

The Senate Rural and Regional Affairs and Transport References Committee
PO Box 6100
Parliament House
Canberra ACT 2600

Dear Senators,

Please find enclosed an article in the August 2010 edition of Australian Veterinary Journal which has appeared after the 5TH August 2010 closing date for submissions to your Committee's examinations of animal bio-security and quarantine arrangements in 2010.

Also enclosed is an email sent to the authors in appreciation of their article.

The article highlights the complete lack of co-ordination between States and Federal Governmental Departments of Agricultures in this issue.

This lack of co-ordination occurs also in the hygiene controls of the fresh and frozen pet meats sold within Australia to pet owners.

The article also points to immediate risks of introducing diseases such as Foot and Mouth.

It is exceptional and very pleasing to have such an exposé in our Australian Veterinary Journal.

Yours Sincerely

Robert Steel B.V.Sc. M.R.C.V.S.
Registered Veterinary Surgeon N.S.W.

Feeding of prohibited substances (swill) to pigs in Australia

N Schembri,* M Hernández-Jover, J-A Toribio and PK Holyoake

Objective To assess current swill feeding legislation, swill feeding investigation practices by authorities and feeding practices of pig producers who trade via saleyards in eastern Australia in order to determine levels of understanding and conformance related to current swill feeding legislation.

Method A three-tiered approach was undertaken to gather information on the feeding of prohibited substances (swill) to pigs in Australia. Firstly, a review of swill feeding legislation was undertaken to highlight the commonalities and inconsistencies between the various state and territory legislations in defining swill. Secondly, agricultural authorities were contacted in each state to gather information on swill feeding investigations undertaken in 2006. Finally, face-to-face interviews were conducted with 106 pig producers who traded pigs at one of six saleyards in eastern Australia to ascertain their knowledge of swill feeding and to determine the feeding practices of this sector of the industry.

Results Areas of concern identified included (1) inconsistencies in the feedstuffs classed as 'swill' among states, (2) the number of producers who had been prosecuted for swill feeding in 2006 ($n = 4$ of 148 inspections), (3) the low knowledge base of producers who sell pigs at saleyards regarding swill feeding, and (4) the types of feedstuffs provided to pigs marketed at saleyards.

Conclusion Our findings highlight the need for a consistent definition for 'swill' across Australian states and for improved awareness of swill feeding among producers, particularly those who market pigs at saleyards.

Keywords Australia; emergency animal disease; foot and mouth disease; legislation; pigs; swill

Abbreviations ASF, African swine fever; CSF, classical swine fever; DAFF, Department of Agriculture, Fisheries and Forestry; DPI, Department of Primary Industries; EAD, emergency animal disease; ELISA, enzyme-linked immunosorbent assay; FMD, foot and mouth disease; GLM, generalised linear model; PRRS, porcine reproductive and respiratory syndrome; SVD, swine vesicular disease

Aust Vet J 2010;88:294–300

doi: 10.1111/j.1751-0813.2010.00604.x

Swill feeding, the feeding of meat and meat products to pigs, is of international concern because of the risk of transmission of emergency animal disease (EAD) viruses to pigs. Foot and mouth disease (FMD) is regarded as the greatest EAD risk to any pork industry because pigs, although less susceptible to aerosol infection, are highly susceptible to oropharyngeal infection via feeding of FMD-infected feed waste.^{1,2}

*Corresponding author.
Farm Animal and Veterinary Public Health, Faculty of Veterinary Science, University of Sydney, 425 Werombi Road, Camden, New South Wales 2570, Australia;
n.schembri@gmail.com.

The role of pigs in exotic disease outbreaks was most evident in the 2001 outbreak of FMD in the UK, which was thought to have originated on a piggery feeding contaminated waste to pigs.³ Although no other piggeries were directly involved in the spread of the disease, the rate of amplification from the initial herd was enough to infect nearby flocks of sheep, resulting in 6 million animals being condemned on over 2000 properties.¹ That disease outbreak demonstrated how FMD could be introduced via contaminated meat products, particularly if strict swill feeding controls are not enforced. The virus is known to survive for up to 48 h at 4°C and pH < 6 in fresh meat products, up to 6 months in partially cooked, cured and smoked meat products and 15 days in inadequately pasteurised milk products.³ Illegal smuggling of animal products was thought to be the most likely route of FMD introduction to the UK in the 2001 outbreak.⁴ Other diseases that can be introduced by the swill feeding of pigs include swine vesicular disease (SVD), classical swine fever (CSF), porcine reproductive and respiratory syndrome (PRRS) and African swine fever (ASF).¹ Swill feeding of pigs has been linked to the introduction of SVD in Portugal (June 2007), ASF in Georgia and Armenia (2007), ASF in Tanzania (January 2005) and PRRS in The Republic of South Africa (August 2004).⁵ FMD involving pigs was last seen in Australia in 1871, and the last outbreak of CSF was in 1960–61, caused by suspected swill feeding. Australia has had no reported cases of ASF, PRRS, SVD, vesicular exanthema or vesicular stomatitis.

