FOOD SAFETY ADVISORY COMMITTEE

Food Borne Campylobacter Enteritis

Report to the
Minister for Health
and the
Minister for Agriculture and Food

REPORT NO. 9
December 1991

FOOD-BORNE CAMPYLOBACTER ENTERITIS

INTRODUCTION

The importance of *Campylobacter* species as a major cause of food borne enteritis has been recognised only in the last decade or so. In 1988 the number of reported *Campylobacter* infections in man in England, Wales and Northern Ireland was 28,714 and now exceeds the number of reported *Salmonella* infections in these (Fig. 1) and other countries . Among people with acute enteritis who reported to a single general practice in England the projected annual rate of *Camylobacter* infection was 1100/100,000. In 1990 sixty three isolates of *Campylobacter jejuni* were reported to the Laboratory Surveillance System by other laboratories in the Dublin area. The number of isolates was greatest in April and May and in males. It is noteworthy that 50% of isolates were from children under five years of age.

In relation to foodborne disease the two important species of *Campylobacter* are *C. jejuni* and *C. coli*. *C. jejuni* may be subdivided into biotypes 1 and 2. These spp will not grow at temperatures less than 28°C and they grow quickly at between 42° and 43°C. Thus they do not normally grow in food. They are sensitive to drying and while they may survive in frozen poultry for months both freezing and refrigeration will reduce their numbers. They commonly are present in nature as commensals or pathogens in animals and as free living forms in the environment. Introduced *Campylobacter* may persist several weeks in cold water.

The isolation of *Campylobacter* species which are associated with foodborne disease require

(a) selective media containing, for example, antimicrobial agents,
(b) a temperature of 42°C and
(c) reduced redox potential.

Much of the increase in reported cases of *Campylobacter* infections is due to the development of accurate laboratory tests which incorporate the above mentioned requirements for isolation and these are becoming more widely available.

