Risk-based meat inspection: The New Zealand experience

Steve Hathaway
Chief Food Safety Scientist

Timeline

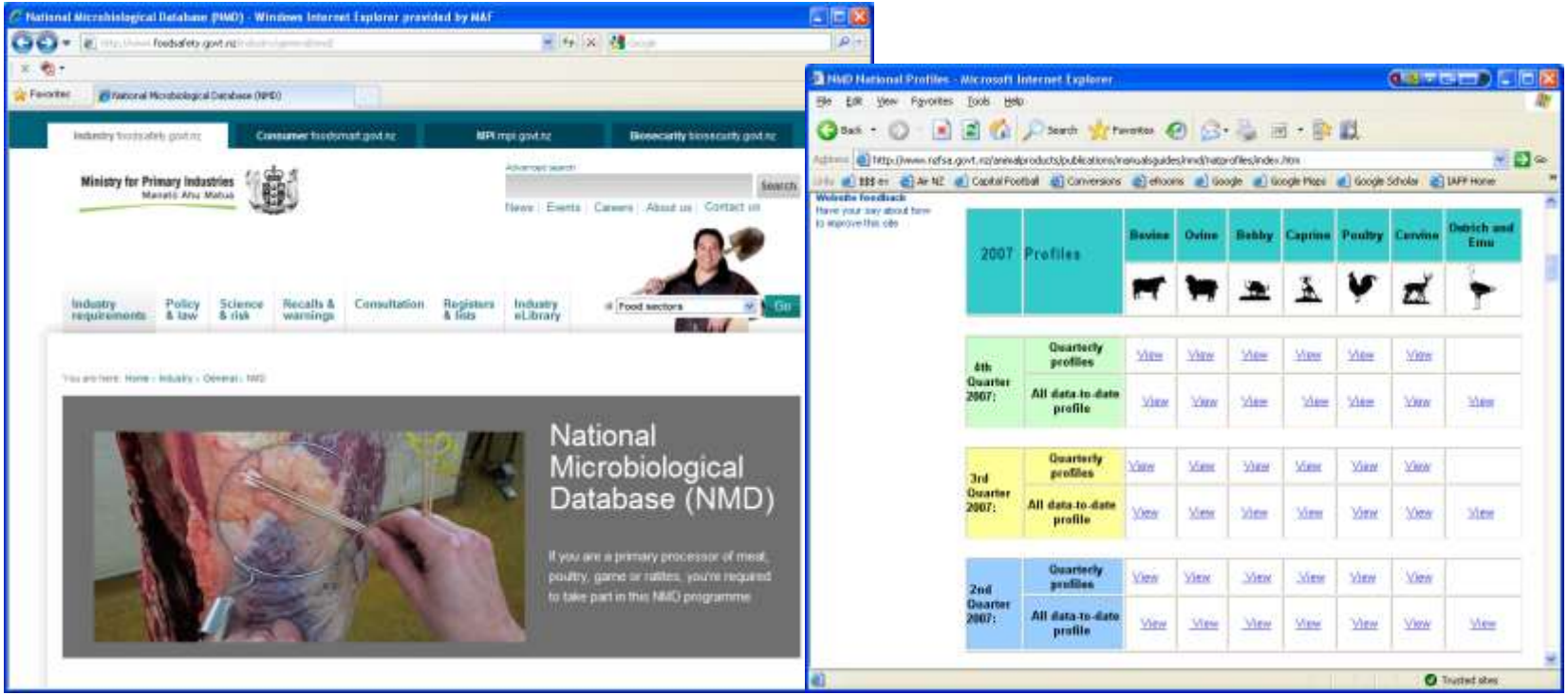
- Detailed scientific work on post mortem inspection began in the mid-1980s, mainly focused on sheep as a “small” animal, then flowing on to other species in the 1990s
- Equivalence submissions to US and EU throughout this period
- High level of international involvement from mid-1990s, with championing of the generic risk-based approach to food safety in Codex
- Codex Committee on Meat Hygiene (NZ as host country) - risk-based Code of Hygienic Practice for Meat established in 2007
- Continuing work on risk analysis and inspection delivery models

The Risk Management Framework

Risk-based approach not limited to inspection!

1. Roles and responsibilities of the Competent Authority
2. Setting of standards
3. Licensing and approvals
4. Food composition and labelling
5. Compliance and verification
6. Certification of foods
7. Monitoring and surveillance
8. Investigation and response
9. Information management
10. Traceability
11. Systems assurance

High quality monitoring is an essential input – NZ National Microbiological Database



“Risk assessment” – a variety of methodologies

- Risk profiles
- Exposure assessment
- Risk ranking
- Systematic review
- “Simplified” risk assessment
- “Full” risk assessment
- Food source attribution

Summary of thirty years of change in New Zealand ….

