FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

E

Agenda Item 4.2 a)

GF/CRD Iceland-1

ORIGINAL LANGUAGE

FAO/WHO GLOBAL FORUM OF FOOD SAFETY REGULATORS

Marrakech, Morocco, 28 – 30 January 2002

HUMAN CAMPYLOBACTERIOSIS EPIDEMIC IN ICELAND 1998-2000 AND EFFECT OF INTERVENTIONS AIMED AT POULTRY AND HUMANS

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CONFERENCE ROOM DOCUMENT PROPOSED BY ICELAND

SUMMARY

The incidence of human campylobacteriosis in Iceland reached epidemic proportions between June 1998 and March 2000. The epidemic was almost exclusively due to an increase in domestically acquired infections, mostly traced to the consumption of fresh chicken. Prior to 1996 it was only permitted to sell frozen poultry in food stores, but with the change of regulations fresh poultry was allowed and sales increased significantly. Interventions consisting of an educational programme for farmers, an extensive surveillance programme for *Campylobacter* in poultry, freezing all known *Campylobacter*-positive broiler flocks before they go to retail and extensive consumers education were implemented in the beginning of 2000. These measures have resulted in a reduction of domestic and total number of cases of campylobacteriosis between 1999 and 2001.

INTRODUCTION

The incidence of human campylobacteriosis in Iceland reached epidemic proportions between June 1998 and March 2000 (Figs. 1 & 2). Between 1990-1995 the average incidence rate was 14.6 cases/100.000/year. Then it started to increase with 33.1, 34.7, 80.4 and 157 cases/100.000 for 1996, 1997, 1998 and 1999 respectively. In 2000 the incidence fell to 87.1 cases/100.000 and in 2001 the incidence was 75.4 cases/100.000. The incidence of human campylobacteriosis in Iceland is now at similar levels as in other European countries (Fig. 3).

The epidemic was almost exclusively due to an increase in domestically acquired infections, mostly traced to the consumption of fresh chicken. Prior to 1996 only frozen poultry meat was permitted to be sold in food stores, but with the change of regulations fresh poultry was allowed and sales increased significantly. The estimated proportion of fresh chicken compared to frozen chicken sold for the years 1996 - 2000 were <5%, 20%, 40%, 60% and 60% respectively. The overall consumption of chicken increased from 6.6 kg per capita in 1996 to 10.6 kg in 2000. Since 1986, several studies have shown that Icelandic chickens have been contaminated with *Campylobacter* spp. A summary of these studies is given in our report to the Minister of Environment in November 1999: "*Campylobacter* infections. The distribution of *Campylobacter* in the environment, farm animals and food, causes of infections in humans and proposed interventions." (can be found in Icelandic at http://www.hollver.is).

