Caecal Testing – Review and Options Assessment

1 Executive Summary

Purpose

NZFSA set up a caecal sampling programme under the *Campylobacter* in Poultry Risk Management Strategy 2006-2009 to provide an initial baseline survey of the prevalence of *Campylobacter* in all New Zealand broiler flocks at each cut. The programme also was expected to provide information to assist with 1) risk management decisions and 2) the NZ risk model for *Campylobacter* in broiler chicken. Sampling has been occurring for two years.

Review

NZFSA agreed to review the caecal sampling programme as an action under the *Campylobacter* Risk Management Strategy 2008-2011.

The poultry industry wishes to stop caecal sampling because of cost and their perception of a lack of scientific benefit relative to that cost.

Progress

The *Campylobacter* Risk Management Strategy Group has reviewed the caecal sampling data to-date and has presented options for assessment in this paper including:

- the status quo
- reduced sampling, and
- removing the requirement for caecal testing.

These options will be discussed with industry representatives on 16 March 2009.

2 Background

Legal requirements

From 30 March 2007, all broiler primary processing premises were required to test 10 caecal samples from each cut of each shed being processed. The current

requirements are in Schedule 1 of Animal Products (National Microbiological Database Specifications) Notice 2008. Refer to:

http://www.nzfsa.govt.nz/animalproducts/legislation/notices/animal-material-product/nmd/schedule-1-technical-procedures-nmd-final.pdf

Purpose of caecal sampling

Sampling regimes for each food animal species are set up with specific outcomes in mind.

The caecal sampling programme for broiler chicken was set up to provide "an initial baseline survey of the prevalence of *Campylobacter* in all New Zealand broiler flocks at each cut" (Reference Schedule 1 section 2.13). This was part of NZFSA's *Campylobacter* in Poultry Risk Management Strategy.

Data was required on both prevalence in flocks arriving at the processing premises and enumeration of pathogen levels in broilers following primary processing. This data would assist risk managers by :

- providing an initial baseline prevalence of *Campylobacter* infection on farm
- differentiating between poor-performing and better performing farms so that practices could be compared and desirable practices identified
- informing risk management decisions
- informing the NZ risk model for *Campylobacter* in broiler chicken.

NZFSAs position

NZFSA made a commitment to review caecal sampling early in 2009 as part of the updated *Campylobacter* Risk Management Strategy 2008-2011. The review analysed the costs and benefits associated with:

- the status quo
- a number of reduced sampling options, and
- removing the requirement for caecal testing.

NZ poultry industry's position

The NZ poultry industry is unhappy with the current ongoing NMD requirement to test caecal samples seeing it as very costly for no further scientific gain.

Submissions received as part of the consultative process for the proposed NMD Schedule 1 amendment, included comments from the poultry industry on this matter. These have been taken into account in this document.

3 Review of Data

3.1 Review process

Data analysis

NZFSA's Science Group have reviewed the broiler chicken caecal sampling data and discussed the findings with the *Campylobacter* Risk Management Strategy Working Group

Risk management questions

The questions to be answered by the review were:

- what scientific information has been provided by caecal sampling?
- what are the implications of reducing or discontinuing caecal sampling?

3.2 Current situation

Caecal samples

Currently the National Microbiological Database (NMD) specifies that caecal samples shall be tested for *Campylobacter* from every broiler cut at slaughter.

Caecal sampling provides information whether or not a cut, flock or farm is positive. *Campylobacter* infection in flocks that are in the early stages of infection may not be discovered with this test due its sensitivity. The probability of flocks testing positive by acquiring an infection during transport is deemed to be small.

Rinsate samples

In addition, all premises enumerate *Campylobacter* rinsates taken near the end of primary processing. Standard throughput premises enumerate three broiler carcasses each processing day. Some lines of birds will not be sampled. Sampling also takes place for *E. coli* which complements the *Campylobacter*

results.

Rinsates provide information on the standard of hygienic dressing and decontamination by slaughterhouses:

- If farms provide negative birds, the rinsates should be negative too, but birds can be cross-contaminated during dressing which can result in positive rinsates.
- If the flock is positive, then hygienic dressing and adequate decontamination should result in negative birds, or at least birds with very low *Campylobacter* counts.

Regulatory use of data

Currently NZFSA uses the rinsate and the caecal sampling schemes as monitoring tools.

