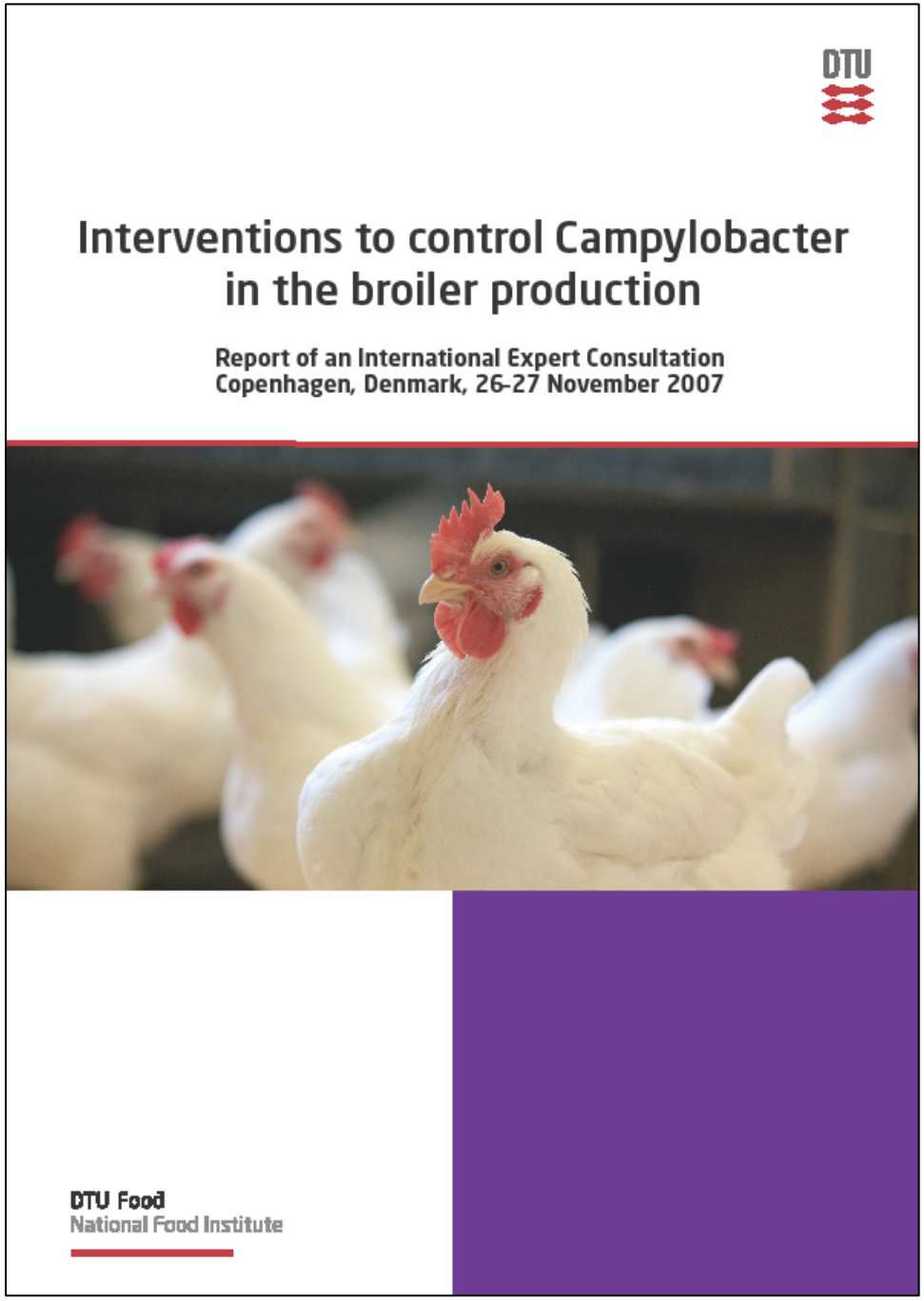
Measures to control Campylobacter in broilers and broiler meat

DTU Food
National Food Institute



DTU

Report of Expert Consultation

www.vet.dtu.dk/Default.aspx?ID=8561

Talk outline

- Recommendations from an Expert Consultation on interventions to control Campylobacter in the broiler production
  - pre-slaughter measures
  - at-slaughter measures
  - post-slaughter measures
- Experiences from EU countries which have implemented interventions
  - implemented interventions
  - changes in prevalence of broiler flocks
  - changes in number of human cases
- Conclusions