- Major changes in post mortem inspection of lambs and adult sheep
- Followed by:
  - reduction in palpation and incision of lymph nodes of cattle (*M. bovis*)
- - risk-based approach to inspection for cysts of *T. saginata* in cattle
- - international risk assessment model for *T. spiralis*
- *C*onditions of processing also subject to detailed investigation e.g. age and changing health status, long wool vs. short-wool sheep
- Detailed risk-based review of primary processing of poultry 2007 – 2009 as a response to unacceptable levels of human campylobacteriosis
- Further work e.g. palpation of superficial lymph nodes, indicators for arthritis, incision of porcine lymph nodes for *M. avium*
- Detailed focus on contamination of carcasses of very young calves (unique status of New Zealand) and fit-for-purpose testing for STEC
- Identification and removal of the large majority of abnormalities a non food safety “sorting” function and can be carried out by suitably competent industry inspectors

Example: Visual-only inspection of lambs and goats (2009)

- Presentation standards important for visual-only inspection
- Premises Risk Management Plan must include industry implementation and verification of good hygienic practice (GHP); independent verification by government
- Inspection performance criteria benchmarked against maximum chain speeds (lower for adult animals)
- Continuing input to improving GHP through New Zealand Food Safety extension slaughterhouse programme e.g. Contamination Pathways Project

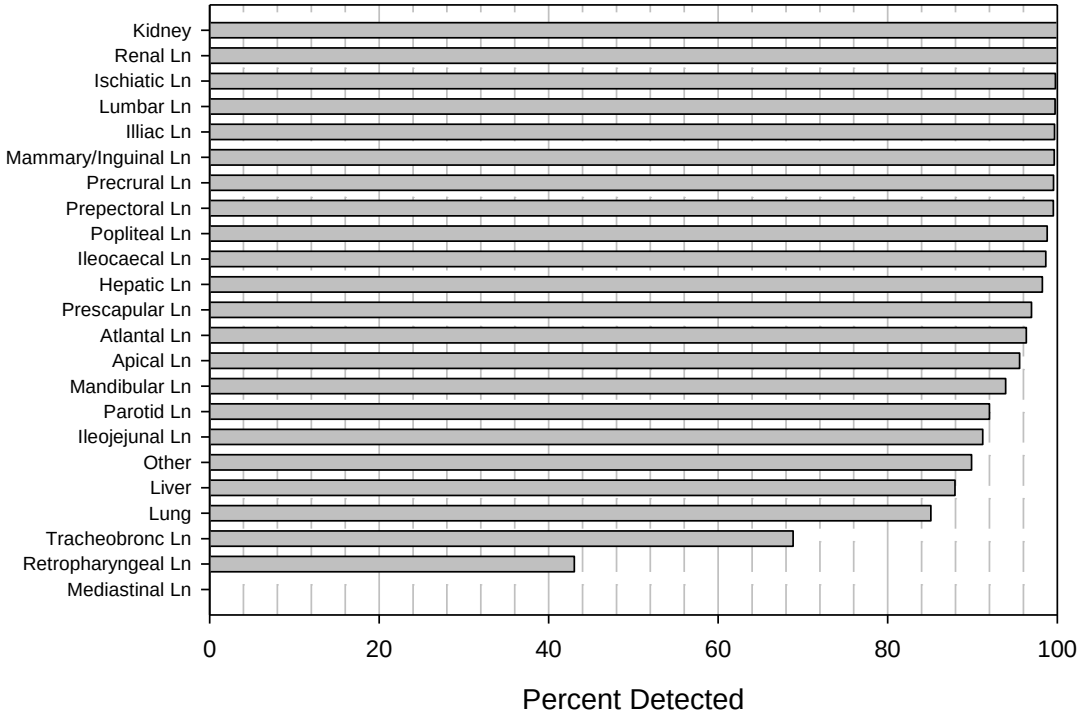
Improved presentation: abdominal cavity

Improved presentation – fat curtain

Changes in inspection of very young calves

- A specific slaughter class in NZ – around 2 million p.a.
- Visual-only procedures introduced in 2010
- Umbilicus inspection discontinued 2012
- Contamination Pathways Project assisting industry to further reduce cross-contamination during primary processing
- STEC detections continue to decrease

Simulation of probability of gross detection of *M. bovis* after sequentially dropping out inspection of a tissue



Some changes in inspection of adult cattle (2012)

- Reflect greatly reduced prevalence of *M. bovis* in recent years
- Several carcass lymph nodes now not routinely examined e.g. lumbar chain, renal, atlantal, subiliac and superficial cervical
- Reduced level of palpation e.g. oesophagus, spleen and thick skirt – view only
- Removal of routine examination of some organs e.g. gall bladder

Tania saginata; sensitivity for detecting one cyst using the New Zealand model for lightly infected animals

• Benchmark - traditional inspection	4.7%
• Delete superficial masseters cuts (left and right)	4.4%
• Also delete deep masseters cuts (left and right)	4.1%
• Also delete pterygoids cuts (left and right)	3.9%

Risk model demonstrates no routine value of intensive inspection!