Only the rinsates are used as a regulatory tool. If the *Campylobacter* Performance Target (CPT) as specified in the NMD is exceeded, escalating corrective actions are taken to reduce the load of *Campylobacter* on carcasses after primary processing.

Other use of data

Operators need to understand how to reduce human exposure to *Campylobacter* using interventions at various stages of poultry production and processing including:

- **Biosecurity** at the farm - so that fewer flocks are infected
- **Hygienic dressing** - so that fewer organisms get onto the carcass
- **Decontamination** – to effectively remove or inactivate organisms by physical or chemical means
- **Storage** – to inactivate organisms on product

The rinsate results reflect the effectiveness of biosecurity, dressing and decontamination as a whole. If caecal sampling was abandoned, the effectiveness of intervention measures would become more difficult to interpret both for the industry and for NZFSA as will be explained below.

3.3 Temporal patterns

Results

Figure 1 displays the prevalence of the positive rinsates, the positive caecal samples (all cuts and cut 1 only) and the number of human notifications over time.

Analysis

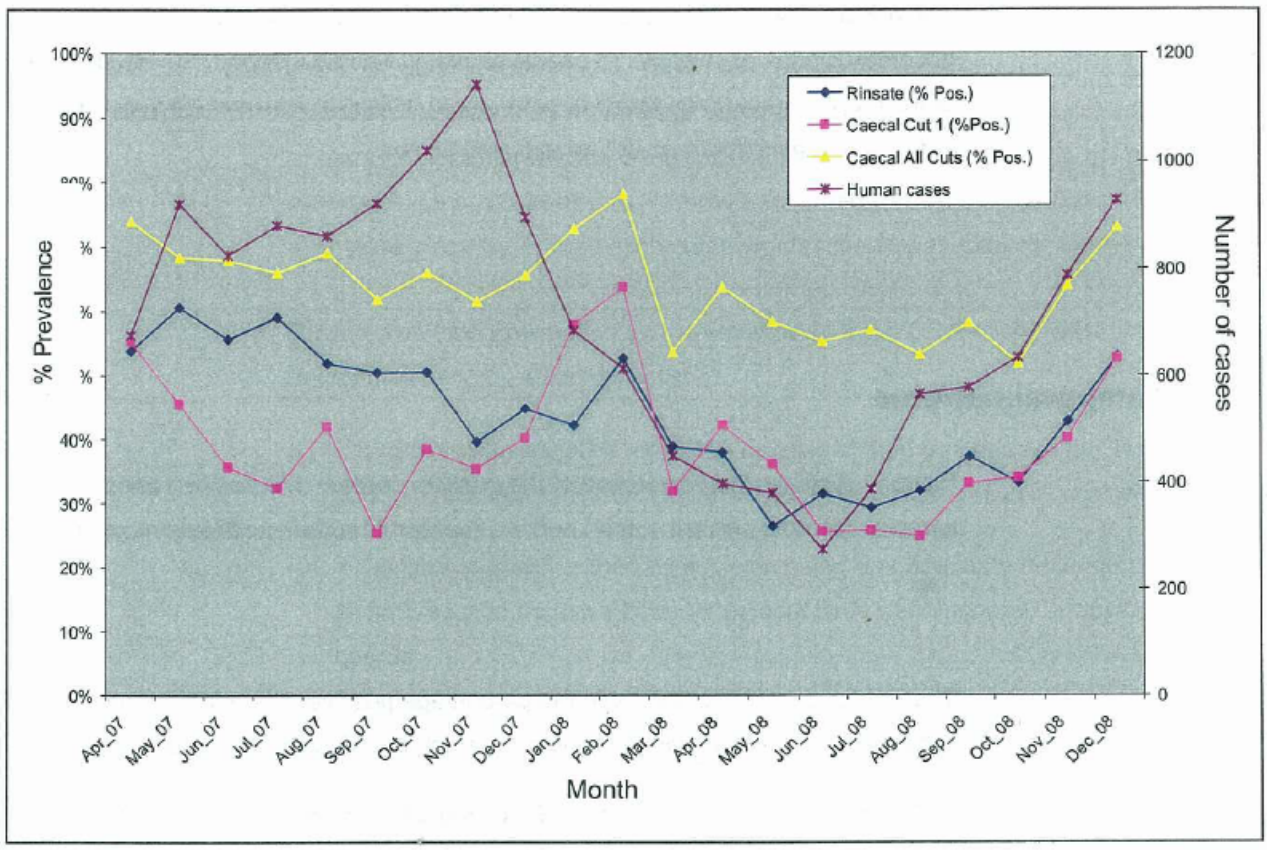
There is an association between the percentage positive cuts and the rinsates. This is especially so for the category 'All cuts' which includes the first cuts.