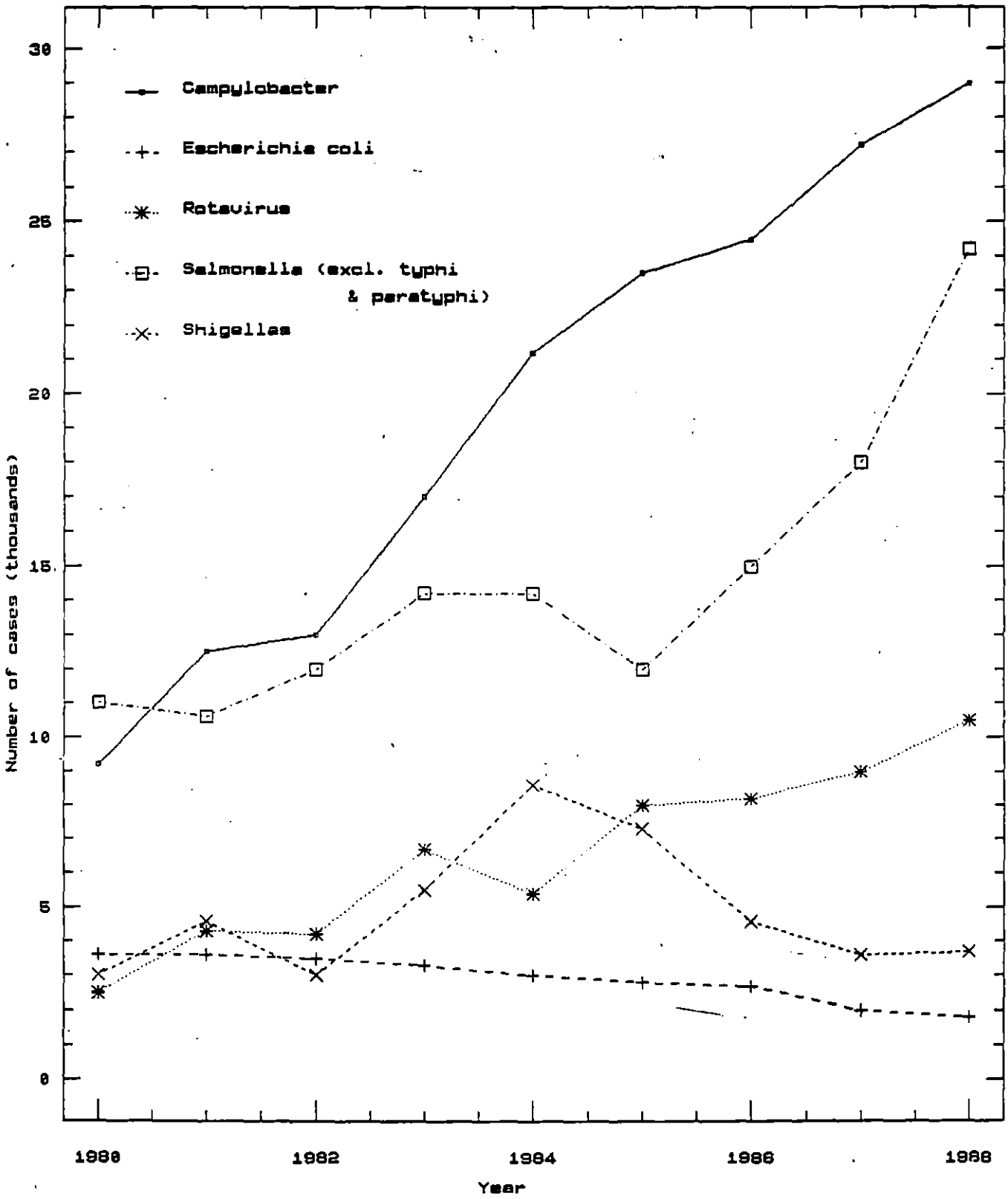
Epidemiological factors

The minimum infective dose is low: 500 colony forming units can initiate illness. The mean incubation period ranges from 2 to 6 days. Symptoms include fever, cramping abdominal pain and diarrhoea which is initially watery but later contains blood and mucus. Diarrhoea usually lasts 2-5 days and more rarely up to 3 to 4 weeks. Abdominal pain is a frequent symptom and may occur without diarrhoea and be

FIG. 1.

Gastrointestinal infection in man

England, Wales and N. Ireland



Adapted from Communicable Disease Report Weekly Edition 88/52

mistaken for appendicitis. Occasionally serious complications may also be present such as septicaemia and arthritis. Most cases are of a sporadic nature reaching a peak in early summer and being most common in young adults.

C. jejuni survives better in food at refrigeration temperature than at room temperature. At room temperature the organisms are rapidly inactivated. Pasteurization (62.8°C for 30 min. or 71.7°C for 15 sec.) will free milk of even unusually large numbers of *C. jejuni*. Few if any of these pathogens will survive in beef that is heated to and kept at 60°C for several minutes. Poultry meat heated to and held at 60°C for 10 minutes should free meat of even unusually large numbers of viable *C. jejuni*.

As regards resistance of *C. jejuni* to salt there is evidence to show that as the temperature decreases from the organism's optimum temperature for growth to refrigeration temperature the pathogens become increasingly tolerant of concentrations of salt.

In sporadic cases the source and mode of spread are not known. Human cases are rarely a source of infection. Spread from handling domestic pets and other animals with diarrhoea is occasionally reported.

In the UK the cost of *Campylobacter enteritis* has been calculated and the results are presented in Table 1 on page 4.

TABLE 1

Costs of *Campylobacter enteritis* based on 53 cases

	Cost per case (£)	Cost per year (£)*
Public sector costs	135	4.1m
Social costs	138	4.1m
Pain and suffering	314	9.4m
TOTAL	587	17.6m

*Based on 30,000 confirmed cases per year.

TABLE 2

The prevalence of *Campylobacters* from the poultry carcasses and poultrymeat products examined at the retail level*

Type of product	% positive	Counts (log_{10}) (CFU/g)	References
Chicken parts (f)	2.0	N.S.	Smith et al. (1974)
Whole carcass (f)	85.7	N.S.	Svedhem et al. (1981b)
Chicken wings (c)	82.9	2.00 - 4.00	Kinde et al. (1983)
Chicken parts (c)	64.0	N.S.	Rayes et al. (1983)
Chicken parts (f)	56.0	N.S.	Rayes et al. (1983)
Carcasses (f)	4.2	N.S.	Hood et al. (1988)
Fresh carcasses	48.0	6.18	Hood et al. (1988)
Uneviscerated carcasses	100.0	7.38	Hood et al. (1988)

(f) = frozen (c) = chilled N.S. = not specified

* Kazwala, R.R. (1988) MVM theses. National University of Ireland.