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Aim of expert consultation

- to provide information and recommendations on the most useful interventions in the broiler production for reducing the human exposure to *Campylobacter*

- to facilitate and guide the decision-making for a new Danish five-year action plan for *Campylobacter* in broilers and broiler meat

Experts were asked

- To identify and discuss the pros and cons of different intervention methods, before, at and post slaughter
- To evaluate interventions in terms of effect, cost, applicability, and consumer acceptability
- To prioritise and evaluate the interventions they believed to be most useful under Danish conditions

The conclusions of the expert consultation are, therefore, not necessarily applicable in other countries where the *Campylobacter* prevalence in broilers is different to that of Danish broilers or where different legislation applies, e.g. legislation on the use of chemical decontaminants.

Interventions before slaughter

- Two categories relating to **mechanism**

  1. Interventions aimed at preventing flocks from being colonized

  2. Interventions aimed at reducing the concentration of Campylobacter in the broiler chicken gut after colonization

Interventions before slaughter

Intervention	Prevents colonization of flocks	Reduces concentration in gut	Ready to implement	Needs further development
Biosecurity				
Farm/farmer hygiene	+	-	+	-
Environment around broiler houses	+	-	+	-
Insect control (fly screens)	+	-	(+)	+
Slaughter broilers young	+	-	+	-
Thinning	+	-	+	-
Drinking water / feed additives Organic acid, bacteria, caprylic acid, probiotics, fatty acids, …	+/-	+	+/-	+
Phage therapy	-	+	-	+
Bacteriocins	-	+	-	+
Vaccination	+	-	-	+
Genetic resistance -broiler breeds able to clear campy	+	-	-	+
Water supply quality (chlorinated, UV)	+	-	+	-
Reduced presence of other animals	+	-	+	-

Interventions before slaughter - given a high score

Intervention	Pros ☺	Cons ☹
Biosecurity		
Farm/farmer hygiene	Applicable, efficient,	Consistent compliance?
Environment around broiler houses	low costs	No guarantee of free flocks
Insect control (fly screens)	Good effect – if other biosecurity measures are in place, relatively low costs	Not commercially available
Slaughter broilers young (31-33 days)	Applicable Effective in Iceland	Relatively costly Not always possible if a special size is required
Thinning – hygiene precautions by catchers	Production more profitable Possibility of different bird sizes	Difficult to thin without causing breach of biosecurity

Interventions before slaughter - given a low score

Intervention	Pros ☺	Cons ☹
Drinking water / feed additives Organic acid, bacteria, caprylic acid, probiotics, fatty acids, …	Easy to apply Relatively cheap	No clear indication that these work efficiently May need legal changes Needs further investigation
Phage therapy	Documented effect	Reduction of Campylobacter may be short lived – development of resistance Needs further development
Bacteriocins	Documented effect under experimental conditions	Needs legal changes Needs further investigation
Vaccination	Could be good	Needs investigation
Genetic resistance – broiler breeds able to clear campy	Could be good	Needs investigation
Water supply quality (chlorinated, UV)	Documented effect	Difficult to maintain
Reduced presence of other animals	Evidence that it is a risk factor	Difficult to change on current farms, but relevant in relation to location and design of new farms

Interventions before slaughter - prioritized interventions

- Biosecurity measures in and around farms
- Fly screens
- Improved procedures re thinning of flocks