T. saginata Pathway Model (2013 Version)

Estimates are to be entered in the yellow cells

Size cattle population	4,272,082	animals	295	Positive animals
Estimated prevalence cysticercosis of cattle population	0.0069%			
Estimated number of cysts in lightly infected cattle	4	cysts	15.1%	Probability of detecting an infected animal → No longer a hazard
Estimated probability of detecting one cyst	4.0%		84.9%	Probability of not detecting an infected animal
			0.006%	Percentage of the population that is infected and not detected
			250	Number of animals that are infected and not detected
			1,000	Number of undetected cysts
Estimated probability of cyst viability	30%		300	Number of viable cysts
Probability cyst survived freezing.	12%		36	Number of viable cysts that survived freezing
Probability cyst survived cooking	32%		12	Number of viable cysts that survived freezing and cooking
Probability of infection	29%		3	**People infected with *T. saginata* tapeworms**

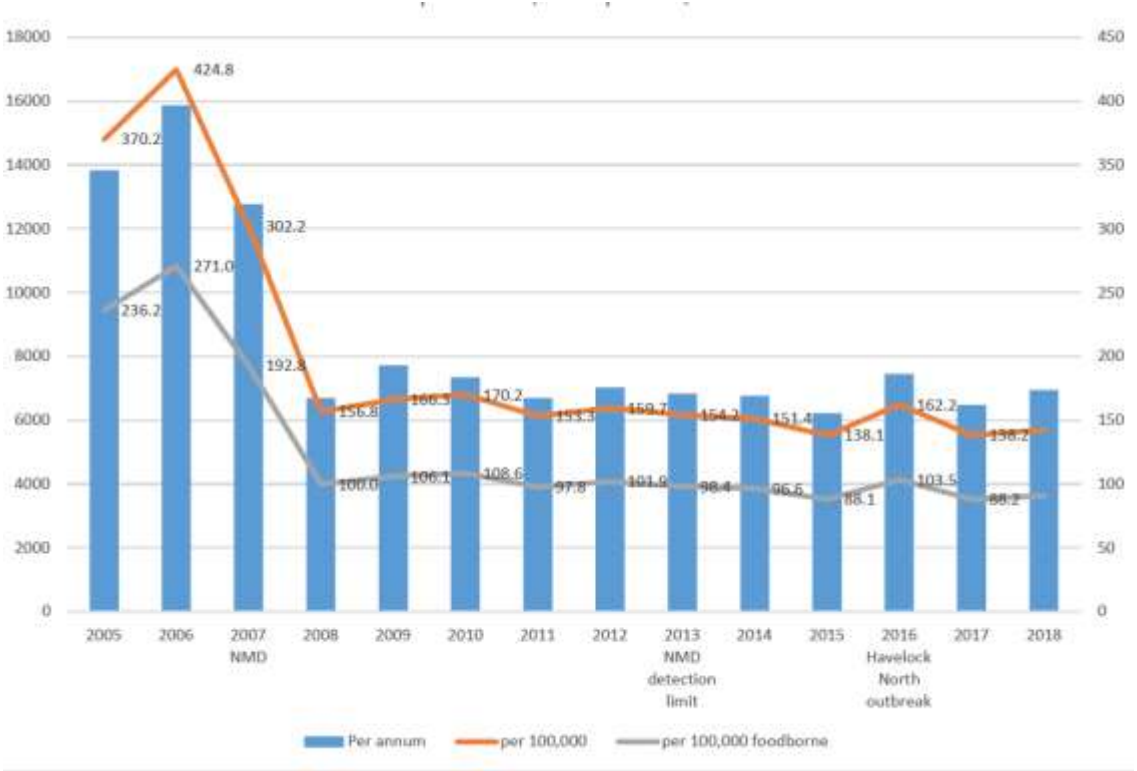
Pathways Contamination Project

- Detailed veterinary visual observation of potential contamination pathways from lairage to packing for very young calves (2016 - 2018)
- Potential sites for cross-contamination and spread ranked for extent and frequency
- GHP guidelines developed for mitigation
- Advice provided on verification of GHP by industry
- Expansion to adult sheep and cattle in 2018