Prior to the 2001 outbreak of FMD in the UK, it was a requirement to "properly process" swill before it was fed to livestock on approved and licensed premises.⁶ The piggery suspected of initiating FMD outbreak possessed such a license. The Department for Environment, Food and Rural Affairs has since banned the practice of feeding swill to pigs in the UK.⁶

In developed countries, pigs are generally fed concentrated feed that consists mainly of cereal and protein supplements. Feed represents a high proportion of the cost of rearing pigs and ranges from 50% to 75% depending on the cost of the feed.^{7–9} The percentage of cost that comes from feed is a factor of feed costs and varies considerably between countries. Waste material from food for human consumption is widely used, either as an ingredient in purchased commercial feed (such as biscuit and chocolate) or purchased direct and mixed with grain produced on-farm (such as dairy or bakery waste).⁹

In 2006, a report on the management of animal and plant diseases in New South Wales (NSW) raised concerns that awareness of illegal feeding practices by backyard and small-scale producers was low.¹⁰ The same report also highlighted that, although random swill feeding inspections by government authorities was occurring, more targeted inspection of suppliers of swill (bakeries, restaurants and supermarkets) was required.¹⁰

Anecdotal evidence suggests smallholder producers and producers residing in peri-urban areas are a challenging sector of the pork

industry to locate and study. This sector of the pig-rearing community has been traditionally perceived to have a higher likelihood of illegal swill feeding than mainstream producers. For example, a recent risk analysis suggested that the feeding practices of smallholder and backyard pig producers would lead to a high annual likelihood of FMD exposure with extreme consequences.¹¹ In addition, recent studies suggest livestock auctions at saleyards, which feature predominantly among peri-urban traders, are an avenue for disease dissemination.¹²

There is limited published data on the feeding practices of smallholder pig producers in Australia. The objective of this study was to gather information on the feeding of prohibited substances (swill) to pigs in Australia to support subsequent risk assessment activities for exotic disease introduction into this country. We also sought to identify areas where the uniformity of legislation and producer awareness of swill feeding could be improved.

Materials and methods

Swill feeding legislation review

A review of legislation regarding illegal feeding practices relevant to pigs was undertaken from January to March of 2006. From this, a database of the various state legislative Acts and Regulations pertaining to the feeding of swill to pigs was compiled.

Consultation process

A steering committee of relevant stakeholders to the pork industry, including Australian Pork Limited, QAF Meat Ltd and state regulatory bodies, was established as a conduit for consultation with state departments of primary industries or agriculture and the Australian Biosecurity Co-operative Research Centre. The legislative Acts and Regulations relevant to swill feeding from the Australasian Legal Information Institute internet site (<http://www.austlii.edu.au/>) were reviewed, focussing on identifying inconsistencies and risk areas in the current system for each state and territory of Australia. A report on the results was distributed to the steering committee members and relevant government agencies and regulators to ensure the information was accurate. Feedback was received through the consultation process. Interpretations of the legislation were adjusted where relevant to assimilate the expert interpretation of the state-based regulators.

Swill feeding inspection review

A review of swill feeding inspections undertaken during the 2006 calendar year by relevant agricultural government agencies within all Australian states was conducted. Selection of relevant agencies was based on advice obtained by the steering committee outlined above.

Interview study

Saleyard selection. This study focussed on the production practices of producers who traded pigs at saleyards in eastern Australia; namely, Queensland (QLD), NSW and Victoria (VIC). These three states have 71.6% of the national sow herd and represent 71.1% of the pig farms in Australia.¹³ In total, 25 of the 30 saleyards in Australia that conduct pig auctions regularly (12 of 15 saleyards) and occasionally (13 of 15 saleyards) are located in these states (Salter, personal communication, 2007), representing 62.8% (123,845 pigs) of the 2006–07 national pig

throughput at saleyards (197,144 pigs; Jackson, Pollock and Van Dissel, personal communication, 2008).^{14,15}

Two saleyards (1 peri-urban and 1 regional) with a relatively high and consistent throughput of producers and pigs where sales were held on a weekly or fortnightly basis were purposively chosen in each of the three states.

Producer recruitment. Interview participants were sourced from two saleyards in each of the three study states and a total of 106 pig producers participated QLD (n = 24), NSW (n = 39), VIC (n = 43)).