Figure 1

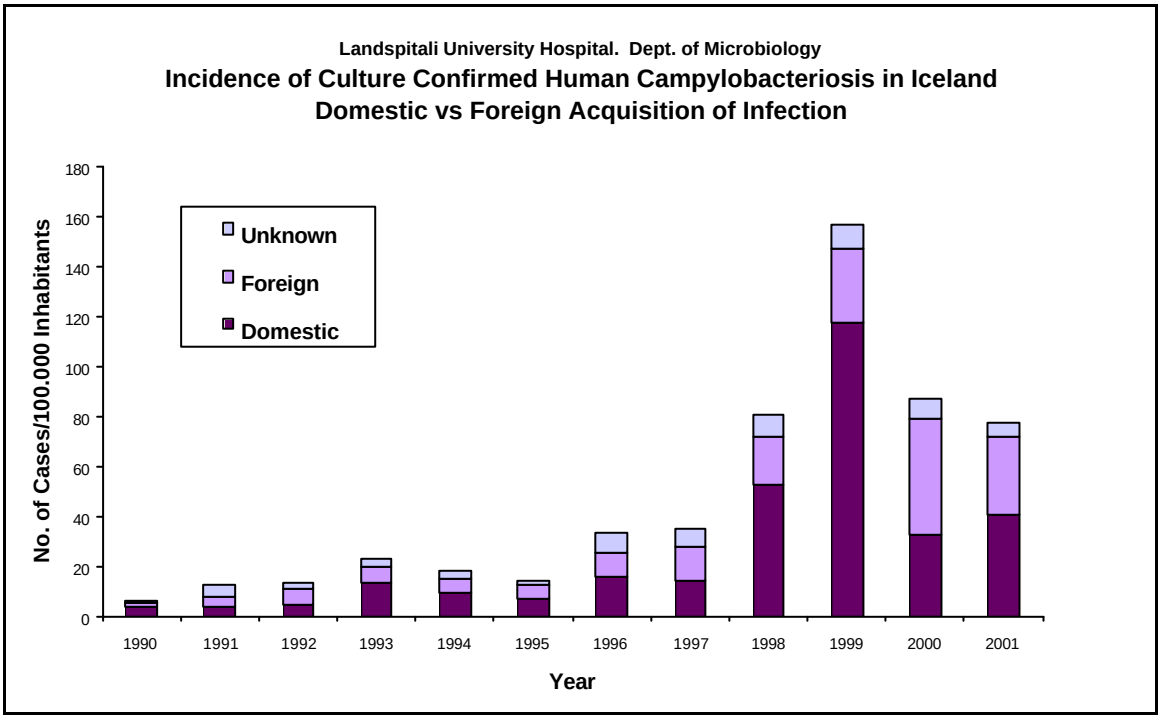


Figure 2

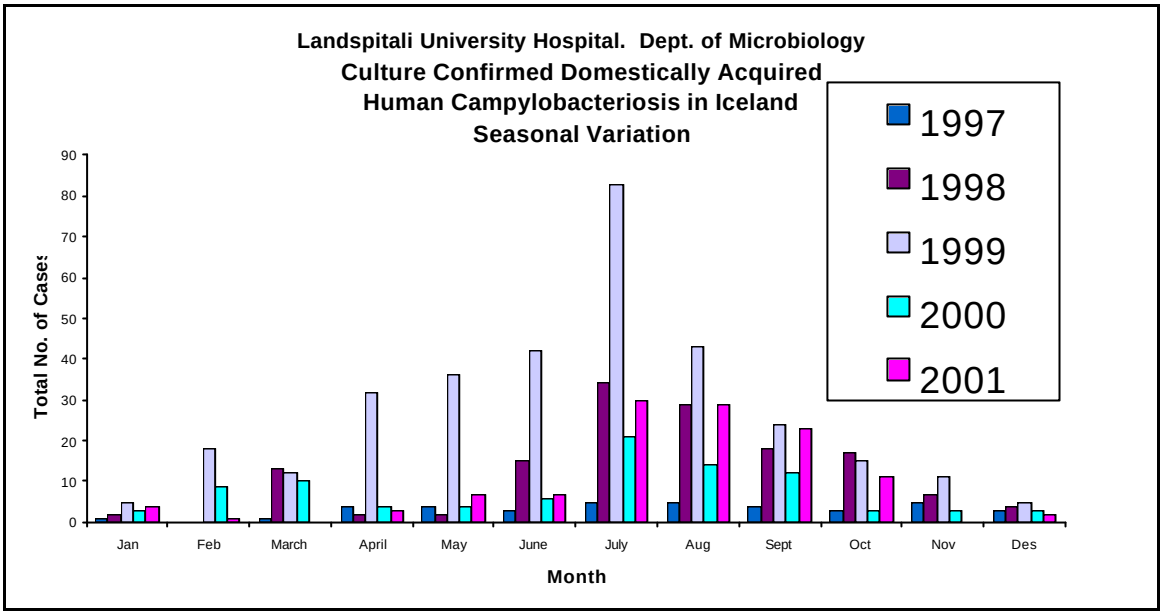
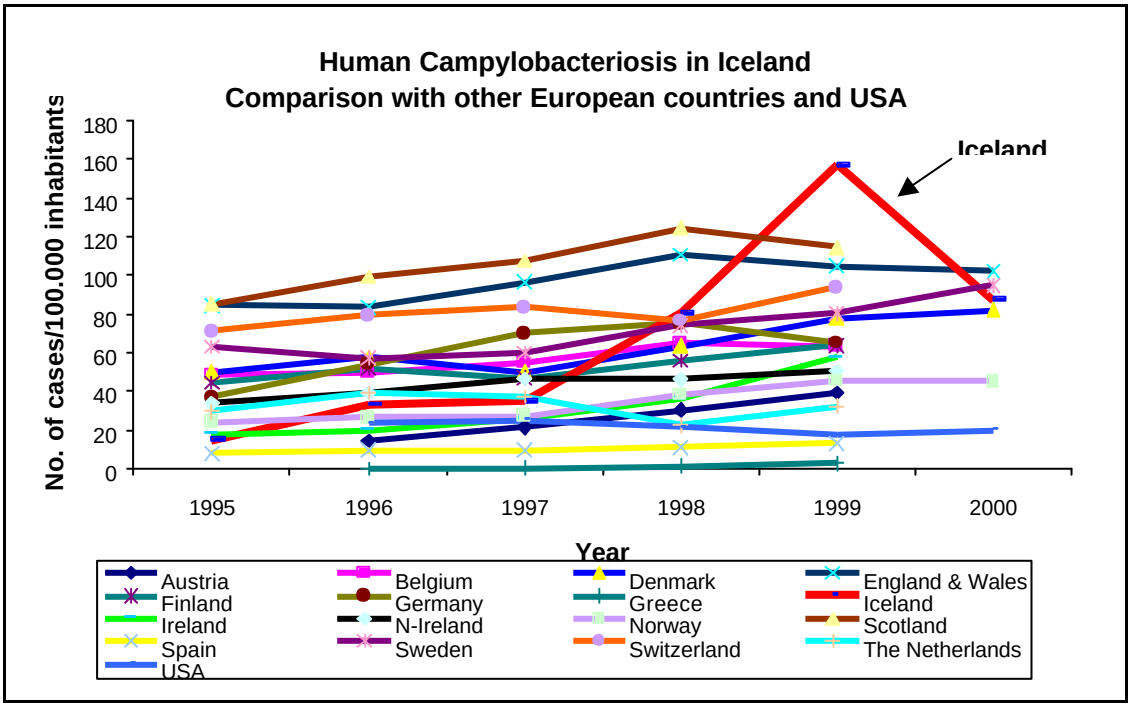


