

## Additional Background Information

Draft import health standards for pig meat and pig meat products, based on an import risk analysis on porcine reproductive and respiratory syndrome virus (PRRS) in pig meat

12 November 2007





## PURPOSE

*To explain the context of this draft IHS, including why it is being released for public consultation and the process that led to its development.*

1. Pig meat was imported into NZ without sanitary measures for porcine reproductive and respiratory syndrome (PRRS) virus until September 2001. At that time MAF imposed provisional sanitary measures (cooking or pH treatment) until further research could be carried out and a new assessment of the risk could be completed.
2. The MAF risk analysis on PRRS virus in pig meat was released for public consultation on 25 July 2006 following internal and external technical review. The risk analysis recommended that an alternative risk management option for effective management of the risk of PRRS in imported pig meat was restricting untreated pig meat imports to consumer-ready, high value cuts. The basis for the recommendation was that the likelihood of introduction of the virus in pig meat would be decreased if major lymph nodes were removed, and the likelihood of raw scraps being generated from these high value consumer-ready cuts prior to cooking was negligible. It was considered that this measure, together with the Biosecurity (Meat and Food waste for Pigs) Regulations 2005 and standard biosecurity practices on pig farms could effectively manage the identified risk.
3. Submissions were received from 44 stakeholders, mostly from pig farmers or their representatives opposing any change in current measures. Several submissions were received from overseas trading partners opposing any sanitary measures for PRRS in pig meat.
4. MAF released a review of submissions document on 11 June 2007, after considering all points made in submissions.
5. A submission was received from the NZ Pork Industry Board (NZPIB). Key concerns of the NZPIB included that a) the risk analysis underestimated the scale and scope of the risk; b) given the volumes of pigmeat that are likely to be imported and the incomplete compliance with the waste feeding regulations, it was inevitable that PRRS will be imported and will infect the commercial pig industry; c) the risk of spread was underestimated; and d) the consequences assessed did not cover the flow on effects for rural support services and communities. NZPIB claimed that MAF's interpretation of the scientific literature, and therefore MAF's assessment of the risk, was flawed, as key scientific literature had not been considered, and other literature had been interpreted selectively with key data being disregarded.
6. In light of this, MAF initiated a further round of external technical review, again using recognised international experts on this disease. The key technical points made in the NZPIB submission were sent to seven reviewers seeking their comments. MAF was seeking scientific information that would challenge assumptions or conclusions as opposed to personal opinions or judgements on the quality of assumptions. This extra round of external review was summarised in the review of submissions. Although there are differences of opinion among scientists as to how certain matters of scientific uncertainty might be interpreted, it was considered that no new information was

presented in this extra round of external technical review. It was concluded that the recommendations of MAF's 25 July 2006 Risk Analysis were sound and that it was appropriate to base an Import Health Standard on them.

7. The NZPIB points were carefully considered by MAF in the review of submissions, firstly in 88 separate points in the main body of the document, and secondly in the further round of external expert opinion on the technical issues raised in the NZPIB submission.
8. On 31 August 2007 NZPIB presented MAF with a draft document dated 30 August 2007 entitled "Further Science report for Biosecurity New Zealand from New Zealand Pork Industry Board Concerning the Implication of a Proposed Relaxation of Import Health Standards to Allow Importation of Raw Pork Products." MAF agreed to treat the material in the draft report as final if no further document were submitted by NZPIB within a week. Further, MAF agreed to review the material in the report and to consider the effect that it had on decision-making. The review of that material, entitled "EVALUATION OF NZPIB NEW SCIENCE REPORT SUBMITTED TO MAF ON 31 AUGUST 2007", was essentially complete by the end of September. However, on 15<sup>th</sup> October NZPIB submitted to MAF their final version of their "further science" report dated 5 October.
9. Of the scientific studies cited by the NZPIB, all but one were considered to be consistent with the published risk analysis. The NZPIB discussed one recent unpublished study which was known to MAF and our knowledge of this was previously communicated to NZPIB on 16 July 2007. The preliminary results of this study suggested that, if PRRS virus were introduced into New Zealand pig herds by the illegal feeding of raw pig meat in quantities sufficient to cause infection, there may be a low risk of aerosol spread to commercial herds that are within 120 meters of an infected herd comprising about 60 pigs. In other words, there may be a slightly higher likelihood of limited airborne spread than that reported in the risk analysis, in the event that PRRS were to become established in this country. However, the propriety of extrapolating field trial results from Minnesota to the New Zealand environment is unknown. Other studies cited by NZPIB in relation to aerosol transmission have been superseded by this field trial.
10. One study cited by NZPIB suggested, based on PCR results, that the risk analysis conclusion that 90% of PRRSv infectivity is lost within a week at 4°C may not always be valid. However, further consideration of this issue has revealed a number of reservations about the ability of PCR results to predict infectious virus. Furthermore, the European Food Safety Authority (EFSA) report concluded that the level of PRRSv in meat at 4°C declines by a factor of ten for each 30 hours stored. Therefore it is considered reasonable to conclude that most infectivity is lost from meat stored in a refrigerator after only a few days.
11. The significance of studies cited regarding the mechanical transmission of PRRSv by insects in relation to viral spread under natural conditions remains uncertain. Studies cited regarding PRRS virus evolution are consistent with the risk analysis. Recent publications in relation to infection dynamics within groups of pigs, PRRSv immunity and control of disease, and diagnostic testing issues did not affect the conclusions of the risk analysis.