From November 2006 to February 2007, two researchers conducted most of the personal interviews either on-farm (32%; n = 34) or at the saleyard (52%; n = 56). A small number of interviews were conducted over the telephone because of the remoteness of the producers' locations (15%; n = 16). If producers were interviewed by phone, a letter explaining the study and a copy of the questionnaire were posted to them prior to the interview taking place. Each participant was offered an incentive of an AUS50 gift certificate and received printed educational material on pig farm biosecurity published by Animal Health Australia.

Questionnaire design. Our eight-page questionnaire was written in English and comprised 59 short, closed questions in a simple and clear format to minimise confusion and maximise response accuracy.^{16–18} It covered six topics (producer demographics, husbandry practices, feeding practices, herd health, biosecurity and pig identification/movement practices), taking up to 30 min to complete. Only the results pertaining to feeding practices and producer's perceptions on prohibited feedstuffs (3 questions) are described here. The questionnaire was piloted among 10 people familiar with producing pigs and modified accordingly to improve clarity prior to undertaking the interviews.

Statistical analysis

Data were entered in a purpose-built relational database (Microsoft® Access 2002) and checked for typographical errors. Validation checks were performed to identify improper categorical entries and numeric extremes. All identified errors were corrected.

To describe the interviewed population, respondents were initially categorised by herd size. Smallholder pig herds were defined as having 0–149 sows (n = 97; 91.5%), with larger herds having > 150 sows (n = 9; 8.5%). Twelve pig producers reported having no sows present at the time the interview was undertaken. These herds had between 0 and 300 grower pigs on-farm. Literature on Australian and North American sow herd equivalents suggest 1 sow is equivalent to between 10 and 15 grower pigs.^{19,20} Based on this, all 12 producers reporting grower herds of up to 300 pigs (equivalent to approximately 30 sows) were classified as being small-scale (0–149 sows).

Producers were also classified according to their area of residence, either peri-urban or regional. Peri-urban producers were defined as those living within a 100-km radius of a capital city or within a 20-km radius of a rural centre with a population of more than 30,000 residents.^{21–23}

Descriptive and statistical analyses were performed using GenStat 9.1© (PC/Windows XP, 2006). A chi-square test could not be used to

analyse the interview study results because of the small sample size of large-scale producers ($n = 9$) and the recurrence of expected values < 5 . Consequently, logistic regression was used to investigate associations between the outcome variables (producer feeding practices) and herd size (0–149 sows or >150 sows) and producer type (peri-urban or regional). The practices investigated included the feeding of 9 different feed types and the sourcing of feed from 5 different sources, and each outcome variable was coded as 1 when a feed type was given or when feed was obtained from a feed source and as 0 when it was not. Associations with each outcome were determined using separate univariable models including either herd size or producer type as the fixed effect. The feeding practices specifically of small-scale producers were then further analysed in a similar manner to investigate association with motivation to keep pigs (primary income, secondary income or other reasons) and state of trading (QLD, NSW or VIC), each evaluated separately as a fixed effect.

Binomial generalized linear models (GLM) were constructed to identify differences between feed types given to pigs separately within each category of herd (smallholder and large-scale herds) and of producer type (peri-urban and regional herds). For each category a separate GLM model was constructed with feed provided (coded as 1 when feed given and 0 when not) as the outcome variable, feed type as the fixed effect (coded 1–9 for each feed type) and farm included as a random effect to account for expected clustering of feed type given within farm. The same GLM approach was used to identify differences in feed source within each category, with feed source (coded 1, 0) as the outcome variable and feed source as the fixed effect (coded 1–5 for each feed source).

Results

Swill feeding legislation review

Each state was found to be responsible for separate swill feeding regulations, with all states and territories prohibiting the feeding or access of swill to pigs. The definition of swill differed among state jurisdictions. There was no legislation pertaining to swill feeding in the Australian Capital Territory (ACT) because pigs are prohibited from being kept there. The legislation relating to feeding prohibited substances to pigs in each state or territory is listed in Table 1.

Prohibited feed material. The definition of swill was similar for NSW, QLD and Western Australia (WA), and included any carcass or part of a carcass (including meat, offal, tissue, blood or bone) of any mammal or bird (Table 2). Animal-contaminated matter was also considered swill and referred to the waste or residue that may contain animal matter, or been in contact with animal matter, such as restaurant food scraps that have been in contact with meat. In NSW and South Australia (SA), stock food that consisted wholly or partly of faeces is also considered swill.

In VIC, SA and Tasmania (TAS), the definition of swill is restricted to placental mammals and excludes poultry, marsupials and monotremes (Table 2). The definition of swill in the Northern Territory includes placental animals and poultry.

In QLD, NSW, VIC and SA swill feeding regulations have been expanded to encompass the pigs' environment, so that pigs are prevented from grazing on, being housed on or being fed any pasture or crops grown on land used for depositing or spreading faecal material, except where approval had been sought from the state's department of primary industries.