Foodborne disease

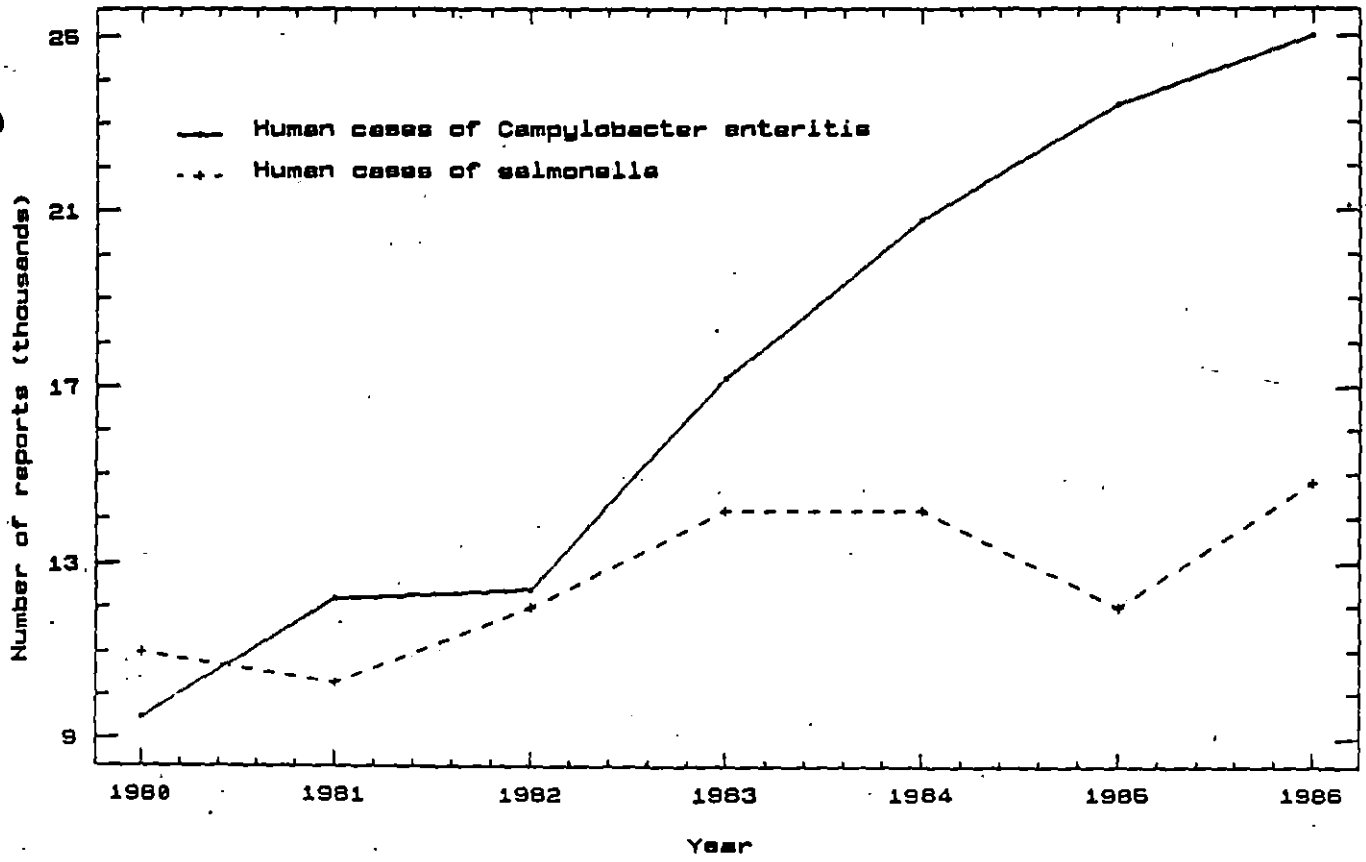
Milkborne outbreaks of *Campylobacter enteritis* can be small or large: one outbreak involved about 3,500 people. The incriminated milk is usually raw. However, some of the largest outbreaks have arisen from milk that was thought or was intended to be pasteurized. In nearly all instances the plant was faulty or the milk was not in fact pasteurized. The organism usually enters milk by faecal contamination. In most herds 10-50% of cows excrete *C. jejuni*. More rarely milk may be infected from cows with mastitis caused by *C. jejuni*. Contamination can also occur after pasteurization. *Campylobacter* infection has been linked to the consumption of milk from bottles which had their caps attacked by birds.