In February 2008 a peak occurred. Some industry members associated this peak with a drought where fewer washes were applied to carcasses or where a reduced water pressure was used. The caecal database however showed an increase in positive cuts too, and it was hypothesised this might have been due to an increase of the fly population. The exact reason may never be known and possibly both issues may have influenced the rinsate results. Had the caecal database not been in existence the potential importance of infected live birds would not have been known.

It is important to know for the *Campylobacter* strategy whether the peak of infected flocks in February was an occasional occurrence or a seasonal effect. The caecal samples that are currently collected are important since they may clarify this issue to some extent.

Figure 1 shows that the various peaks do not all coincide.

Figure 1: Prevalence of positive rinsate and caecal tests, and human notification numbers.



3.4 Farm – related issues

Pathways

There is a lack of knowledge regarding the relative importance of the pathways leading to infection of flocks. The relevant importance may also differ from farm to farm. It would appear that farmers have little control over biosecurity during partial depopulation of their flocks. These factors make it difficult for farmers to keep their flocks *Campylobacter*-free.

Breeders

It has been claimed that breeder flocks stay negative for a longer period of time than broiler flocks. If similar procedures were applied to broiler flocks, birds at their age of slaughter might not have become positive yet. There are additional costs associated with biosecurity as practised with breeder flocks and consequently this level of biosecurity may not be aimed for.

Farm status

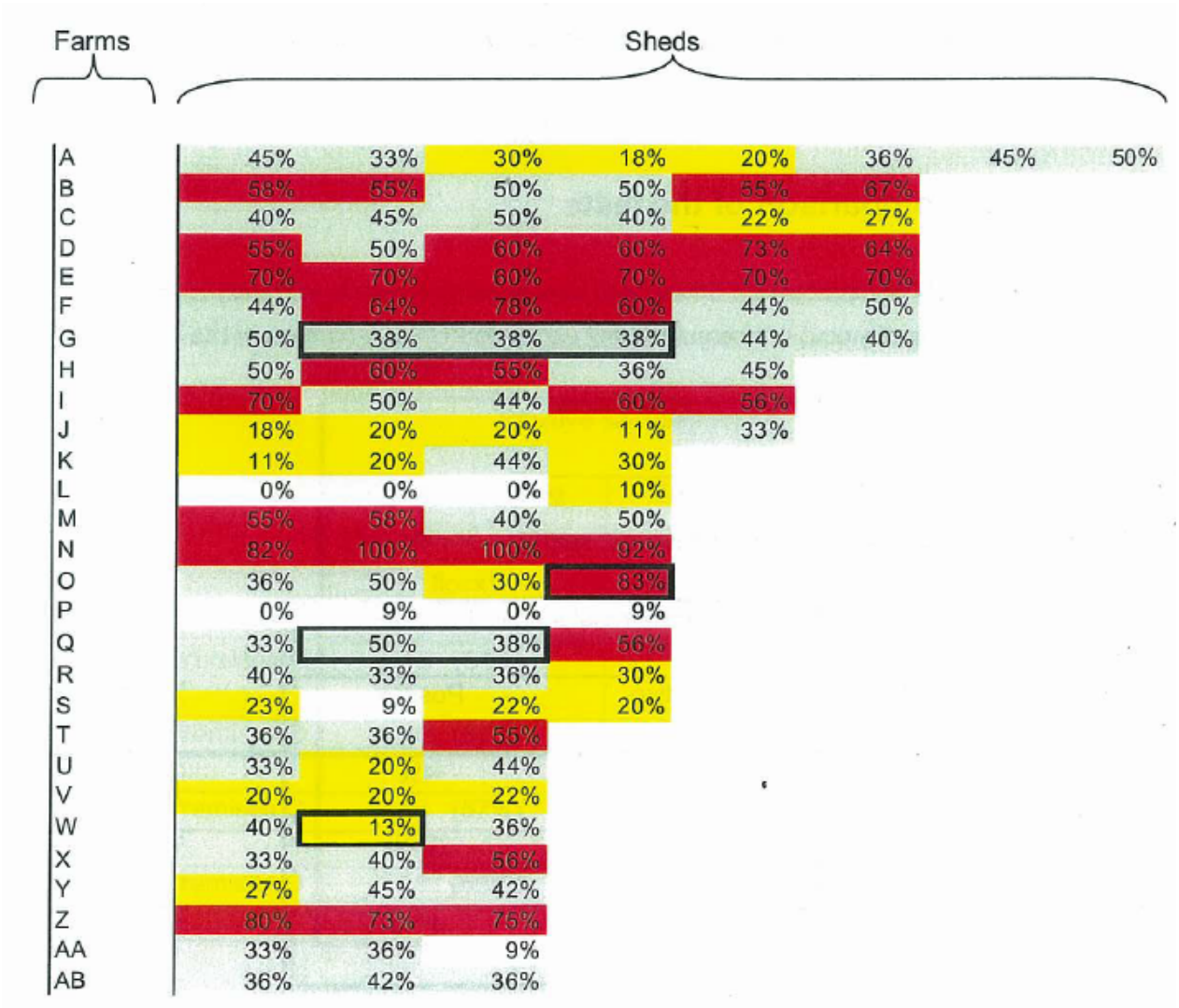
Figure 2 shows the proportion of positive first cuts from a number of farms from the same geographic area.