Organisation of inspection tasks

- Introduction of company inspectors for non-food safety abnormalities: 2012
- Trained and competent company inspectors carrying out non-food safety tasks widely implemented since 2013
- Government (AsureQuality) meat inspectors carry out carcass-by-carcass inspection for food safety-related abnormalities
- Monitoring data demonstrates equivalent (sometimes better!) performance of company inspectors

Risk management of foodborne campylobacteriosis in NZ: an ongoing problem



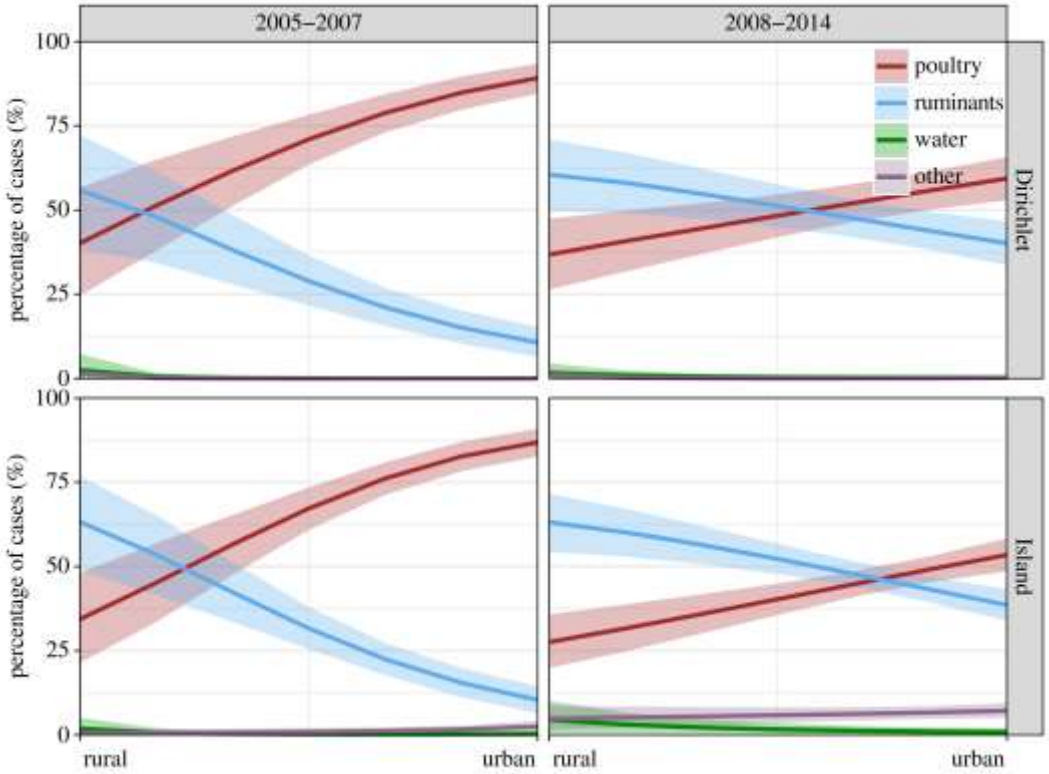
Modelling of broiler contamination and human food-borne campylobacteriosis in New Zealand

- Prevalence of contamination and concentration levels work together to generate risks to consumers
- Predicted notification rates per 100 000 population reduce as contamination decreases

	20% ccs. positive but < 3.78 $\log_{10}$ cfu	15% ccs. positive but < 3.78 $\log_{10}$ cfu	10% ccs. positive but < 3.78 $\log_{10}$ cfu
2% ccs. > 3.78 $\log_{10}$ cfu	40	32	24
1% ccs. > 3.78 $\log_{10}$ cfu	36	28	20

Insights from new *Camyplobacter* source attribution models (Liao *et al*., 2019)

- Human and reservoir data 2005 - 2014
- Marked differences in sources of rural vs. urban cases
- Differences over time
- Difference between models



The future

- Much more work to do - a risk-based approach to meat hygiene somewhat trails risk-based approaches for other food commodities!
- Whole of food chain information systems (including monitoring systems such as the NZ National Microbiological Database) provide essential inputs to designing and verifying risk-based systems
- COST 2019 Risk-Based Meat Inspection and Integrated Meat Safety Assurance is a key opportunity
- Future role of the Codex Committee on Meat Hygiene?


Thank you