Campylobacters have almost become part of the normal gut in poultry and present slaughterhouse practices cannot guarantee a Campylobacter free finished product. Poultry differ from other animals in that the skin of poultry is not normally removed during processing. The skin comes into contact with equipment and this allows cross-contamination to occur.

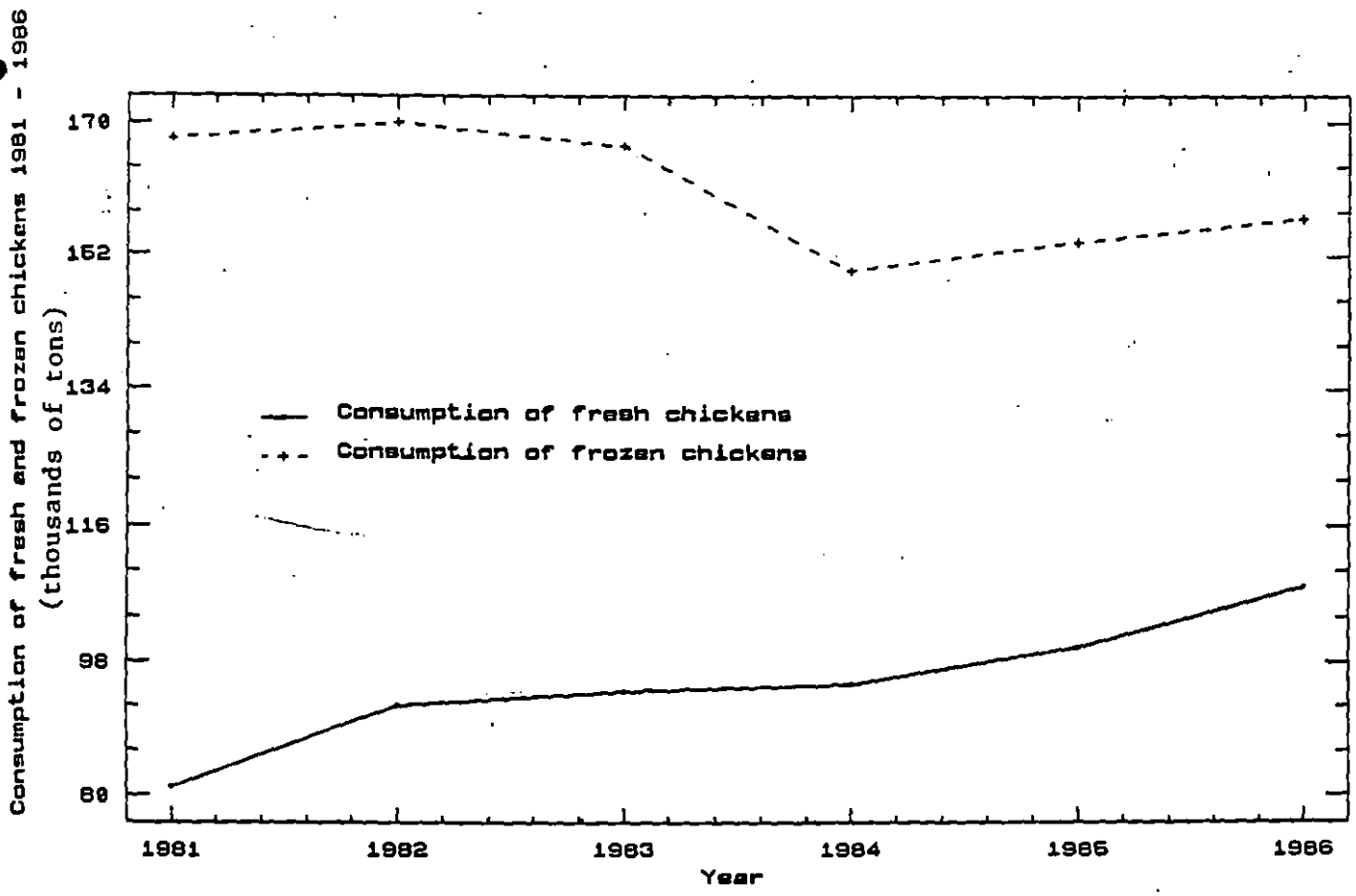
Commercially reared **poultry** are commonly carriers of thermophilic *Campylobacter*. In Ireland 92% of flocks were reported to be positive in one survey and in another 63% of 115 samples collected from a broiler processing plant were also positive. It has been postulated that the increase in *Campylobacter enteritis* cases is associated with the rising consumption of fresh chickens (Fig. 2) and that poultry are very important vectors of this infection (Table 2). However, conditions which would allow this pathogen to multiply in the environment or foodstuff such as a reduced redox potential and an ambient temperature in the range 30-45°C are not often present. Nevertheless because a small number of organisms can cause disease, cross contamination between infected raw poultry meat and foods that are eaten unccoked is considered important in the spread of this pathogen. Faeces from infected poultry may also contaminate the surface of eggs.