Biosecurity – farm / farmer hygiene

Ante-room

Empty period, proper cleaning

Biosecurity – environment around broiler houses

Vegetation free zone

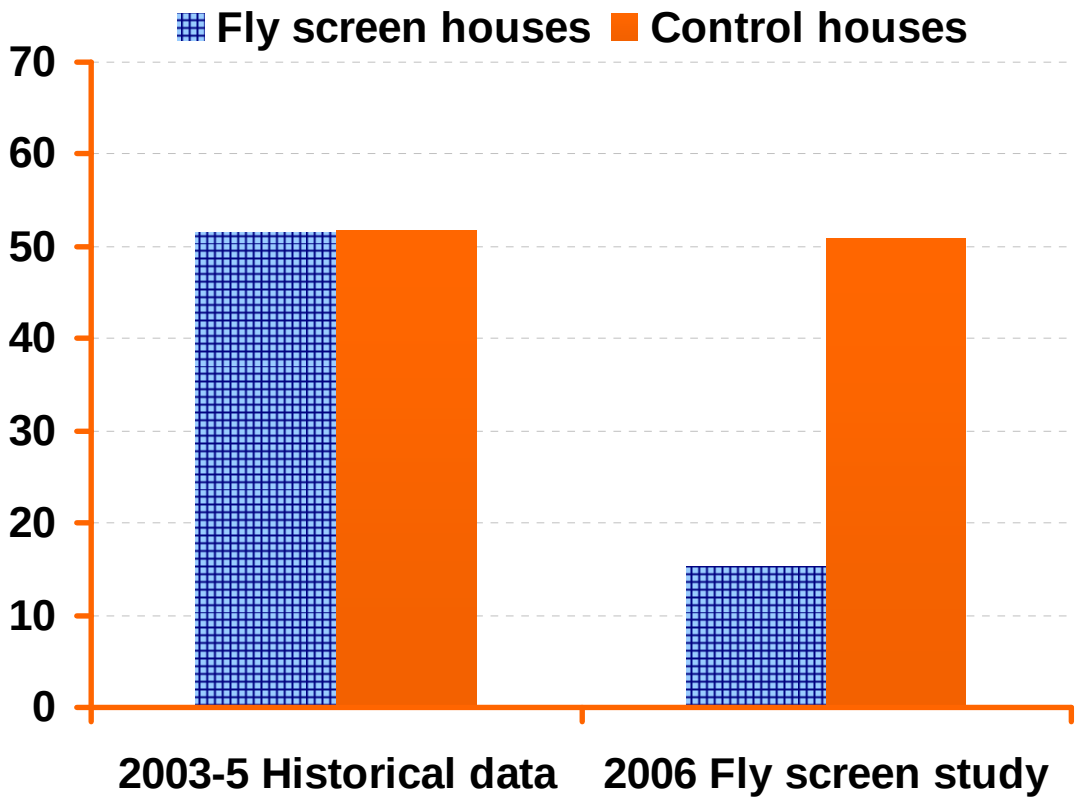
Drained zone

Dust free zone

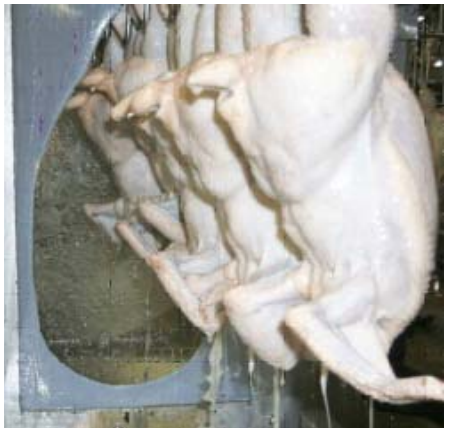
Biosecurity – insect control, fly screens

% *Campylobacter* positive flocks at slaughter June - November 2003-5 and 2006

Hald et al. 2007



Interventions at slaughter



- Two categories:

1. **Hygienic measures** - interventions aimed at reducing fecal contamination (GMP)

2. **Decontamination** - interventions aimed at reducing the concentration on carcasses
   - **Chemical** (acidified sodium chlorite, chlorine, chlorine dioxide, trisodium phosphate, cetylpyridinium chloride, ozone, and peroxy acids)
   - **Physical** (freezing, crust freezing, steam-ultrasound, steam/hot water, forced air chilling, heat treatment, irradiation)

Interventions at and after slaughter - given a high score

Intervention	Pros ☺	Cons ☹
Scheduled slaughter followed by decontamination of positive flocks or production of safe to handle products (e.g. oven-ready or ready-to-eat)	Proven effect May be based on past performance to limit testing Production of safe to handle products may be cheap	Pre-slaughter testing, expensive, needs a low prevalence Needs a marked
Physical decontamination that leaves the meat fresh		
Steam-ultrasound	Fairly effective, relatively low costs	New equipment Needs further development
Crust freezing	Limited effect, may be combined with other methods	Relatively expensive
Forced air chilling	Limited effect, may be combined with other methods	Relatively expensive
Steam or hot water	Fairly effective	Difficult to achieve success i.e. reduction while still maintaining product quality
Marinating – low pH together with food ingredients	May be effective and cheap	Only for a limited production – needs a marked More research needed