Yellow indicates better than average, green is average and red is worse than average performance.

Some farms have had consistent results, while others have not.

The sheds with bold black frames submitted 7 or less first cuts while the other sheds submitted more than 7 first cuts.

Figure 2: Proportion of birds positive at first cuts



Use of data

A number of first cuts are negative, so it is possible for farmers to supply

Campylobacter-negative cuts.

A reduction in caecal positive flocks appears associated with a reduction of positive rinsates (see above). It would appear beneficial to processors to provide additional assistance to farms that do not perform well. Farmers would require feedback on the status of their flocks in order to work towards or maintain *Campylobacter*-negative flocks. This is currently achieved with caecal sampling.

Future work

The numbers of *Campylobacter* in the gastro-intestinal tract of infected birds can be very high. A reduction of the counts due to additives in the feed or drinking water of the birds is very likely to lead to lower counts on the carcasses and consequently a reduced risk to consumers. There have been various publications suggesting that caprylic acid might result in such a reduction. If additives became available that reduced the *Campylobacter* density in the infected gastro-intestinal tract, identification of farms that perform badly would become beneficial.

3.5 Performance and comparison of the tests

Rinsates vs. caecal samples

The relationship between rinsate and caecal sample results is shown in table 1. The rinsate results would not be sufficiently accurate to inform farmers of the status of their birds.

Table 1: Relationship between rinsates and caecal samples

		Rinsate results until Nov 2008		
		Negative	Positive	Total
Caecal results	Negative	36%	4%	40%
	Positive	23%	37%	60%
	Total	59%	41%	100%

Analysis of data

In 23% of the cases the rinsate was negative but the cut was infected. Hygienic dressing may have prevented contamination of the birds. Effective

decontamination may have removed contamination if it had occurred.

In 4 % of the cases the rinsate was positive while the caecal samples were negative. This may have been a result of the sensitivity of the test. Alternatively cross-contamination might have occurred during dressing.

Timing of caecal sampling

A survey was carried out with the cooperation of a number of major poultry processors. All cuts were sampled by two different methods:

- Timed sampling (T): the 10 caecal samples were collected equally spaced over the whole period of time the cut was slaughtered.
- Batched sampling (B): the 10 caecal samples were taken over a short period of time with small time intervals between the birds that were tested.

Tables 2 and 3 show a comparison of results.

Table 2: Comparison of positive samples in timed vs. batch collection

	Positive samples .		
	Timed sampling (T = spread out over flock)	**Batch sampling** (B = over a short period of time)	Number of cuts
Premises A	18 (64%)	20 (71%)	28
Premises B	46 (87%)	45 (85%)	53
Premises C	16 (57%)	15 (54%)	28
Premises D	25 (66%)	28 (74%)	38

Table 3: Comparison of timed and batch collection

Method combination	Cuts
T + B+	101
T + B-	4
T- B+	7
T- B-	35
Total	147

Analysis

The caecal sampling method is not 100% sensitive. The results above show that out of a total of 147 cuts, 101 cuts were found positive by both methods. In addition 4 samples were positive with the timed method and 7 with the batched method, leaving 35 cuts that were negative according to both methods.