In **red meats** *C. jejuni* is most commonly associated with pigs carcases (38 to 59%) and rarely with freshly slaughtered beef. In addition, it appears from studies on meat at the point of retail sale that red meat is considerably less commonly infected than poultry meat.

FIG. 2.



Gastrointestinal infections in man 1980.- 1986



Consumption of fresh and frozen chickens 1981 - 1986

Adapted from Hood et al. (1988). Epidemiology and Infection 100 : 17-25

Water has not only been indirectly associated with outbreaks of *Campylobacter* infection involving shellfish but also with outbreaks of *Campylobacter* infections which have been traced to drinking infected water. Some of the single outbreaks have affected nearly 3000 people. A pure culture of *C. jejuni* inoculated into unchlorinated water and kept at 4°C will remain viable for weeks.

Campylobacter enteritis when caused by contaminated food is statutorily notifiable on suspicion as food poisoning in England, Wales and N. Ireland but not in Scotland or in the Republic of Ireland. It may be reported in the Republic under the heading "Other food poisoning organisms".

PREVENTION

At present the sources or modes of transmission of most infections are unknown. The consumption of raw milk, untreated water, raw or undercooked poultry are well documented sources of *Campylobacter*. However, these sources account for only a small proportion of infections. Cross contamination from poultry carcases to cooked food or foods to be eaten raw is the most likely factor in transmission. Against this background the control measures which follow were prepared.

It is recommended that greater emphasis be given to the reporting of laboratory isolations and clinical cases of *Campylobacter enteritis* to the Department of Health.

CONTROL MEASURES FOR CAMPYLOBACTER HUMAN INFECTION FROM FOOD AND WATER
(Guidelines adapted from Pearson and Skirrow 1985)

Source	Risk factor	Prevention
Milk from faecal contamination and rarely, mastitis.	1 Raw milk	Ban retail sale of unpasteurized milk.
	2 Pasteurization Failures: misuse or failure of equipment; failure of power supply or transport, e.g. snowbound	Adequate instruction of dairymen,
	3 Bird attack on milk bottles	Protect caps of bottles on doorsteps.
Water	4 Contaminated water supplies	Maintain system/cover header tanks; identify heavily polluted areas, e.g. discourage swimming off sewage outfalls and marinas; educate public to boil or disinfect suspect drinking water,
	5 Swimming in or immersion in polluted water	
	6 Drinking stream/lake water	
	7 Non-chlorinated supplies/wells	
Poultry surface contamination by chicken/contamination of kitchen knives/hand contamination of the food handler	8 Contamination of cold meats	Educate chefs and housewives to the specific risks of chicken as a means of contaminating uncooked foods, salads, etc; identify this activity as high risk,
	9 Contamination of salads	
	10 Contamination of uncooked mushrooms	
	11 Contamination of any uncooked food	
	12 Degutting a chicken	
	13 Wiping knives on kitchen cloth	

Poultry inadequate cooking	14 Barbecues and fondues 15 Survival courses and camping orienteering 16 Inexperienced cooks, eg young people, students. etc.	Increase public awareness to specific activities; target education on at risk group (15–40 years) and during summer months,
Fast food retail outlets	17 Hamburger/chicken off-street sales 18 Kebabs and salad	Clean surfaces regularly; maintain equipment; ensure minimum cooking time and the separation of raw meats from cooked or raw foods,
Seafoods	19 Clams and possibly other shellfish	Cook if from doubtful source,

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