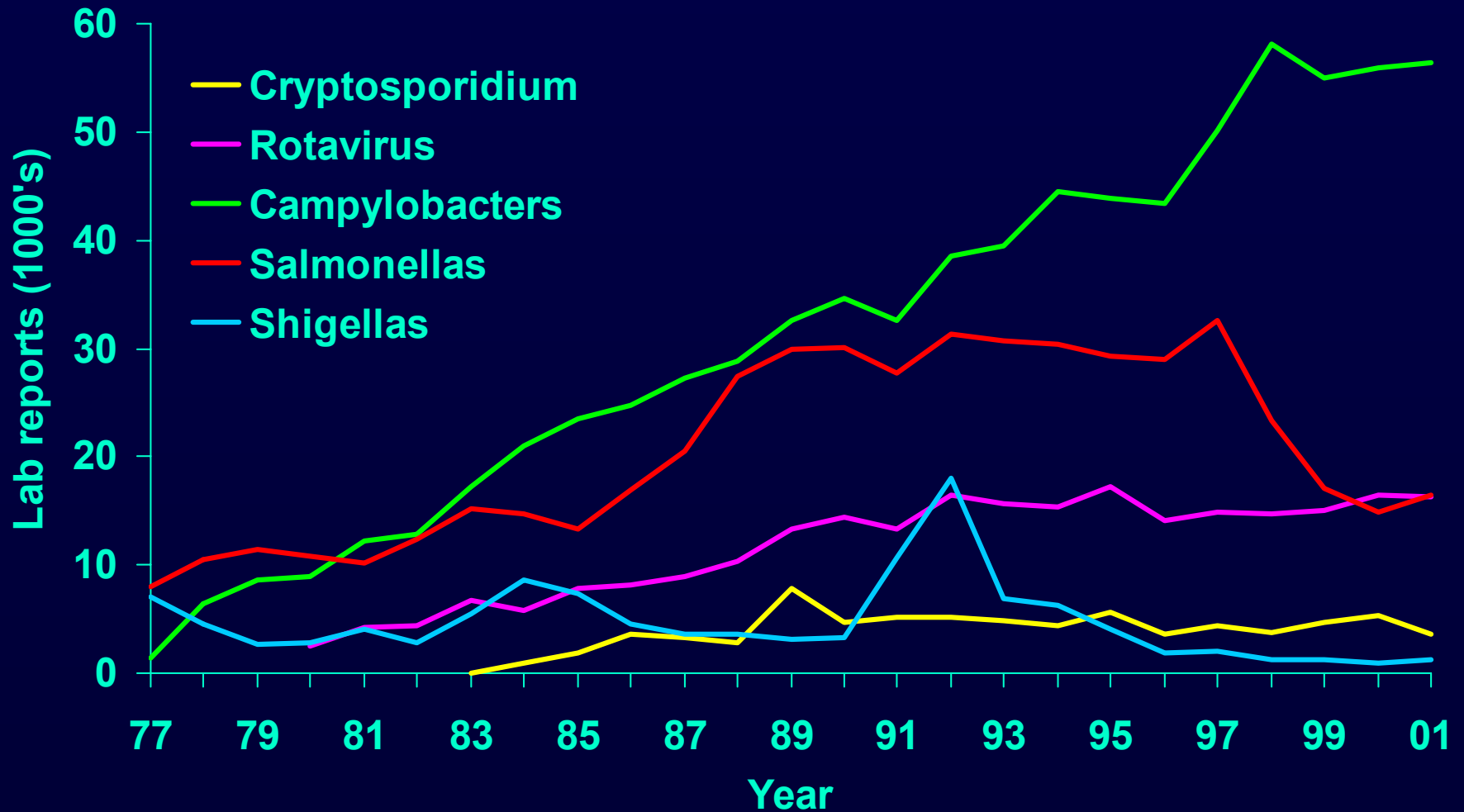
Acknowledgements

- Staff in the participating DHA's
    - Public Health
    - Environmental Health
    - Laboratory
- The Campylobacter Reference Unit
- Gastrointestinal Diseases Division, CDSC
- Dr SJ O'Brien & Mrs J Frost