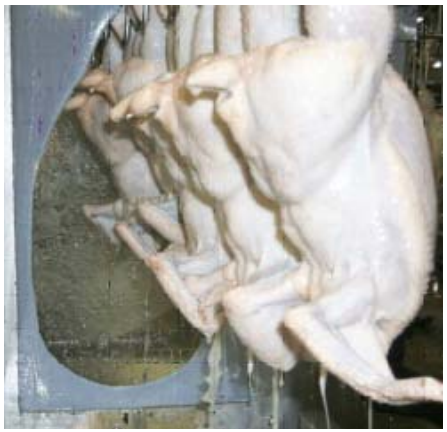
Interventions at and after slaughter - given a low score

Intervention	Pros ☺	Cons ☹
Prevention of fecal leakage	May be effective (CARMA)	No equipment developed
Chemical decontamination of all carcasses	Effective, relatively cheap	Needs consumer acceptance Substances needs approval and authorization
Physical decontamination of all positive flocks Freezing Heat-treatment	Effective	Not fresh meat, expensive Risk of marked distortion (opening to imports)
Name and shame - publicity exposing producers and companies, who produce/sell highly contaminated products	Used in DK (case-by-case risk assessment), seems fairly effective Transparency	Expensive – many batches controlled
Consumer information –– labeling about Campy Information on hygiene	Cheap Relatively cheap	Efficacy uncertain Effect minimal
Logistic slaughter – to avoid contamination from positive to negative flocks	Incentive for the industry to do something	Minimal effect, not feasible, expensive
Physical decontamination Irradiation	Very effective	Strong consumer resistance Expensive

Interventions at and after slaughter - prioritized interventions

- Channeling of flocks based on Campy history of producers to
  1. decontamination by methods that keep the meat fresh, chilled
  2. Safe to handle products

- Education, especially of children



Implemented interventions in EU countries

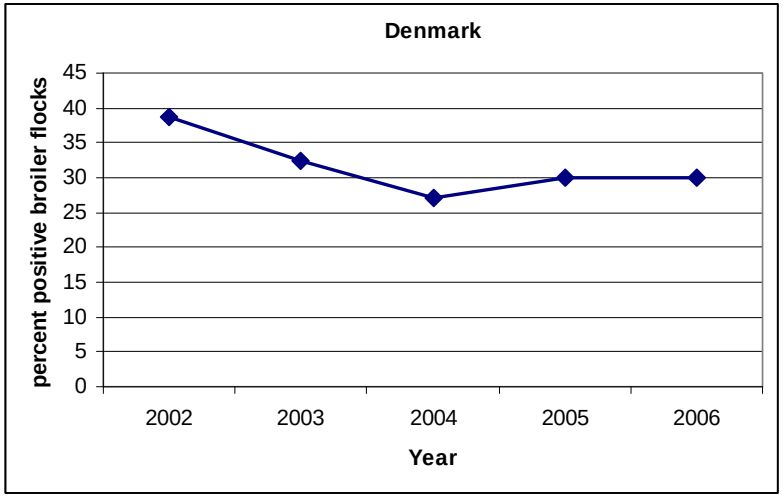
EFSA Zoonosis report 2007 - Focus of the year

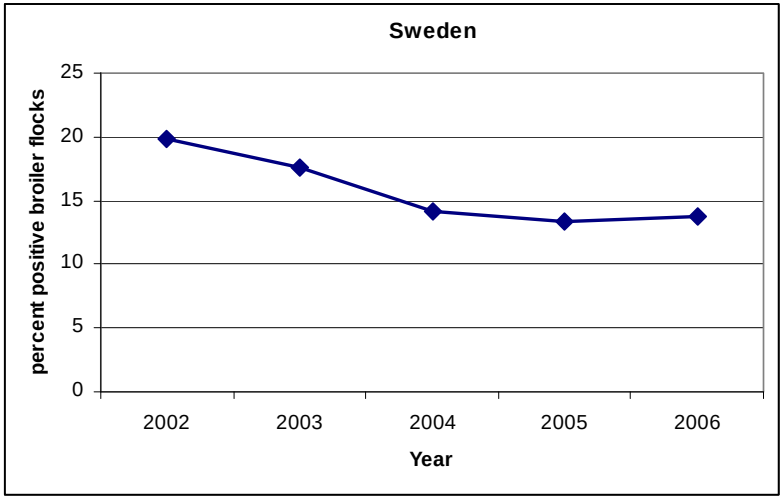
Table 2. Specific measures within countries with *Campylobacter* control strategies, 2006