12. Two models for PRRS were presented in the NZPIB material – an exposure model and a secondary transmission model. The exposure model estimated the number of primary infected herds resulting from imported pig meat being fed raw to pigs in household garbage, and the transmission model estimated the spread of infection from primary infected herds to other pig herds in various sectors of the pig industry.
13. Of the twelve parameters in the exposure model, at least eleven appeared to be either incorrect or based on assumptions with very limited, contradictory, or no supporting evidence. The model failed to consider the conditions that pig meat would be exposed to during transport to New Zealand and the loss of infectivity as meat passes beyond its ‘use-by’ date. Furthermore, it is doubtful whether the model actually addressed the commodity in question at all, that is, consumer-ready, high-value cuts.
14. A key assumption in the model was that 10% of every pork meal consumed in New Zealand households would be discarded as raw scraps. Papers cited regarding the level of raw scrap generation from fresh meat highlighted the lack of hard data to enable accurate prediction. However, it was noted that one of the more reliable estimates for this cited by NZPIB appeared to have been disregarded in selecting parameters for their exposure model. If data cited by NZPIB for the rate of raw meat scrap generation was used (1% instead of the assumption of 10%), the exposure model in the draft “further science” report predicted that even if *all* pork in New Zealand was imported *without* sanitary measures from countries with PRRSv and *none* of this was subject to processing likely to destroy this virus, then (if *all the other assumptions* made in this model were accepted) there would be zero incursions of PRRS per year into New Zealand pig herds. However, the NZPIB model was amended in the final “further science” report so that there is a higher likelihood of small scraps being infectious (in the draft NZPIB model, scraps smaller than 20g were initially not assumed to be infectious, while now they are assumed to have a 10% likelihood of being infectious). No rationale or scientific evidence was provided to support this change. The result of this change in the model is a substantially higher number of predicted incursions in the above scenario.
15. Since the commodity in question is high value consumer ready cuts, it is likely that even a rate of 1% for discard of uncooked scraps at the household level is unrealistically high. Therefore there is no reason to question the major premise behind the recommendation to manage the risk by restricting raw pork imports to consumer-ready high-value cuts – that is, the likelihood of generating a significant quantity of raw scraps from this type of pig meat prior to cooking is negligible.
16. The spatial spread model was less transparent than the exposure model as it relied upon the InterSpread Plus package. If the parameters in this model were accepted as reasonably representing standard industry practices in New Zealand, the model suggested that if PRRS were introduced and no attempt was made to control or eradicate the disease, then it would gradually spread throughout the pig industry. The parameters used in this model appeared to be based largely on untested assumptions. Its predictive capacity should therefore be regarded with some caution.

17. In summary, notwithstanding the uncertainty surrounding short distance airborne spread from backyard pig herds that are illegally fed sufficient raw pork to result in PRRS infection, the information provided by the NZPIB in their draft and final “further science” reports did not support a change in the conclusion of the risk analysis – that is, that the risk of PRRS in pig meat can be effectively managed by limiting importation of uncooked pig meat to consumer-ready high-value cuts. The adoption of this risk management measure would ensure that the PRRS risk posed by this pathway is negligible. The key logical steps behind this conclusion are summarised in the following updated “cascade of risk reduction”, a concept that was introduced in the review of submissions to aid communication of the complex technical and practical issues that characterize this risk analysis.

## UPDATED “CASCADE OF RISK REDUCTION” FOR IMPORTED CONSUMER-READY HIGH-VALUE CUTS

- i. Only 1.2 percent of carcasses contain infectious PRRS virus at the time of slaughter.

This estimate of 1.2% is based on a single Canadian study which took meat samples from pigs at the time of slaughter in commercial slaughterhouses and immediately froze these samples at minus 70°C in order to maximize virus survival for the purposes of that study.

- ii. The level of PRRS virus present in pig meat imported from countries that have the virus can be expected to be much lower at the point of consumption than the levels found in the Canadian study.