Exceptions. Most states (SA, WA, TAS and the NT) allow pigs to be fed prohibited substances that have been treated via rendering, provided that the rendering process had approval from the relevant State Government Officer (usually the state's Chief Veterinary Officer).

In WA, treatment licenses are issued to owners of a registered abattoir, treatment premise or owners of pigs that will be fed the treated products. All pigs kept in such systems must then be sold for direct slaughter only and the treatment license is valid for 12 months.

Special mention was made in the NT of the treatment of food scraps to avoid the unintentional feeding of swill and the requirement to ensure feral pigs are excluded from places where food scraps may be present (National Parks or garbage refuse sites).

Allowed feed material. Milk and milk by-products of Australian origin or legally imported into Australia for human consumption are allowed to be fed to pigs in all states and territories (Table 2). Tallow and gelatine are acceptable sources of feed for pigs in all states. Cooking oil or oilseed waste is allowable in NSW, QLD and WA if it is

Table 1. Legislation pertaining to the feeding of prohibited substances to pigs by state (2006)

State	Regulatory body	Swill feeding legislation
Queensland	Queensland Department of Primary Industries and Fisheries (QDPI&F)	<i>Stock Act 1915 and Stock Regulations 1988</i>
New South Wales	New South Wales Department of Primary Industries (NSW DPI) and Rural Lands Protection Board (RLPB)	<i>Stock Diseases Act 1923 and Stock Diseases Regulations 2004</i>
Victoria	Victorian Department of Primary Industries (VIC DPI)	<i>Livestock Disease Control Act 1994 and Livestock Disease Control Regulations 1995</i>
South Australia	Department of Primary Industries and Resources South Australia (PIR SA)	<i>Livestock Regulations 1998</i>
Western Australia	Department of Agriculture and Food Western Australia (DAFWA)	<i>Exotic Diseases (General) Regulations 1970</i>
Northern Territory	Department of Business, Industry and Resource Development - Northern Territory (NT DPIF&M)	<i>Stock Diseases Act 2004</i>
Tasmania	Department of Primary Industries, Water and Environment, Tasmania (DPIWE TAS)	<i>Animal Health Act 1995</i>

Table 2. Allowed (A) and prohibited (P) feed substances for pigs in Australia by state

Feed substances	State						
	QLD ²³	NSW	VIC ³⁴	SA	WA ³⁵	NT ³⁶	TAS ³⁷
All meat and meat products	P	P	—	—	P	—	—
Placental mammals and products	P	P	P	P	P	P	P
Non-placental mammals and products	P	P	A	A	P	A	A
Meat meal	A	A	A	A	A	A	A
Faecal material (e.g. sprayed pastures)	P	P	P	P	—	—	—
Poultry	P	P	A	A	A	P	A
Eggs	A	A	—	—	A	P	—
Fish	A	A	—	—	A	—	—
Milk (of Australian origin or legally imported)	A	A	A	A	A	A	A
Bread (not in contact with meat)	A	A	A	A	A	A	A
Fruit or vegetables	A	A	A	A	A	A	A
Tallow	A	A	A	A	A	—	A
Gelatine	A	A	A	A	A	—	A
Cooking oil (treated, with no solids)	A	A	—	—	A	—	—

(—) Lack of information provided in the legislation and education materials to indicate whether the particular substances identified are allowed or prohibited.

NSW, New South Wales; NT, Northern Territories; QLD, Queensland; SA, South Australia; TAS, Tasmania; VIC, Victoria; WA, Western Australia.

free from solid particles and has been treated (rendered) after its last contact with animal matter. New South Wales was the only state to allow manufactured dry dog or cat food, non-meat bakery waste, fruit, vegetables, cereal or legume waste to be fed to pigs. Other states made reference to some of these substances in the swill feeding educational materials available to the public.^{24–28}

Swill feeding inspection review

There were 148 swill-feeding inspections undertaken in QLD, NSW, VIC, TAS, SA, WA, and the NT in the 2006 calendar year. As a result, 9 warning letters were issued to non-compliant producers and an additional 4 producers were prosecuted for illegal (swill) feeding practices. Inspections were not carried out in the ACT because pigs are prohibited.

In QLD, swill-feeding investigations were mostly undertaken during animal welfare investigations and/or following allegations of swill feeding (Skelton, personal communication, 2007). Victoria conducted swill inspections following allegations of swill feeding and/or during targeted visits to farms with a history of feeding swill (Harkin, personal communication, 2007). In 2006, the WA authorities provided information to 39 piggeries as a reminder that swill feeding is illegal and to 83 country retailers who were identified as potential suppliers of swill (Rodan, personal communication, 2008). In the NT, swill-feeding investigations were carried out during educational activities targeted at tourists with regard to feral pigs (Rodunz, personal communication, 2007). Tasmania's swill feeding investigations in 2006 were part of an awareness campaign during an update of the agriculture property database system or they occurred following swill feeding allegations (Conway, personal communication, 2007).