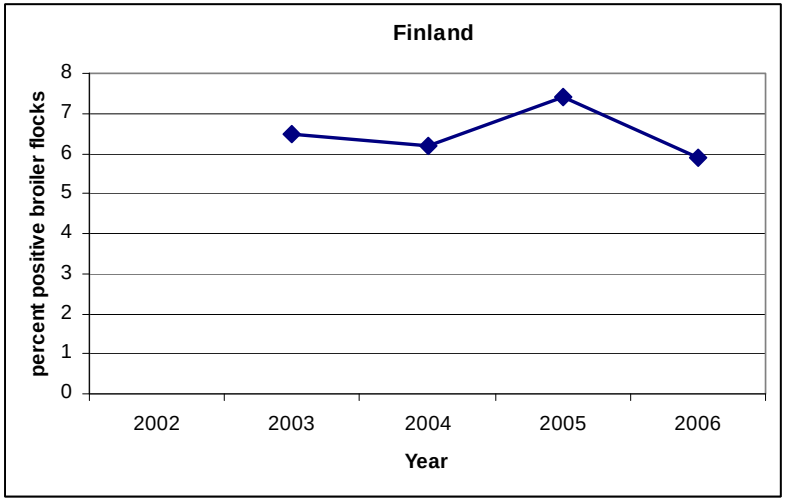
	DK	FI	LT	ES	SE	UK	NO
Year of implementation	2003	2004	2004	N.S.	1991	2003[2]	2001
Mandatory (+/-)	-	+	-	-	+	-	+
Control measures							
FARM							
Biosecurity	√	√	√	√	√	√	√
- Personal hygiene	√	√	√	√	√	√	√
- Buildings	√	√	√	√	√	√	√
- Environment	√	√	√	√	√	√	√
Treatment of drinking water	÷	÷	÷	√	÷	÷	√
Feed additives	√	÷	√	N.S.	÷	÷	÷
ABATTOIR							
Logistic slaughter	√	√	√	÷	÷	÷	÷
Freezing of meat from positive flocks	√	÷	÷	N.S.	÷	÷	√
Heat treatment of meat from positive flocks	÷	÷	√	√	÷	÷	√
Improved GHP[3]	÷	÷	√	√	√	√	√
Removal of faecal contamination	÷	√	√	N.S.	÷	√	√
Use of chemicals	÷	÷	÷	N.S.	÷	÷	÷
RETAIL							
Labelling	÷	÷	÷	÷	÷	√	÷
Leak-proof packaging	√/÷	÷	√	÷	√	√	√/÷
CONSUMERS							
Education	√	÷	√	√	÷	√	÷