Figure 3



INTERVENTIONS

A) Poultry: In August 1999 an educational programme was launched for farmers on how to produce *Campylobacter*-free chicken, based on the guidelines given by Eva Berndtson in her PhD thesis "*Campylobacter* in Broiler Chickens" (1996). Poultry veterinarians visited each farm and advised on how to improve biosecurity. Changes and repairs to broiler houses were recommended to make the buildings pest-proof. Equipment for UV-treatment of drinking water was recommended on farms with insufficient water supplies. Seminars and courses were held to teach farmers how to reach the overall goal to produce *Campylobacter*-free chickens. In the beginning of year 2000 an extensive surveillance programme for *Campylobacter* in poultry was established by legislation. Broilers were tested when four

weeks old, on arrival to the slaughterhouse and again following processing. The surveillance programme also included testing of other poultry prior to and at slaughtering. The results of these tests prompted changes in catching routines (including improvements in washing and disinfection of catching crates) and in the order of processing. Partial slaughtering of broiler flocks should be avoided because of the high risk of introducing *Campylobacter* to the remaining birds. From January 2000 all known *Campylobacter*-positive broiler flocks were required to be frozen before going to retail. From May 2000 an agreement was made with the farmers to freeze the following two broiler flocks reared in a broiler house which had previously housed a *Campylobacter*-positive flock. The intention was to put pressure on making improvements in biosecurity. As an economical impact for the workers on the farms, an extra bonus was paid monthly if they produced *Campylobacter*-free chickens.

The surveillance programme in the poultry production demonstrated:

- High risk of introducing *Campylobacter* into a broiler house from crates during the first catching when partial slaughtering is practiced.
- Insufficient cleaning, disinfection and drying of the crates before reuse.
- A high degree of cross-contamination in the slaughterhouse if a *Campylobacter*-positive poultry flock was processed prior to a *Campylobacter*-negative flock.
- *Campylobacter* found not only in broilers, but also most other poultry

Actions taken in light of the results from the surveillance programme:

- Partial slaughtering avoided.
- Cleaning, disinfection and drying of catching crates improved.
- Freezing of all known *Campylobacter*-positive broiler flocks and the two following flocks reared in the same broiler house.
- The order of poultry processing should be the following:
  - First priority: *Campylobacter*-negative broilers
  - Second priority: *Campylobacter*-negative broilers scheduled for freezing because of former positive flocks
  - Third priority: *Campylobacter*-positive broilers and other poultry

More than 95% reduction in the numbers of *Campylobacter* on naturally infected broiler carcasses by freezing has been demonstrated (Georgsson, F. et al, unpubl., Table 1).

Sample lot	Mean $\log_{10}$ CFU/ per 1000 g chicken (n = 10 samples) Carcasses rinsed with 225 ml BPW		
	Before freezing (x ± sd)	After freezing (y ± sd)	Reduction (x – y)
1	4.96 ± 0.49	3.13 ± 0.46	1.83
2	4.76 ± 0.45	3.19 ± 0.51	1.57
3	5.63 ± 0.85	3.72 ± 0.26	1.91
4	6.07 ± 0.69	3.20 ± 0.31	2.87

Table 1. Effect of freezing and frozen storage at – 20°C for 30 days on *Campylobacter* in naturally contaminated broilers.