Producer interviews

Interviews with 106 pig producers who traded pigs at saleyards in eastern Australia revealed 5% and 14% of smallholder producers fed their pigs retail waste and/or table scraps, respectively. None of the large-scale producers fed these substances (Table 3). A small proportion of smallholder producers sourced their pigs' feed from supermarkets (4%) or from retail outlets such as cafés, restaurants and take-away shops (1%; Table 4). These smallholder producers predominately resided in regional areas. Large-scale producers did not source their pigs' feed from these outlets.

There were no differences between smallholder and large-scale producers in their understanding of the definition of swill, or between those residing in peri-urban and regional areas ($P > 0.05$). Almost all smallholder (95%) and all large-scale producers interviewed correctly classified feeding meat as swill. There appeared to be less clarity on allowable feedstuffs, with producers often identifying these as swill: table scraps (82%), dairy products (73%), eggs (82%) and fish (87%). There was no difference ($P > 0.05$) detected between smallholder and large-scale producers in their understanding of swill.

Further analysis showed producers who kept pigs for primary and secondary income purposes considered feeding table scraps to be swill feeding (79% and 90%, respectively; $P > 0.05$). Producers who kept pigs for acquisition of primary income and other reasons (hobby, food for home consumption or family tradition) claimed to feed their pigs bakery products and fruit and vegetables ($P > 0.05$). State comparisons of feeding practices showed that Victorian producers were significantly more likely to feed table scraps, bakery and dairy products and fruit and vegetables than producers trading pigs at saleyards in QLD and NSW ($P < 0.05$).



Table 3. Feeding practices of 106 producers trading pigs via saleyards in eastern Australia, according to herd size and location (2006)

Feed given to pigs (% of respondents)	Herd size		Producer type	
	0-149 sows	>150 sows	Peri-urban	Regional
Complete commercial feed	66 ^a	67 ^{a2}	84 ^{a,v}	59 ^{b,x}
Home-mixed commercial feed	52 ^{b,w}	89 ^{a,x}	55 ^w	55 ^x
Grain produced on-farm	39 ^w	67 ^{x2}	16 ^{b,w,yz}	52 ^{b,x}
Home table scraps	14 ^{x2}	0	19 ^{y,yz}	11 ^y
Retail waste food (café, shops)	5 ^{x2}	0	10 ^{y2}	3 ^z
Meat products (unprocessed)	2 ^z	11 ^y	3 ^z	3 ^z
Bakery items ¹	14 ^w	11 ^y	19 ^{x2}	12 ^y
Fruit or vegetables	24 ^w	11 ^y	32 ^w	19 ^y
Dairy products	13 ^x	22 ^z	23 ^{y2}	11 ^{y2}

^{a,b}Within a row and farm classification values without a common superscript letter differ (P < 0.05).

^{w,x}Within a column and variable, values without a common superscript letter differ (P < 0.05).

¹Bakery items not containing meat.

Table 4. Sources of pig feed of 106 producers trading pigs via saleyards in eastern Australia, according to herd size and location (2006)

Source of pig feed (% of respondents)	Herd size		Producer type	
	0-149 sows	>150 sows	Peri-urban	Regional
Livestock produce/feed store	80 ^x	78	71 ^x	84 ^x
Retail outlets (e.g. café, restaurants)	1 ^z	0	0	1 ^z
Supermarkets	4 ^z	0	3 ^z	4 ^z
Buy grain and mix on-farm	47 ^y	78	45 ^y	51 ^y
Feed produced on-farm	39 ^y	44	26 ^y	45 ^y

^{a,b}Within a row and farm classification values without a common superscript letter differ (P < 0.05).

^{x,z}Within a column and variable, values without a common superscript letter differ (P < 0.05).

Discussion

In some cultures, it is common practice to feed human food waste to pigs, particularly by those living in close proximity to their livestock. Although many countries, including Australia, have banned the feeding of swill to pigs, it is often difficult to implement, regulate and enforce.²⁹ The majority of producers interviewed for this study knew that meat was swill, yet answers to some interview questions indicated they did not always follow the legislation. A proportion of small-scale producers participating in this study fed table scraps and food waste sourced from retail food outlets and supermarkets to their pigs. This result, coupled with the apparent confusion surrounding the definition and understanding of 'swill' and the number of swill feeding prosecutions, suggest current extension activities are not having the desired impact – either it is being ignored or is not reaching this sector of the pig-rearing community.

Under the Australian Pork Industry Quality Program, there is a condition for farms not to feed swill. In May 2008, however, three large-scale producers in regional NSW were charged with 14 offences

related to swill feeding and fined in excess of AUS\$2,000,³⁰ suggesting that swill feeding is not just a smallholder or peri-urban issue.