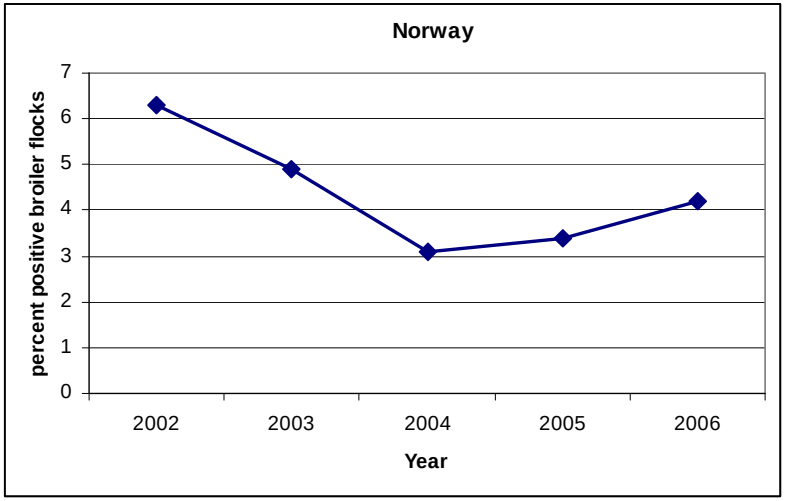
Broiler flock prevalences

EFSA Zoonosis report 2007

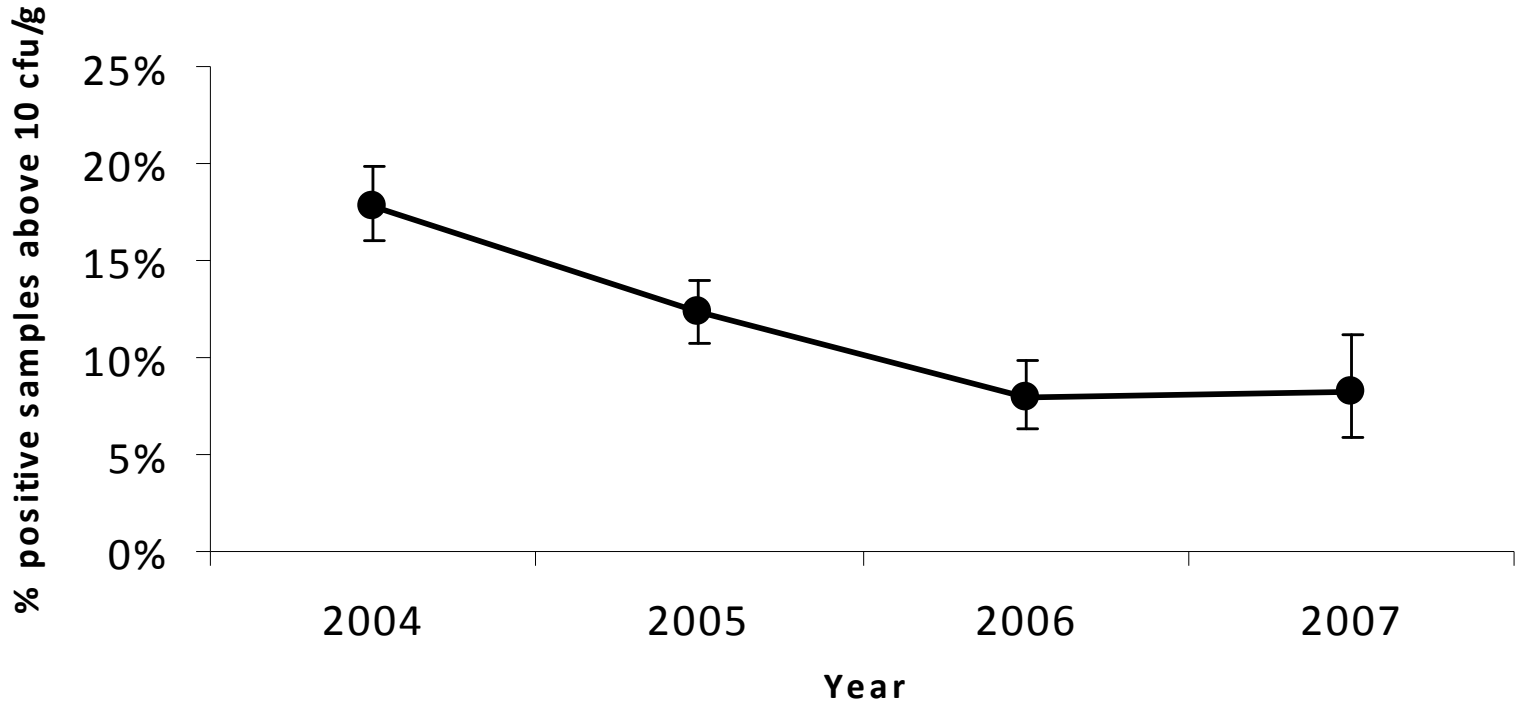






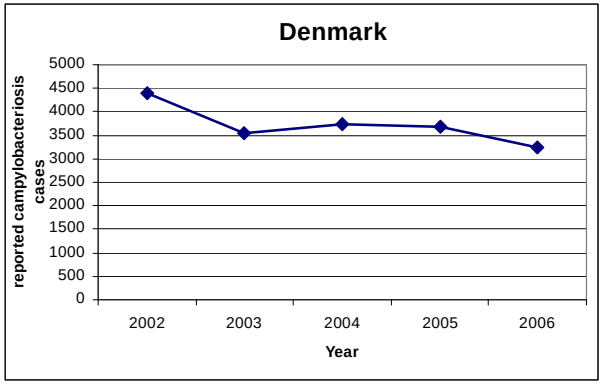


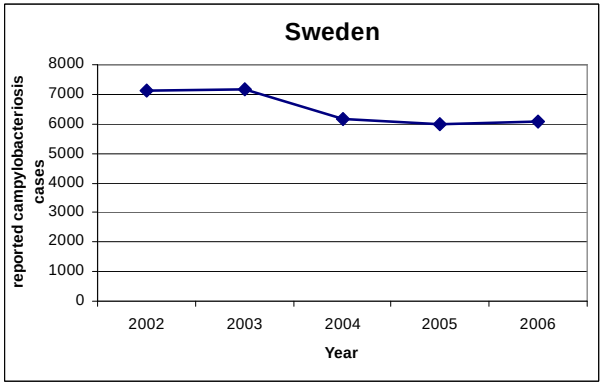
Campylobacter in broiler meat at two largest Danish processing plants

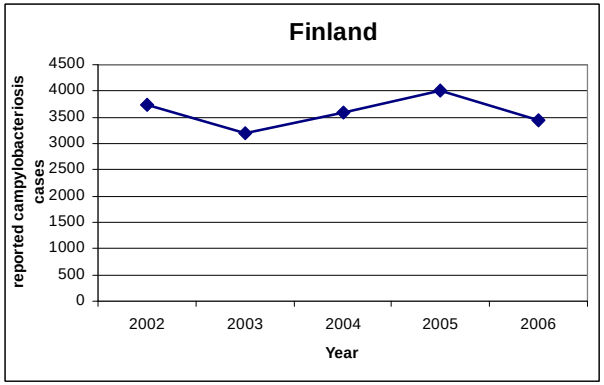


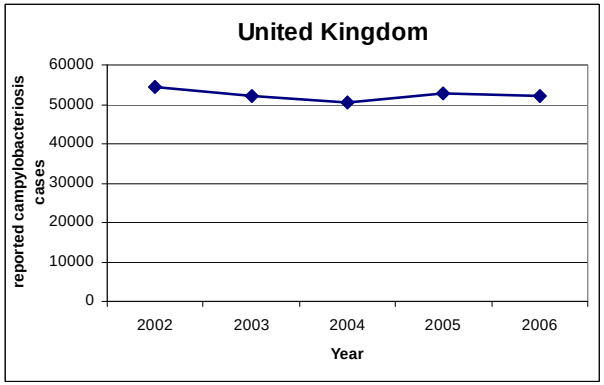
