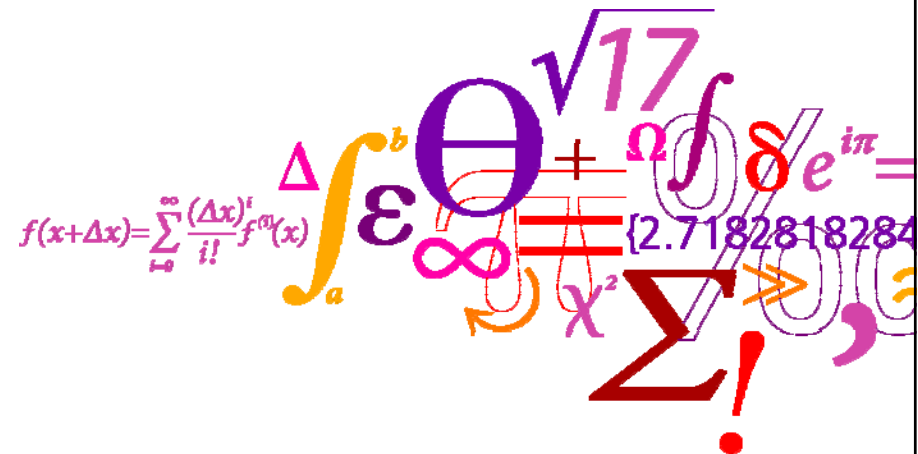




Case-by-Case Risk Assessments of Domestic and Imported Foods in Denmark

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Background – Why Case by Case?

- Survey data showed higher *Salmonella* and *Campylobacter* levels in imported meat compared to Danish produced meat
- Very strong public pressure on political system to establish means to reject import of meat from countries with higher *Salmonella* and *Campylobacter* status

But - EU law do not allow to differentiate between member states

Unless – the food can be scientifically documented to be unsafe



Background - *the regulation*

Article 14 in the EU food law:

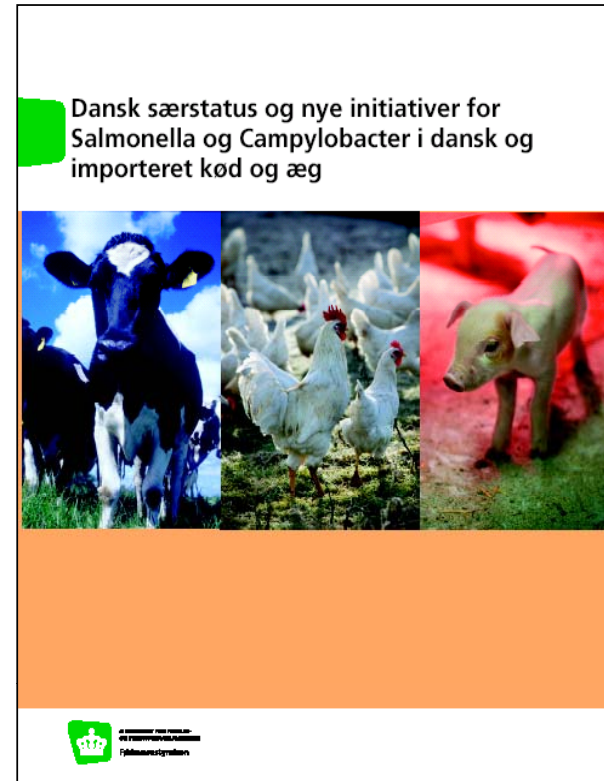
- i) Each member state is allowed to make a specific assessment of each food lot, and decide whether it pose a risk to the consumer or not.
- ii) The decision should build on a scientifically based risk assessment
- iii) If the food lot is considered a problem to human health the food can be rejected by the member state.

The EU law states that control of foods should be non-discriminatory
→ the intensified control should be representative for the food sold in the member state, incl. food produced by the member state itself.



Background - *Intensified Control*

In 2006 the Danish government decided to carry out an **intensified control** for *Salmonella* and *Campylobacter* in Danish and imported fresh meat





Request by the Danish food authorities:

- Assess the risk of acquiring Campylobacteriosis (or Salmonellosis) from a lot of e.g. broilers.
- **The risk assessment should preferably be made day-by-day (case by case).**



But, But, But.....