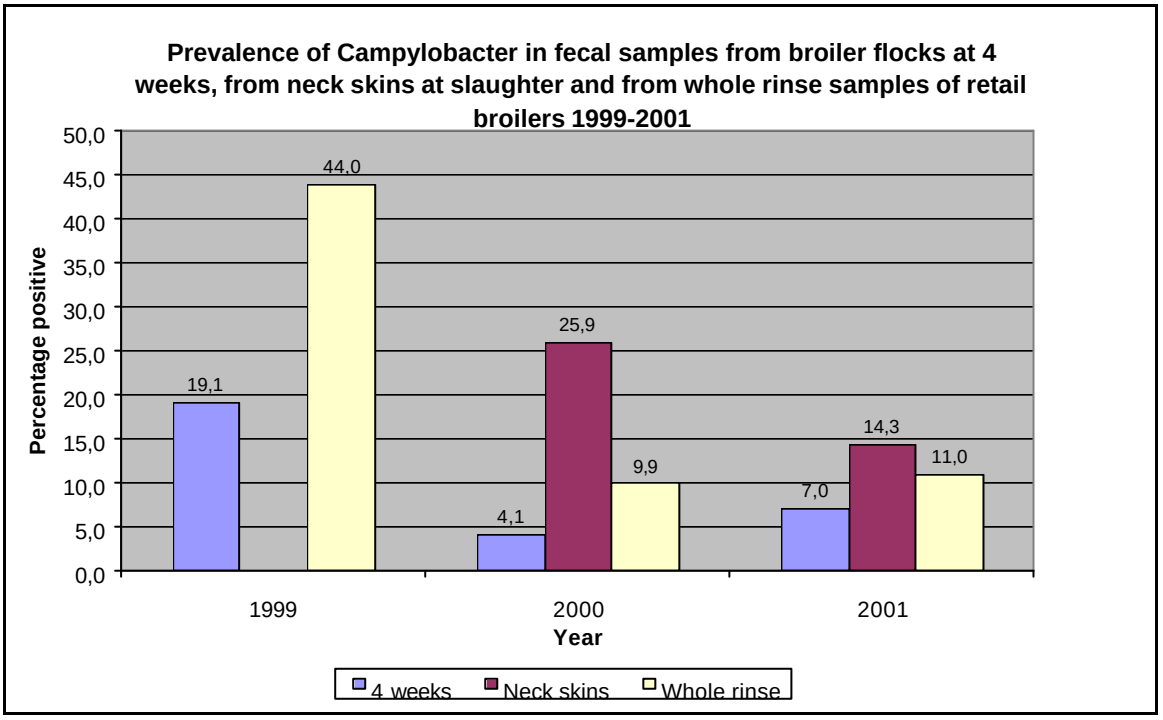
B) Consumers: Consumer education was in the form of full-page advertisements in newspapers, newsflashes and interviews with professionals in newspapers, television and radio and the distribution of a pamphlet on food-borne bacteria to all households in the country. A close co-operation was

established between the Directorate of Health, Chief Veterinary Office and the Environmental and Food Agency in Iceland for implementing an action plan to reduce the contamination of *Campylobacter* in the chicken breeding and slaughter. This action plan became effective in the beginning of 2000. The estimated cost of the Icelandic society due to preventable human campylobacteriosis was in the range of 100-200 million ISK. (≈ 1-2 million US$) for the year 1999 (estimated total cost 160-320 million ISK.) as compared to 50-100 million ISK. (≈ 0,5-1 million US$) for the year 1998 (estimated total cost 80-160 million ISK.).

RESULTS

Interventions in broiler houses and at slaughtering were highly effective in reducing the proportion of *Campylobacter*-positive chicken. A comparison between the number of cases of domestic human campylobacteriosis and the number of fresh *Campylobacter*-positive chickens on the market demonstrates a good correlation between the two. As a result of the interventions in broiler houses and at slaughtering the percentage of fresh *Campylobacter*-positive poultry found in market surveys diminished significantly between 1999 and 2001 (Fig. 4).

Figure 4



In 2000 there were 92 domestic cases of human campylobacteriosis (245 total) as compared to 326 (435 total) in 1999. This equals a reduction of 72% in domestic and 43.7% in total no. of cases. In 2001 there were 117 domestic cases of human campylobacteriosis (211 total) thereof 82 cases in July, August and September (Fig. 2). This coincided with an increased incidence of *Campylobacter*-positive flocks at slaughtering and consequently an increase in fresh *Campylobacter*-positive poultry reaching the market.

Questionnaires used for confirmed human campylobacteriosis cases of domestic origin suggest a difference in possible sources of infections from the beginning of 2000 to the end of the year (from poultry to domestic traveling, drinking surface water etc.).

CONCLUSION

An epidemic of domestically acquired human campylobacteriosis in Iceland in 1998 and 1999 was controlled by interventions focusing mainly on eradicating *Campylobacter* from poultry meat, reduction of contamination levels by freezing poultry meat and educating the general consumers.