Numbers of human Campylobacter infections

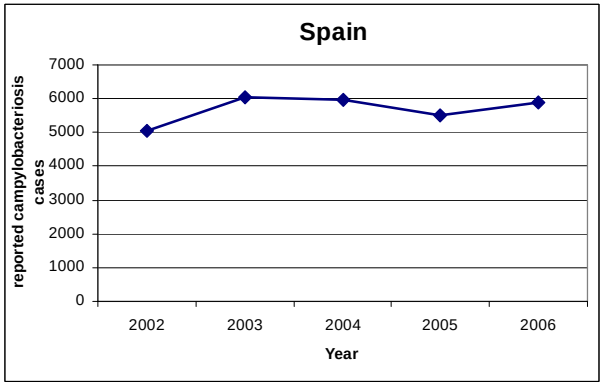
EFSA Zoonosis report 2007

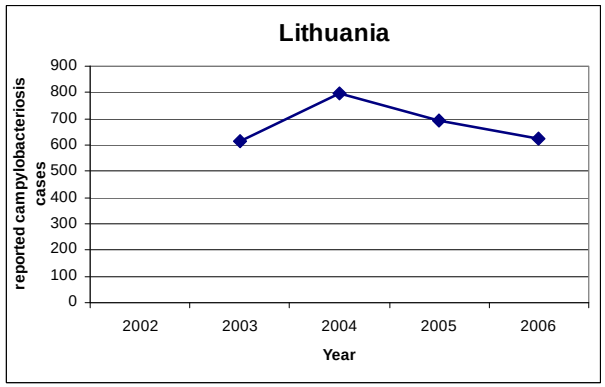












Hypothesis of positive effect in Denmark

Economical incentives

- Rewarding farmers for compliance with industry code of practice
- Rewarding farmers for delivering Campylobacter free flocks