- To reject high risk foods – a scientific based risk assessment should be carried out for each individual food lot
- Scientifically based risk assessment is normally time consuming – especially if they are quantitative

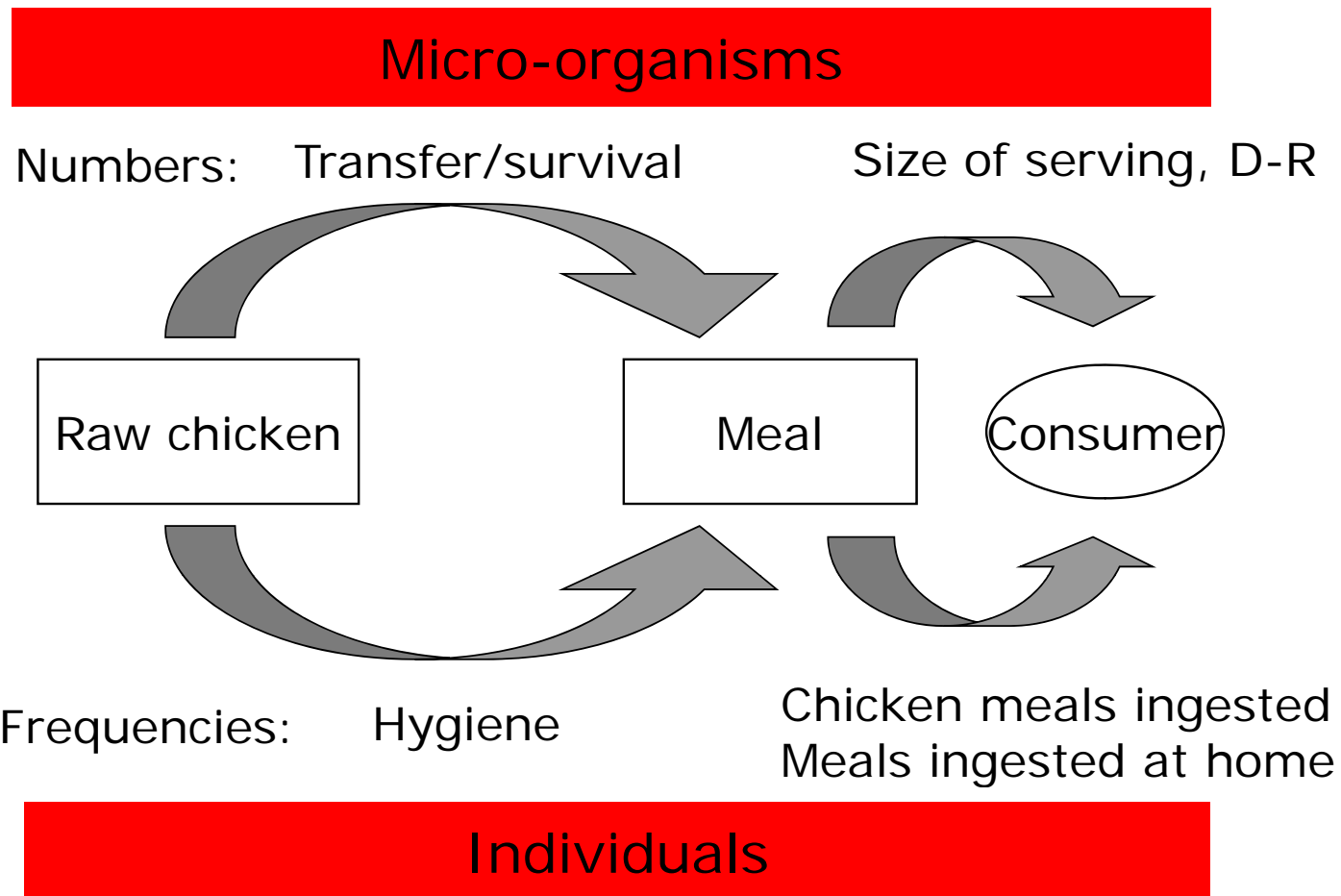
Solution: Change previous risk assessment models from explorative and general to pro-active and case by case oriented

Time to produce a quantitative risk estimate should be in minutes, rather than days or years

Basis → The Danish *Campylobacter* risk assessment (Rosenquist et al. 2003)