3.6 Sampling of all cuts

Description of cuts

All companies practise partial depopulation where birds from a shed are collected for processing at various times. There are commonly 3 or 4 harvesting occasions (cuts) per shed.

Catching crews collect the birds using equipment that has been at other farms and at the slaughterhouse. The grower has little control over this process.

To some degree birds are also more likely to have been exposed to *Campylobacter* the older they get.

The relative importance of the cuts versus the age of the birds is not clear.

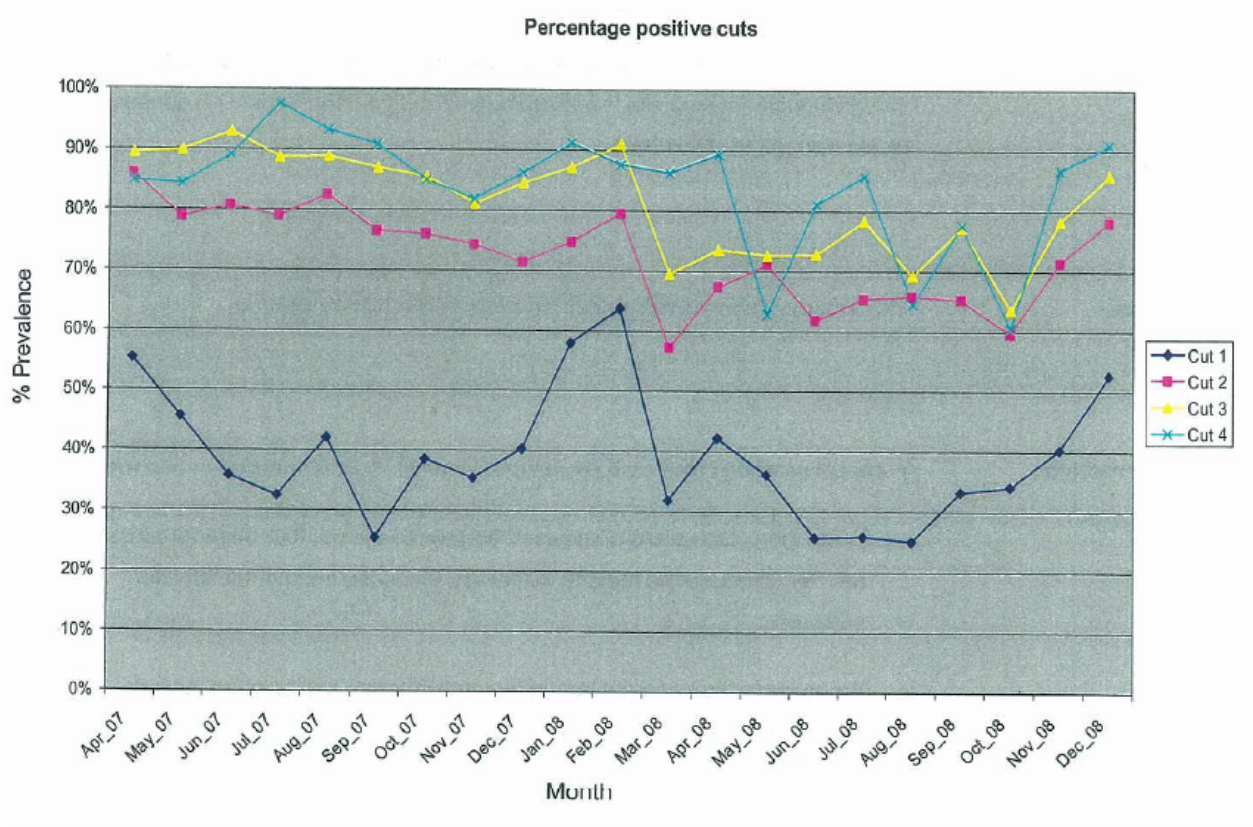
Analysis

Figure 3 shows that after the first cut little additional information is acquired. However, it would be of interest for companies to start collecting information on second and subsequent cuts if their biosecurity procedures at depopulation had improved considerably and its effectiveness needed to be verified.

Limiting sampling to the first cut only would reduce the total number of caecal

samples collected by approximately 65%.

Figure 3: Percentage of positive birds at each cut



3.7 Summary of scientific review

Use of data

Caecal sampling provides essential scientific information on temporal, geographic and premises specific patterns relating to live bird production in New Zealand. As previously discussed, the rinsates give information on the effectiveness of the combination of production and processing. Changes in rinsate patterns would not inform whether infection rates of flocks have increased.