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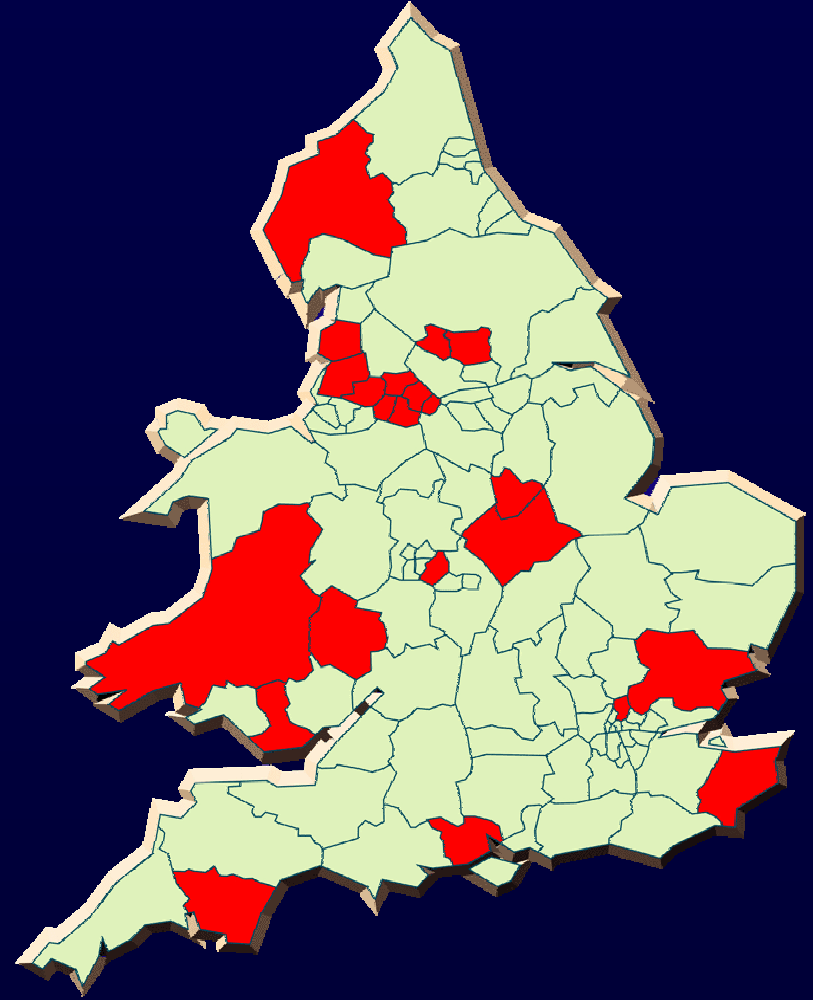Laboratory reporting of selected GI pathogens in England & Wales.

Epidemiology

- Associations with chicken

  – minority (10-40%) of cases

- Other studies show a protective effect

- Most infections remain unexplained by recognized risk factors

Campylobacter Sentinel Surveillance Scheme

- 1st May 2000

- 22 HA's

- ~12.5 million

- 15% lab. confirmed

cases

Typing

- Speciation

- Serotyping

- Phage typing

- Antibiotic resistance testing

Questionnaire

- Demographics
  - Age, sex
  - Occupation
    - SEG
- Illness
  - Symptoms
  - Length
  - Severity
- Travel
  - Abroad/home
  - Destination
  - Accommodation

- Foods
  - 20 exposures
  - Never/once/more often
  - Handling/cooking
- Milk
  - 3 exposures
- Water consumption
  - 8 exposures
- Recreational water act.
- Animal contact
- Other illness
  - Household
  - Community

Response rate ~76%

The current picture (E&W)

- Ampicillin   26%
- Chloramphenicol   3%
- Quinolones   21%
  – Ciprofloxacin   19%
  – Nalidixic acid   21%
- Aminoglycosides   2%
  – Gentamycin   0.2%
  – Kanamycin   2%
  – Neomycin   2%
- Erythromycin   1%
- Furazolidone   0.2%
- Tetracycline   30%
- Overall   51%

Aim

- Determine factors affecting the acquisition of a ciprofloxacin-resistant *C. jejuni* infection

- Generate new hypotheses for campylobacter infection

Analysis I

- 'Cases'
  - cipro resistant *C. jejuni* infection
- 'Controls'
  - *C. jejuni* sensitive to all antimicrobials
- Excluded
  - Sensitive to cipro but resistant to one other antimicrobial

Analysis II

- Single risk variable analysis   P<0.1

- Logistic regression

- Simplified

  - LR test

- Interactions

  - Main effects in initial model

  - Age, gender and season

Ciprofloxacin resistance in *C. jejuni*
638 'cases' vs. 1741 'controls'

Exposure	OR	*P* value	Lower	Upper
Summer	0.66	0.001	0.51	0.85
Travel abroad	12.79	<0.001	9.83	16.65
Baby food	0.34	0.011	0.15	0.78
Age	1.00	0.706	1.00	1.01
Sex	0.94	0.627	0.74	1.20

Risk ratios for travel abroad

- Ciprofloxacin resistance
  - 4.58 (*P*<<0.001)
- Erythromycin resistance
  - 1.99 (P>0.05)
- Clinicians need to obtain travel history prior to treatment
- Self treatment with ciprofloxacin may not work

Ciprofloxacin resistance in *C. jejuni* Acquired abroad (n=653)