- Consumer phase module

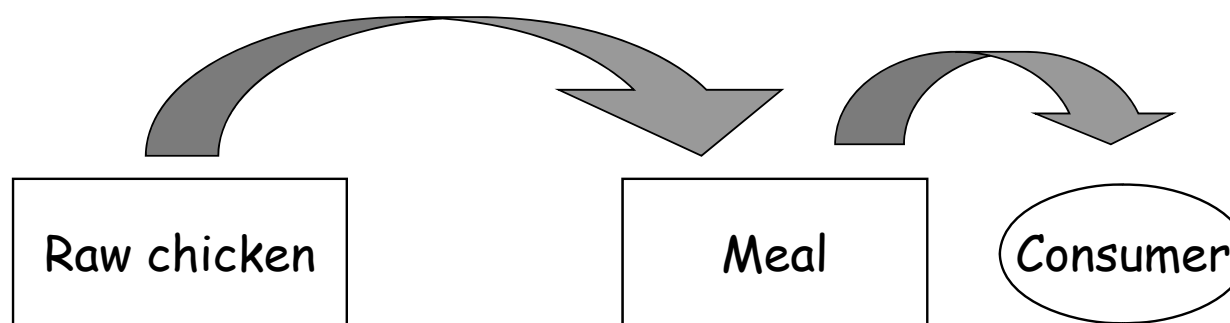




In what form can the outcome of the risk assessment be presented?

$$\rightarrow \text{Relative risk} = \frac{\text{Risk (Batch)}}{\text{Risk (Baseline)}}$$

Numbers

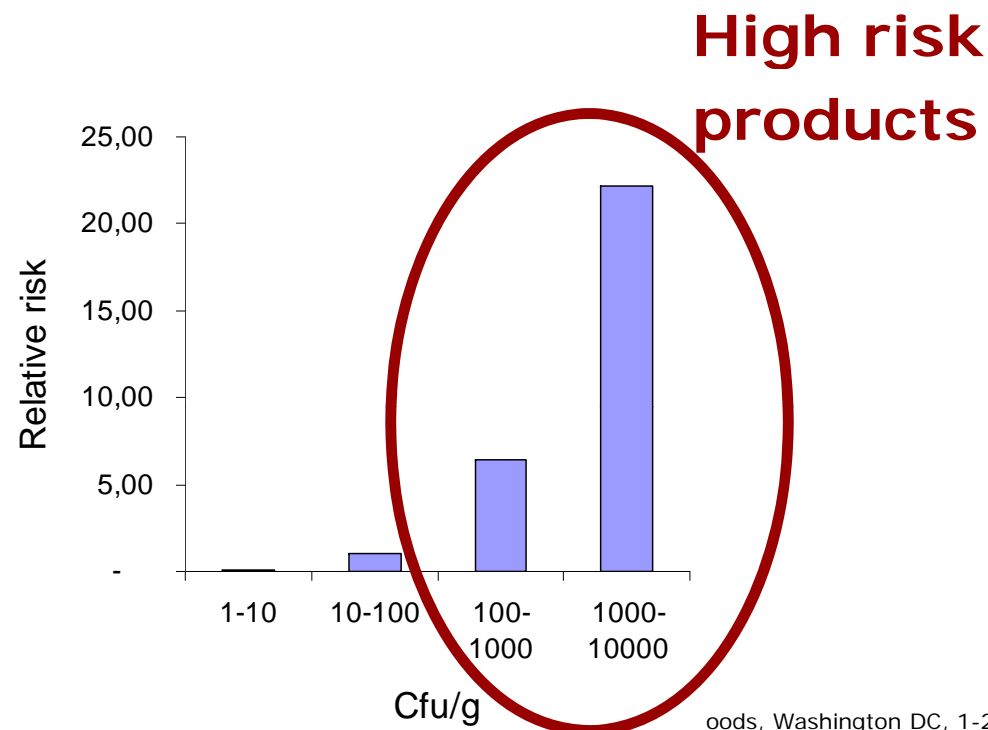


~~Frequencies~~



Sampling Campylobacter:

- Quantitative data
- 12 random samples – single samples
- Sensitivity 100 cfu/g (low sensitivity)





Model (version 1)

- 12 samples pr. batch

- Data input categories:

- Samples below 100 cfu/g
- Samples between 100 and 1000 cfu/g
- Samples above 1000 cfu/g