Need for data

The data collected to-date has provided strong inputs on the epidemiology of *Campylobacter* in slaughter populations and the potential impact on consequential levels through the food chain.

Costs	The industry is concerned about the costs of the current scheme.
Alternatives	A caecal sampling plan could be devised that will be informative but at a lower cost: • A sampling plan could be devised that applies to the four major processors only (as they produce the majority of poultry products) and not the smaller producers. • A number of farms could be made sentinel farms and only first cuts of designated sheds would be sampled.

4 Option Assessment

4.1 Status Quo

Description	As per Annex 1 (Schedule 1 of NMD)
Pros	Continue to get information on trends in farm performance and biosecurity.
Cons	No regulatory action is planned based on results of data collected. Ongoing annual costs to industry is estimated at $240,000 (laboratory costs) and $20,000 (labour costs for taking samples). Industry does not support this option.

4.2 Reduction in testing

All options under 4.2 are to be considered as occurring under NMD requirements for lab analysis and data recording.

4.2.1 Only test first cut

Description Test the first cut from each shed from each farm.

Pros

Allows NZFSA to monitor whether biosecurity practices are good enough to keep *Campylobacter* out of the sheds until the first cut. Taking samples from later cuts is less useful as sheds are likely to be positive.

Gives NZFSA information about each farm but cuts back on the testing significantly, therefore reducing laboratory costs by 65% overall; from $240,000 to $84,000 per annum.

Would inform whether biosecurity improvements were being made on each farm.

Provides ongoing base of knowledge of on-farm *Campylobacter* status

Cons

Would still need sampling staff available to take samples.

Logistically more complex to manage on premises and for NMD.

Only 35% of samples are first cuts and these have the lowest percentage positive results, thus first cuts alone do not represent the microbiological loading on premises.

The cost saving of 65% varies from 0% for VLT to 81% for a standard throughput plant. Thus is inequitable for small players who process a greater percentage of first cuts.

No regulatory action is planned based on results of data collected.

4.2.2 Reduced sampling

Description One cut sampled per processing day for standard throughput.

One cut sampled per processing week on the same day rinsate sampling is conducted for VLT.

Random selection of sample. Record shed and cut.

Pros	Gain knowledge of pathways of infection across all cuts and sheds over time.
	Logistically easier for NMD using existing functions.
	Costs reduced 81% from an estimated $240,000 to $50,000 per annum.
	Maintains regulatory monitoring and review of farm practices at a much reduced cost to industry.
	Provides ongoing information essential to support decision making regarding responses. Removes lag time in review of biosecurity and micro loading on plant.
Cons	Training and time for caecal samplers needs to be maintained.
	Those with ongoing responses have been organic with high percentages of caecal.
	An ongoing cost to industry.
	No regulatory action is planned based on results of data collected.

4.2.3 Throughput – based testing

Description	Vary the amount of caecal testing based on the throughput of the processing premises as follows:
	Standard throughput = over 1,000,000 birds per year – current caecal testing
	Very Low throughput(VLT) = Between 150,000 – I,000,000 birds per year - test caecals once a week on the same day as carcass tests are done
	Very Very Low Throughput (VVLT) = a maximum of 150,000 birds/year (= 0.17% of the broiler market). – no testing
Pros	Testing would be more proportionate to the risk (which relates to the level of exposure the population experiences from the premises given the number of broilers that they are putting onto the market).

Very Low throughput (VLT) plants would save sampling, testing and courier costs as carcass and caecal samples would be submitted on the same day. (Currently those plants must take caecal samples every processing day, and carcass samples only one day a week). This would save them 80% per annum.

Very Very Low Throughput (VVLT) plants would not have to test. This would save them 100% per annum.

Provides ongoing knowledge of on-farm *Campylobacter.*

Cons

Inequitable.

There are very few poultry premises (currently 11) and only 3 of those fit the current VLT category. Using the above definitions there would be only one VLT premises and only two fitting the Very Very Low Throughput category.

The smaller plants have had more compliance problems than the larger plants.

Larger plants would not benefit from the changes. There would be 0% saving for standard throughput. Only 5% saving to industry overall.

Logistically complex.

No regulatory action is planned based on results of data collected.