Conclusion

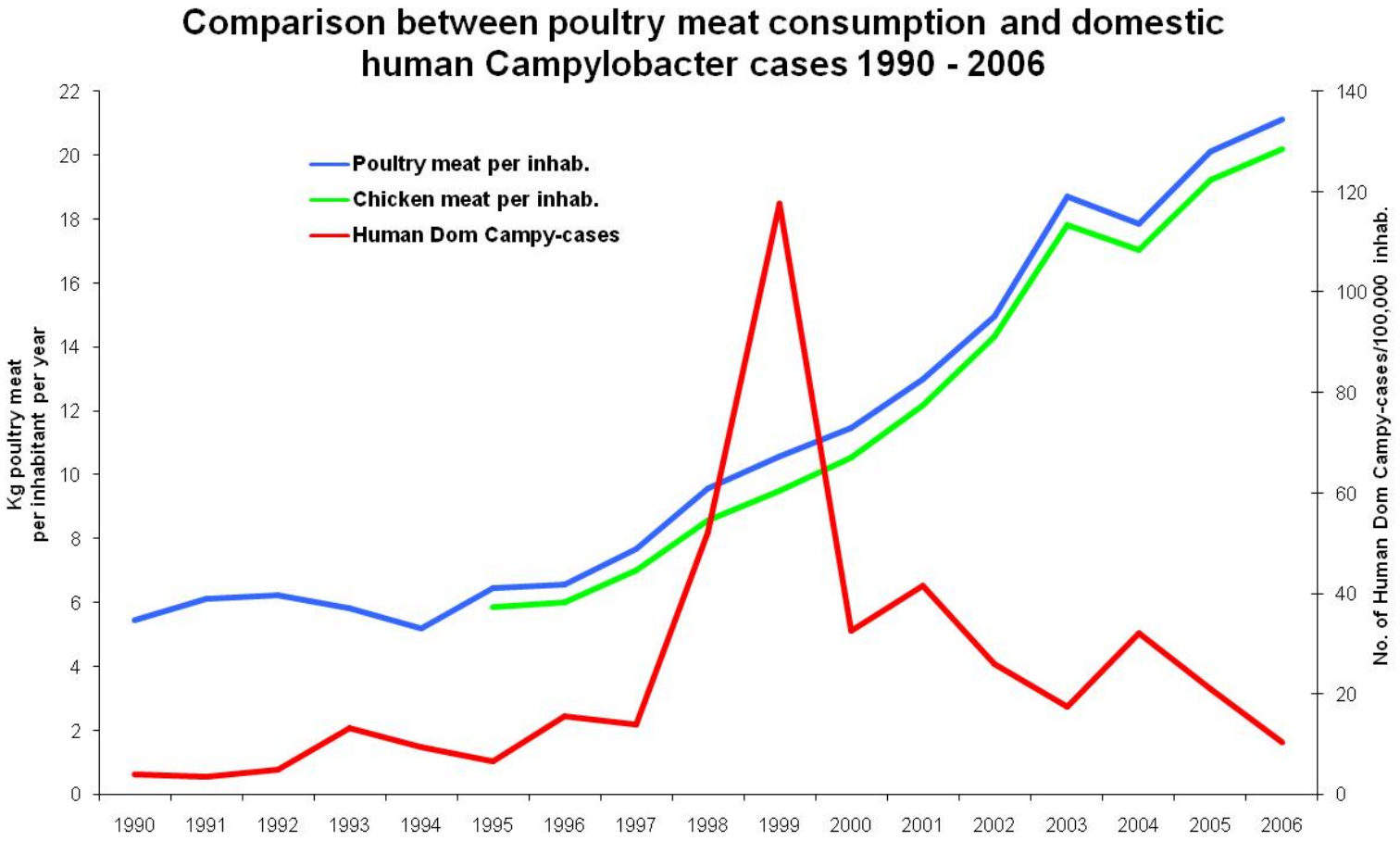
With the control measures available :

It is possible to reduce (not eliminate) the occurrence of Campylobacter in broilers and broiler meat

And to reduce (slightly) the numbers of human Campylobacter infections

The Icelandic experience

figure borrowed from Sigurborg Dadadottir



Thank you for your attention!

Bon appetit!