- Baseline

- Survey data from 2005
- Categories: Danish chilled and frozen, imported chilled and frozen

$$RR = \frac{P_{\text{ill}} (\text{Batch})}{P_{\text{ill}} (\text{Baseline})}$$

$$RR = 0,465 * N_{100-1000} + 1,647 * N_{>1000}$$



Model update

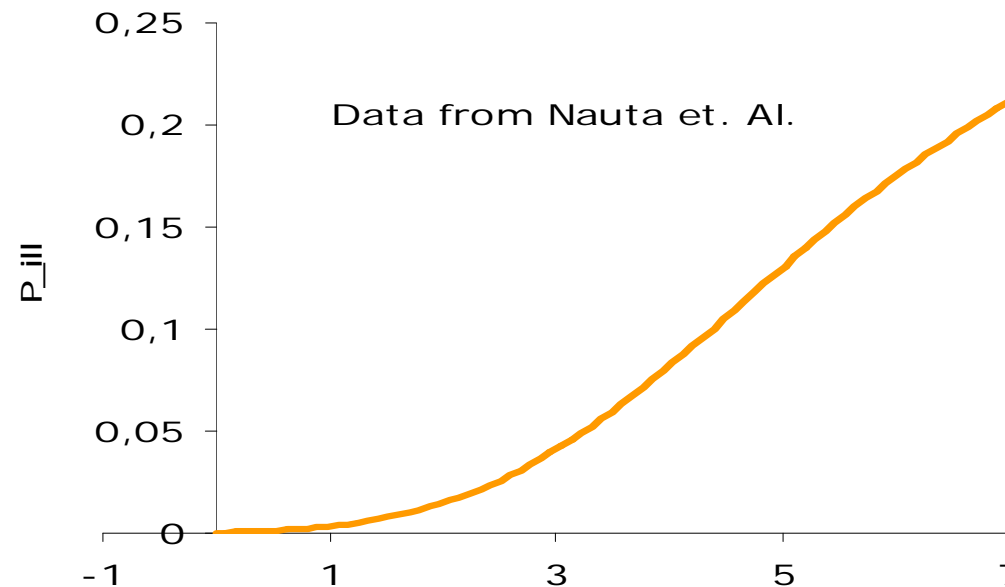
New Relative Risk estimation:

- Input data should be true quantitative data (not just categories)
- Use "better" transfer data

New baseline:

- Included survey data from more than one year.
- Variation in sampling rate over the year was taken into account

Determine relationship between *Campylobacter* load (cfu/g) on carcass and mean probability of illness



Polynomial fit

$$P_{\text{ill}} = 0,00033512 + 0,00170867c + 0,00047941c^2 + 0,00057208c^3 + 0,00050586c^4 - 0,00012852c^5 + 0,00000786c^6$$

$$R^2 = 0,99999801$$



Enter sampling data and estimate Relative Risk

$$RR = \frac{P_{\text{ill}} (\text{Batch})}{P_{\text{ill}} (\text{Baseline})}$$

Case by Case risk assessment tool

Fill in cfu/g in twelve samples from the batch.
 If none detected, type 0 (zero);
 It is assumed the detection limit is 100, so values <100 are not found

Input	output
5000	prevalence: 0,6667
10000	mean positives 3962,5 cfu / g
300	
4000	
300	Relative risk estimate: 10,148
0	
100	
5000	
7000	
0	
0	
0	



Comparison of consumer phase models *Model Verification?*

It was uncertain how well the model estimate the relative risk (Danish model based on few and uncertain bacterial transfer rates in the kitchen)