4.2.4 Performance – based testing – link to CPT results

Description

Premises that comply with the *Campylobacter* performance targets described in NMD schedule 1 permitted to cease caecal sampling.

Premises that fail the performance targets could be required to:

- re-instate caecal sampling at response 3 to determine whether or not a change to the farm status is contributing to their poor performance, or
- re-instate caecal sampling as a sanction at response 5.

Pros

Allows industry the freedom to work out the best interventions to achieve compliance (whether on farm or in process).

Assists poor performers to determine corrective actions

Large cost saving for most of the industry. So far companies have reached response 3 approximately 10 times since the target came into force. Only 3 companies have got to response 5.

Provides NZFSA with some on-farm data for poor performers which are the ones that are of most interest. This allows NZFSA to check whether farm status has changed and whether this is contributing to the problem in premises

Cons

Current poor performers could struggle financially to do testing.

Caecal testing will be of little use to organic/free range processors who generally have positive farms.

Additional NZFSA resource needed for monitoring of responses.

Lag period before response required will not identify possible areas of concern in time for changes to current flocks being processed.

Lack of effective interventions at livestock means the additional data will give a greater understanding of the problem – but not necessarily of the solution.

Logistically complex.

No regulatory action is planned based on results of data collected.

4.2.5 Sentinel sheds only

Description

Test sheds selected as “sentinels” or “indicators”. (The actual number of sheds would need to be decided.)

Pros

Trends and seasonal differences could be detected.

Differences between cuts could still be monitored.

Cost would be significantly reduced compared to status quo.

Cons

Logistically complex.

No regulatory action is planned based on results of data collected.

4.3 No caecal testing

Description

Remove caecal testing requirement from NMD (but leave database open for voluntary use by industry).

Pros

Data indicates national trends in positive caecal samples closely matches national trends in positive rinsate samples, so loss of information minimal.

Savings estimated at $260,000/year (laboratory and labour costs).

Surveys could be done if justified by new information / interventions.

Cons

May not realise if there are changes in shed/farm status over time.

Processors may lose a monitoring tool to assist in on-farm management practices. They may reduce their focus on shed improvements and rely solely on processing interventions to manage Campylobacter.

5 Implementation Issues

Schedule 1 of the NMD specification would need to be amended to make any change to the NMD. This would mean a separate consultation but could take into account discussions with the poultry industry to-date.

6 Comparison of Options

		Options						
		4.1 Status Quo	4.2.1 First Cut Only	4.2.2 Reduced Sampling	4.2.3 Throughput-based	4.2.4 Performance-based	4.2.5 Sentinel Sheds Only	4.3 No testing
Pros	Decreased Cost	X	✓	✓	✓	✓	✓	✓
	Keep info on production so can detect trends, seasonal variation	✓	X	✓	✓	X	✓	X
	Keep info on biosecurity before cuts	✓	✓	✓	✓	X	✓	X
Cons	No planned regulatory action	✓	✓	✓	✓	✓	✓	✓
	Inequitable (small v large) $		✓	X	X	✓	X	X
	Inequitable (small v large) risk		?	X	✓	X	X	X
	Loss of some info		✓	✓	✓	✓	✓	✓
	Lag period before response					✓		
	Logistically complex compared with status quo		✓	X	✓	✓	✓	X
	Samplers needed (training etc)	✓	✓	✓	✓	✓	✓	X
	Industry supports	X	?	?	?	?	?	✓

Note – some options could be combined, e.g. throughput based options could also go for first cut sampling only for standard throughput.

7 Preferred Option

NZFSA prefers the option of removing all caecal sampling of broiler chicken, for the following reasons:

1. A body of robust scientific information is now available on the epidemiology of *Campylobacter* in slaughter populations
2. National trends in positive caecal samples closely matches national trends in positive rinsate samples
3. Regulatory controls at farm level are unlikely to be imposed in the short or medium term
4. Costs of an ongoing programme incurred by the New Zealand poultry industry are high.

8 Decision Making

NZFSA reserves the right to revise this position on caecal sampling of broiler chicken in light of any new information becoming available as a result of the required consultation process.

9 Future Direction

NZFSA may revise its position on caecal sampling given further scientific knowledge of on-farm controls becoming available. The poultry industry would be fully consulted in the normal manner if this should occur.

Industry may wish to use the caecal sampling part of the NMD Database on a voluntary basis. This will be discussed at the joint NZFSA/industry meeting on 16th March 2009.