As of 2005, there were 2395 pig farms listed in Australia, with 1449 (60.5%) farms having 0-99 sows (i.e. smallholder production systems according to the Department of Agriculture, Fisheries and Forestry).¹¹ Queensland had the greatest proportion of the nation's farms, with 26.2%, followed by 25.6% of farms in NSW, 19.3% in VIC and 17.0% in SA.¹³ The NT and Tasmania have few pig farms under their jurisdictions, with 0.2% and 2.1% of the national herd, respectively.¹³ There are no pig farms in the ACT. Because of the sensitivity of state-based swill feeding information obtained, national rather than state figures are presented. Swill feeding inspections reported to have taken place in 2006 represented only 6.2% of the national herd and 10.2% of smallholder producers (according to DAFF's definition of 0-99 sows), if all inspections were of farms with less than 100 sows. The results show smallholder producers who trade pigs at live auction are more likely to feed non-commercial products to their pigs than large-scale producers. With so few swill feeding inspections undertaken in each state annually, there is a real likelihood that an

EAD such as FMD could be introduced without early detection and reporting.

Four of the eight states and territories in Australia still permit, approve and regulate the use of treatment licenses in their legislation for the feeding of swill to pigs. In 2002, DAFF reported that an outbreak of an exotic disease such as FMD would result in immediate loss of markets for wool, meat, dairy and live-exports in the order of AU\$13 billion over a 10-year period.^{31,32} Although there are currently no treatment licenses issued in Australia, this is still allowed in the legislation, with the potential for producers to contest.

Overall knowledge and understanding of what specifically constitutes swill by all interviewed producers was generally poor; however, the results indicate all producers are generally cautious about what they feed their pigs. It would appear that smallholder producers, in particular those producers trading pigs at live auctions in VIC, pose a potentially greater risk of swill feeding because they were more inclined to give non-commercially prepared feed or food waste to their pigs, which could include swill, compared with larger-scale producers. The introduction of a consistent definition of swill across all states would prevent unnecessary confusion between producers.

This study was part of a broader 3-year study focussing on the practices of pig producers who trade via live auction, with specific emphasis on biosecurity and EAD prevention. A 2-day National Forum was held in Sydney in August 2008 at the completion of the study and involved members from State DPIs, Animal Health Australia, Australian Pork Limited, producer groups and livestock producers. The forum participants made the following recommendations.

- Co-ordinate a national swill feeding reporting system to be put in place for uniform inspection procedures.
- Reporting swill feeding investigation outcomes to a central organisation (such as Animal Health Australia) to improve transparency among the States of this important surveillance activity.
- Undertake further research to determine whether current swill feeding messages are being ignored by producers or not reaching their audience.
- Investigate the most effective and efficient means of reaching pig producers to provide extension related to swill feeding if this message is not being received.

Presently, the legislative differences are being reviewed by the Animal Health Committee with a view to harmonising legislation nationally, reviewing current investigation practices by authorities and collating the national swill feeding data. A collaborative team from the University of Sydney, NSW DPI and Industry stakeholders are researching current extension methodologies used to reach pig producers and their effectiveness.

Acknowledgments

Research supported by the Australian Biosecurity CRC for Emerging Infectious Diseases. Available: <http://www.Labcrc.org.au/>. The authors would like to thank the assistance of Peter Thompson from the University of Sydney for his statistical assistance and the Project 3.016RE Steering Committee for their collaborative support. Duncan Rowland

(Animal Health Australia) and Bill Salter (Australian Pork Limited) assisted with the update of industry activity on the management of swill feeding in Australia.