Brynstad et al. 2008, IJRARM

Christensen et al. 2001, DFVF report

Fazil et al. 1999, *unpubl.*

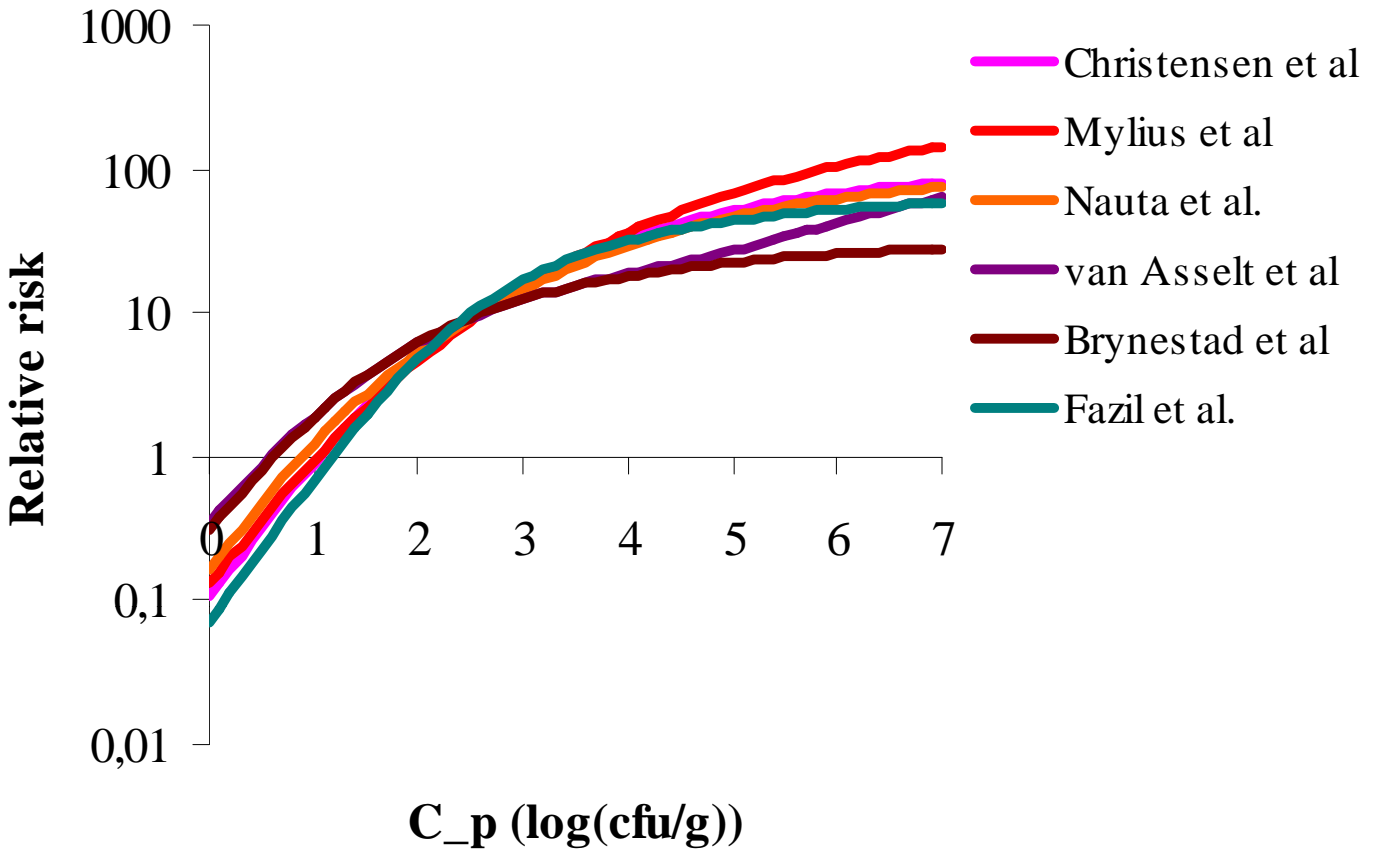
Mylius et al. 2007, Risk Analysis 27:803-813