EFSA estimated that normal processing (bleeding, chilling, freezing & thawing) would reduce the level of virus by 2-4 logs. That is, the level of virus in meat that is processed normally, imported in frozen form and thawed for consumption is up to 99.99% lower than the level at slaughter.

EFSA concluded that the level of PRRS virus in meat at 4°C declines by a factor of ten for each 30 hours stored. Therefore it is considered reasonable to conclude that most infectivity is lost from meat stored in a refrigerator after only a few days. Considering the transport time required for meat from North America or Europe, imported chilled pig meat would be expected to have very little infectivity present even if it came from infected pigs.

Chilled meat is most unlikely to be airfreighted to NZ from any of the northern hemisphere countries. Currently the vast majority of pigmeat imported into NZ is frozen, and only a tiny proportion is imported chilled from Australia. As northern hemisphere countries appear unable to compete with Australian chilled exports for the Asian market, it is considered highly unlikely that they would be interested in airfreighting chilled meat to New Zealand. Therefore, it is likely that all meat coming from the northern hemisphere will be in frozen form, with the effect that, as discussed above, the level of PRRS virus in that meat when consumed would be 2-4 logs less than the level at slaughter.

- iii. Imported pork, in the form of consumer-ready high-value cuts, would have to find its way onto a property where backyard pigs are kept.

There are currently around 1.6 million households in New Zealand. The number of households with pigs is unknown, but the NZPIB model presented 'a most likely estimate' of 12,000 households with pigs. There is very little data to either support or challenge this estimate. However, it is reasonable to suggest that people with backyard pigs keep them in order to achieve some degree of self-sufficiency in pork, so such individuals may be less inclined to purchase pork.

If pork were purchased at various times by such households, it is unlikely that it would all be in the form of imported consumer-ready high-value cuts, which is the only form that could be considered to pose any risk of PRRS.

- iv. Uncooked scraps of meat would have to be generated from the imported consumer-ready high-value cuts.

The nature of consumer-ready high-value cuts means that they would not be likely to be trimmed prior to cooking for human consumption. Data cited by NZPIB indicated that in the UK around 1% of purchased meat may be disposed of as raw trim. However, the level of scrap generation from consumer-ready high-value cuts is likely to be significantly lower than this.

- v. Scraps of fat and bone would be much less likely to contain infectious virus than scraps of muscle meat

EFSA noted that macrophages are the main target cells for PRRS virus, especially mature cells of that type in the lungs and blood stream. Such cells are rarely found in fat, and the precursor cells in bone marrow do not support PRRS virus growth.

- vi. Raw meat scraps would have to be disposed of very quickly

Since the virus is inactivated quickly at room temperature, any delay in disposal of meat scraps would result in further inactivation of any virus present. Holding scraps in a garbage bucket overnight prior to disposal, especially where there might be any temperature rise above normal room temperature due to fermentation, would result in further virus inactivation. EFSA suggest that a minimum of 16 hours is likely to elapse between disposal and feeding, which would result in a further 32% decay of any PRRS virus present.

- vii. Raw meat scraps would have to be disposed of in garbage rather than by other routes

It is reasonable to assume that even in households that keep backyard pigs, not all scraps of raw meat generated in kitchen waste would be put into the garbage. Some may be fed to dogs or cats or disposed of in an "insinkerator", rubbish bin, or compost heap.

- viii. Garbage containing raw meat scraps would have to be fed to backyard pigs rather than disposed of in other ways.

An unknown proportion of backyard pig owners would be disinclined to feed raw pork to pigs on personal/ethical grounds or due to knowledge of the garbage regulations.

- ix. Pigs would have to ingest enough raw meat scraps to constitute an infectious dose

This would be affected by how long the meat was held at room temperature beforehand, and by competition from other pigs. The minimum size of meat scrap that is capable of resulting in infection when fed to pigs is unknown. Only 2 feeding trials have been carried out, and the amount fed to each pig in those trials was 500-900g. Experiments have not been done to determine if smaller amounts might be enough to result in infection.

- x. It is likely that the raw meat scraps would have to be chewed rather than swallowed whole for infection to be possible.

This assumption is based on what is known about the sensitivity of the PRRS to acid conditions. It is likely that the acidity of the stomach would destroy the virus, so meat scraps that were gulped whole would probably not result in infection. Rather, the likely point of entry to the body for virus in food is probably via the tonsil, into lymphoid tissue where it is known that the favoured target macrophage cells are present and where PRRS virus growth can occur.

If there is competition for food from other pigs, leisurely chewing is unlikely, so infection may be more likely in single pig units.

- xi. An infected pig would have to develop viraemia and pass infection on to other pigs

If all the above steps were to occur, there would be no spread unless there were more than one pig in the herd. Infection in a single backyard fattener pig would quite likely not be seen and the virus would not spread, so the single pig unit is likely to be a “dead end”.