Exposure	OR	*P* value	Lower	Upper
Spain (vs. others)	6.87	<0.001	3.52	13.38
Portugal (vs. others)	22.40	<0.001	4.36	114.99
Cyprus (vs. others)	11.74	0.03	1.28	108.02
Africa (vs. others)	0.11	0.019	0.02	0.70
Chicken	4.95	<0.001	2.12	11.56
Bottled water	3.70	0.001	1.69	8.10
Mains water	0.24	<0.001	0.12	0.50
Contact with a pet bird	0.11	0.009	0.02	0.58
Mains water x Africa	9.17	0.044	1.06	79.67

Controlling for age & sex

Chicken

- Enrofloxacin in veterinary medicine and animal husbandry?
  - used extensively in the broiler industry
    - 1st week to reduce vaccination problems
    - $3^{rd}/4^{th}$ week to combat respiratory illness due to *E. coli*. *(Jacobs-Reitsma, et al. 1994)*
  - Same class as cipro
    - Selection of resistance to one → cross resistance to the other *(Piddock, JAC, 1996)*

Bottled water

- No interactions
  - age group
  - Gender
  - Season
  - other variables in the initial model

- Narrow confidence intervals

- → Real effect

Bottled water

- Biologically plausible

  - Raw water can be contaminated with campy

    (Jones, et al. 1984; Bolton, et al. 1987)

  - European legislation governing the marketing of natural mineral water

    - free from parasites and pathogenic organisms

  - Testing for campylobacters is rarely undertaken

Ciprofloxacin resistance in *C. jejuni*
Home acquired (n=2783)

Exposure	OR	*P* value	Lower	Upper
Summer	0.46	<0.001	0.33	0.65
Cold meats (pre-cooked)	2.13	<0.001	1.44	3.13
Private water supplies	0.38	0.018	0.17	0.85
Age	1.00	0.925	0.99	1.01
Gender	0.87	0.521	0.56	1.35

Cold cooked meats

- Not been implicated in epidemiological studies in the past

- 3494 ready-to-eat sliced meat samples
  - 26% unsatisfactory
  - 15 (<1%) unacceptable/potential risk to public health *(Gillespie, et al. 2000)*

- Improvements could be made in the hygienic handling of meats

Cold cooked meats

- *Salmonella agona* infection assoc. precooked turkey meat *(Synnott et al CDPH, 1998)*
  - Turkey joints (3.2 to 5.2 kg) cooked for fixed periods of time
  - survival of the pathogen in undercooked larger joints
- Campy – low infective dose

Board 78. Risk Factors for Sporadic *Campylobacter* Infections in Maryland

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Background: *Campylobacter* is the leading cause of bacterial diarrhea in the United States and among CDC's Foodborne Diseases Active Surveillance Network (FoodNet) sites. Data from FoodNet show that Maryland has a remarkably low incidence of culture-confirmed *Campylobacter* infections, where it is the third reported most common cause of diarrhea. In this analysis, we sought to examine risk factors for sporadic infection in Maryland to determine if differences in exposure may explain the difference between Maryland and other FoodNet sites. **Methods:** Between March 1998 and February 1999, a *Campylobacter* case-control study was conducted in FoodNet sites (Connecticut, Georgia, Minnesota, Oregon, and selected counties in California, Maryland, and New York). A case was defined as a person with *Campylobacter* infection identified by a clinical laboratory; and

Results: Of 157 cases identified by surveillance in the Baltimore metropolitan area of Maryland, 119 were enrolled. The mean age of the cases was 35.6 years (range 2 months to 93 years); 17 (14.3%) cases were hospitalized. Cases were more likely than controls to be white ($p<0.01$), to have recently eaten in a restaurant ($p=0.01$), traveled internationally ($p=0.01$); eaten chicken luncheon meat ($p=0.03$), or ham ($p<0.01$); had contact with a puppy ($p=0.01$), dog ($p=0.03$) or cat ($p=0.02$); or visited a petting zoo ($p=0.04$). Cases were less likely than controls to have purchased ($p=0.01$), stored ($p=0.01$), or cooked ($p=0.01$) raw chicken. Cases who purchased chicken reported leakage from the package onto other items in their grocery bag more often than controls ($p<0.01$). The remainder of kitchen practices did not differ between groups. **Conclusions:** Except for the handling of raw chicken, Maryland's site-specific analysis identified similar risk factors for *Campylobacter* infection as the analysis of FoodNet-wide data, and previously published reports, suggesting that exposure to poultry and animals, eating outside the home, and international travel are risk factors for disease. The reason for the unusually low incidence of *Campylobacter* infections in Maryland remains unexplained, but

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Conclusions.

- Foreign travel remains an important risk for cipro resistance in *C. jejuni*
- The risks at home appear to differ from those abroad
  - Implications for intervention strategies
- Case-case comparisons useful for generating hypotheses for infection
- These can be tested analytically & microbiologically.

Don't drink the water!