References

1. Geering WA, Foreman AJ, Nunn MJ. *Exotic disease of animals: a field guide for Australian veterinarians*. Bureau of Resource Sciences, Canberra, 1995.
2. Kitching R, Alexandersen S. Clinical variation in foot and mouth disease: pigs. *Rev Sci Tech* 2002;21:513–518.
3. DEFRA. *Origin of the UK foot and mouth disease epidemic in 2001, 2002*. www.defra.gov.uk/footandmouth/pdf/fmdorigins1.pdf. Accessed 15 January 2008.
4. Bourn J. *The 2001 outbreak of foot and mouth disease: Report by the Comptroller and Auditor-General*. London: National Audit Office, 2002. http://www.nao.org.uk/publications/nao_reports/01-02/0102939.pdf. Accessed 18 July 2003.
5. ISID-ProMed. ProMed-Mail. In: International Society for Infectious Diseases, editor. *International Society for Infectious Diseases*, Brookline, MA, USA, 2009. http://www.promedmail.org/pls/otn/www_flow.accept. Accessed 6 April 2009.
6. Anderson I. *Foot and mouth disease 2001: lessons to be learned inquiry*. UK Department Environment, Food and Rural Affairs, 2002. http://archive.cabinetoffice.gov.uk/fmd/fmd_report/report/index.htm. Accessed 9 October 2005.
7. Department of Agriculture, Fisheries and Forestry. *Australian agriculture and food sector: stocktake*. DAFF, Canberra, ACT, 2005; 50–52. <http://www.daff.gov.au/agriculture-food/agfoodgroup>. Accessed 28 May 2009.
8. M'Gee D. Submission to Productivity Commission Pig and Pigmeat, Industries Inquiry and Safeguard Action Against Imports. Brisbane, Stockfeed Manufacturers Association of Queensland, 1998. www.pca.gov.au/_data/assets/pdf_file/0015/42045/sub042.pdf. Accessed 14 February 2008.
9. Royal Society. *Inquiry into infectious diseases in livestock*. Carlton House Terrace, London. Royal Society, 2002; 139. <http://royalsociety.org/inquiry/index.html>. Accessed 28 May 2009.
10. NSW Parliament Legislative Assembly, Public Accounts Committee. *Managing animal and plant diseases*. Sydney, Australia: Public Accounts Committee, 2006. [http://www.parliament.nsw.gov.au/prod/Parliament/Committee.nsf/0/8ca01fd5a8f7f9bfa25722f0012ec7b/\\$FILE/Final%20Report%2023%20November%202006.pdf](http://www.parliament.nsw.gov.au/prod/Parliament/Committee.nsf/0/8ca01fd5a8f7f9bfa25722f0012ec7b/$FILE/Final%20Report%2023%20November%202006.pdf). Accessed 1 December 2006.
11. DAFF. *Generic Import Risk Analysis (IRA) for Pig Meat: Final Import Risk Analysis Report: Biosecurity Australia*, 2004. www.daff.gov.au/_data/assets/pdf_file/0014/11930/2004-01a.pdf. Accessed 21 October 2006.
12. Schembri N, Hart K, Petersen R et al. Assessment of the management practices facilitating the establishment and spread of exotic diseases of pigs in the Sydney region. *Aust Vet J* 2006;84:341–348.
13. Australian Bureau of Statistics. ABS 7111.0: Principal Agricultural Commodities, Australia, 2005–06. ABS, Canberra, ACT, 2007. <http://www.abs.gov.au/AUSSTATS/abs@nsf/Previousproducts/7111.0Main%20Features42005-06?opendocument&tabname=Summary&prodno=7111.0&issue=2005-06&num=&view=->. Accessed 2 August 2007.
14. Meat and Livestock Australia. *National Livestock Reporting Service: Qld Pig Saleyard Survey (June 2007)*. MLA, Sydney, 2007.
15. Meat and Livestock Australia. *National Livestock Reporting Service: NSW Pig Saleyard Survey (June 2007)*. MLA, Sydney, 2007.
16. Dillman DA. *Mail and Internet surveys: the tailored design method*. 2nd edn. John Wiley, New York, 2000.
17. Dohoo I, Martin W, Stryhn H. *Veterinary epidemiologic research*. AVC Inc., Charlottetown, Canada, 2003.
18. Thrusfield MV. *Veterinary epidemiology*. 3rd edn. Blackwell, Oxford, 2005.
19. Morgan J. Responsible pig ownership: Information for local councils and pig owners. In: *Primefacts #712*, 2007. <http://www.dpi.nsw.gov.au/agriculture/livestock/pigs/management/responsible-pig-ownership>. Accessed 11 November 2009.
20. US Department of Commerce. *Live swine from Canada: Preliminary results of Countervailing Duty Administrative Review*, 56 FR 5676. International Trade Administration/Import Administration. Sect. IV. Other Provincial Programs: 4. Ontario Pork Industry Improvement Plan (OPIIP), 1991.
21. Australian Bureau of Statistics. *Australian demographic statistics: December quarter 2005*. ABS, Sydney, 2005. [http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/0B1E7CB656FC8C72CA2571800015FC8B/\\$File/31010_dec%202005.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/0B1E7CB656FC8C72CA2571800015FC8B/$File/31010_dec%202005.pdf). Accessed 2 February 2007.
22. Houston P. Re-valuing the fringe: some findings on the value of agricultural production in Australia's peri-urban regions. *Geog Res* 2005;43:209–223.