Nauta et al. 2008, Risk Analysis 28:179-192

van Asselt et al. 2008, J Appl. Microb. *in press*

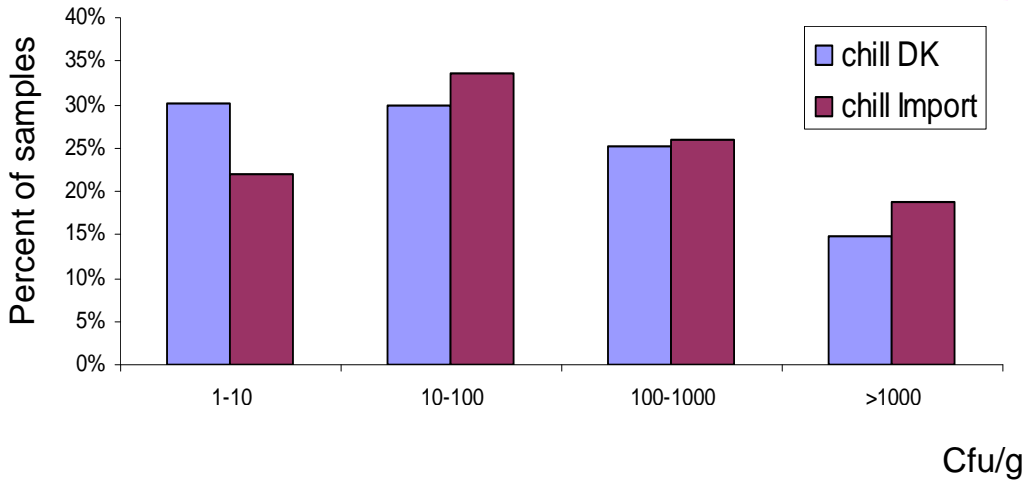


Relative risk estimate



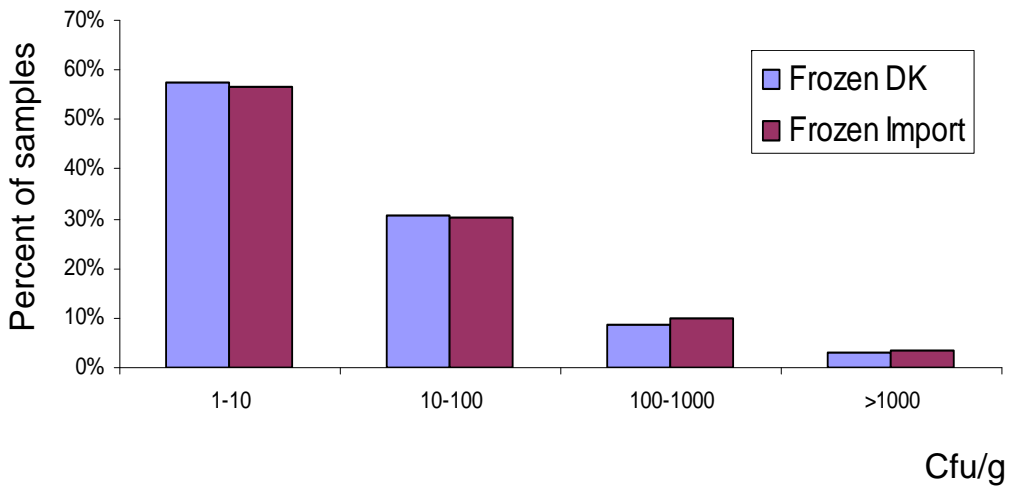


Campylobacter levels in Danish and imported broiler meat 2005-2007



Number of samples below 1 cfu/g

- Chill DK: 73%
- Chill Import: 39%
- Frozen DK: 76%
- Frozen Import: 53%





Sampling and analysis of *Salmonella*

- 60 samples per batch
- Pooled in 12 analysis (5 in each, unless very small batch)
- Analysed for the presence of *Salmonella*
- A positive finding leads to
 - Analysis for sero-type and phage-type
 - Analysis for antimicrobial resistance



Assessment of Relative Risk- *S. Enteritidis* in chicken meat

Input parametre

Pool size (k) **2**
No. Pools (m) **12**
q- Value

Np					
5					
6					
7					
8	42.1%				
9	50.0%			2.4	3.4
10	59.2%			5.2	
11	71.1%	(38-95%)		2.4	6.3

Obtained from our source attribution account with source, subtype and "baseline" prevalence as input

Estimated value for a baseline (average) batch

Average prev. 2005	1.7%	0.9%	6.5%	29.1%	11.3%
q-value	1				



Conclusions

- Case-by-Case is truly a “risk based” control system for imported and domestic food
- Risk assessments can be used pro-active to perform day to day risk assessment
- For Campylobacter - Case by case risk assessment is dependant on good consumer phase models – there is still lot of work to do
- Relative risks seems to simplify everything
- The case by case model follow the EU law, but it is expensive.
- Uncertainty still needs to be considered.....
- It works...



This is not a Microbiological Criterion:

- A risk assessment is carried out for each individual batch
- Rejection/acceptance directly linked to risk
- Rejected lots should pose a significantly higher risk than average
- Rejection/acceptance is not based on specific number of positive and negative samples
- Judgment of relative risk estimate is based on risk management decision, not risk assessor.



Risk assessment – who is doing what

Sampling
Sending samples for analyses

Control departments

Risk management

Cultivation, diagnostics
Quantification of *Campylobacter*
Asking for risk assessment

Regional laboratories

Serotyping, phage typing and determination of resistance,
risk assessment

National Food Institute

Risk assessment



Thank you!