23. MacKenzie J, Wheian J, Oliver P. *Reconnecting fragmented landscapes: A scoping study on natural resource and environmental management in the peri-urban landscapes of South Eastern Queensland*: South East Queensland Catchments and the Coastal Cooperative Research Centre, 2006. <http://www.seqcatchments.com.au/periUrban/index.htm>. Accessed 2 February 2007.
24. Department of Primary Industries and Fisheries. *Swill feeding: feeding food or food scraps containing animal matter to pigs, poultry or ruminants. Why is it banned?* DPI&F Note. DPI&F Queensland, 2007. <http://www2.dpi.qld.gov.au/health/3579.html>. Accessed 12 July 2007.
25. Glynn T. *Swill feeding is banned in Australia*. Agriculture Notes: Victorian Department of Primary Industries, 2007. [http://www.dpi.vic.gov.au/dpi/nreninf.nsf/9e58661e880ba9e44a256c640023eb2e/692c1a7e598c5d9dca25730100024e0b/\\$FILE/AG0922_Jun07.pdf](http://www.dpi.vic.gov.au/dpi/nreninf.nsf/9e58661e880ba9e44a256c640023eb2e/692c1a7e598c5d9dca25730100024e0b/$FILE/AG0922_Jun07.pdf). Accessed 12 July 2007.
26. Butler R. *Swill feeding is illegal: Do not give food scraps to pigs*. Department of Agriculture and Food, Western Australia, 2006. <http://www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/AAP/P/HEA/SWILLFEEDINGOFFIG52.PDF>. Accessed 12 July 2007.
27. Morton R. *Don't feed swill to pigs*. AgNote. Northern Territory Department of Primary Industries, Fisheries and Mines, 2004. [https://transact.nt.gov.au/ebiz/dbird/TechPublications.nsf/66A254F8EAF55A6569256EFE004F65B6/\\$file/602.pdf?OpenElement](https://transact.nt.gov.au/ebiz/dbird/TechPublications.nsf/66A254F8EAF55A6569256EFE004F65B6/$file/602.pdf?OpenElement). Accessed 12 July 2007.
28. Department of Primary Industries and Water, Tasmania. *Swill and restricted animal materials feeding* 2007. <http://www.dpiw.tas.gov.au/inter.nsf/WebPage:EGIL5FDUNS?open>. Accessed 12 July 2007.
29. Teran MV, Ferrat NC, Lubroth J. Situation of classical swine fever and the epidemiologic and ecologic aspects affecting its distribution in the America continent. *Ann NY Acad Sci* 2004;1026:54-64.
30. NSW Department of Primary Industries. *Central West farmers fined \$32,980 for swill feeding racket*. Agriculture Today. New South Wales DPI, 2008. <http://www.dpi.nsw.gov.au/aboutus/news/recent-news/agriculture-news-releases/swill-feeding-racket>. Accessed 19 June 2008.
31. Department of Agriculture Fisheries and Forestry: Strategic Planning and Performance Reporting (SPPR) Team. *Annual report 2001-2001*. DAFF, Canberra ACT, 2002. <http://www.daff.gov.au/about/annualreport/01-02>. Accessed 2 October 2006.
32. Productivity Commission. *Impact of a foot and mouth disease outbreak in Australia*. Productivity Commission, Canberra, 2002. <http://129.3.20.41/eps/oah/papers/0207/0207001.pdf>. Accessed 29 May 2009.

(Accepted for publication 3 February 2010)

Dear Nick ,Congratulations to you and your colleagues on your wonderful article on "swill" feeding of domestic pigs in Australia, as it is in 2010, from your investigations in 2006-2008 ,published this month in the AVJ.

Your findings are vital not only from the risks from viral diseases transmitted to and by pigs.

Your findings illustrate the risks ahead from the indirect feeding of imported beef meats and beef meat products to pigs that can occur in the future.

"Swill"and packaged- ruminant origin meat meals for pigs ,dog and cat dry foods etc containing ruminant tissues (ALL these packaged foods are legally allowable to be fed to pigs in Australia BUT not to ruminants) may contain misfolded prion proteins from clinically normal cattle, whose beef muscle tissues and beef products may be imported into this country in the future .

These tissues of imported cattle may contain these rogue proteins .

We have no declared TSEs in Australia including BSE at the moment. Australia is unique in the world in this regard.

The amplification of BSE and TSEs prions which occur following passage through pigs, especially after their prior passage through sheep, is referred to you.

DAFF did not consider that these animal transmission experiments were important when they approved the relaxation of importation of beef and beef products into Australia in 2010.

DAFF was aware of the situation on swill feeding in 2010 and has allowed EACH State's Legislation to determine parochial policies ,ignoring National responsibility for coordination. This is the same situation as in the supervision of fresh meat for pets.

Until reason prevailed in March 2010 and an IRA was commenced , DAFF had done nothing to address the increased future risks of swill feeding or packaged ruminant origin meat meals etc feeding to pigs.

Thank goodness that you at the University are on the qui vive.

Again the profession's thanks for all your hard work and determination to seek out the state of a risk which my English colleagues cannot believe could exist after their problems with F&M.

Kind Regards

Beverley and Bob Steel(B.V.Sc. M.R.C.V.S)