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The Australian Animal Use Industry Rejects Anthropomorphism, But Relies on Questionable Science to Block Animal Welfare Improvements

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Abstract

Public interest in and concern for the welfare of farm animals is increasing. This has been reflected in changes by food retailers and others whereby products are sourced from suppliers which keep animals in improved conditions. Examples include bans on eggs from hens kept in battery cages, or on pork from pregnant sows kept in sow stalls. Those who use farm animals for profit have sought to resist consumer and public pressure for change, arguing that people's views are based more on emotion than science. This paper presents a review of the way in which those responsible for developing farm animal welfare legislation in Australia use science to arrive at their recommendations. The evidence indicates that where science is used it is misused, either by being selected to suit the cause of industry or by being interpreted likewise. The paper uses sow stalls, time off feed for bobby calves, mulesing in sheep and caustic paste disbudding in cattle as examples. The analysis shows that the development process relies on questionable science, selectively refers to studies which support the industry stance and misstates the actual scientific position. It is clear that the current Australian legislation development system is inadequate, and results in laws which are not based on a proper evaluation of the science. It should be replaced by an independent body which can objectively assess the relevant science.

Keywords

Animal welfare science, intensive animal farming, sow stalls, battery cages, land transport, animal cruelty law, anthropomorphism, dairy farming, bobby calves

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Introduction

This paper seeks to set out and critically review the process in Australia whereby animal welfare law concerning farmed animals is developed. It demonstrates that the development process is flawed, primarily because of the dominant role of animal farming interests, which are necessarily concerned with profit.

In Australia, serious public concern for the welfare of intensively farmed animals has in recent years resulted in major supermarket chain Coles excluding eggs from caged chickens or pork from facilities where pregnant pigs are kept in small cages ('sow stalls') from among its own-brand products ('Responsible Sourcing'). Food retailer Woolworths has partly followed suit regarding its own-label products ('Responsible Sourcing – Animal Welfare'). In like vein, major fast food chain McDonald's has committed to using only eggs from cage-free facilities by 2017 ('Market and regional-level Cage Free Commitments'). There are media reports that burger restaurant chain Hungry Jack's has already transitioned to using eggs from cage-free sources (Cormack 2017).

Reflecting consumer concern for animal welfare, the Australian Consumer and Competition Commission (ACCC) has successfully prosecuted a significant number of producers for misleadingly using the label 'free range' to describe products such as eggs (ACCC v Derodi Pty Ltd; ACCC v RL Adams Pty Ltd; ACCC v Pirovic; ACCC v GO Drew Pty Ltd), ducks (ACCC v Luv-a-Duck Pty Ltd) and chickens (ACCC v Turi Foods Pty Ltd) which did not come from free-range systems. Farmers' motivation in making these misrepresentations is to make money out of those wishing to improve conditions for farm animals. As Justice Siopis said in ACCC v Snowdale, consumers who seek to buy free-range eggs are 'concerned about the welfare of laying hens...and would be prepared to pay more to buy those eggs' (187).

The animal use industries, particularly those which keep animals in very close confinement, have repeatedly argued that the concerns of consumers may be more driven by emotional perceptions than by any scientific evidence that a particular farming system, such as caging chickens or pregnant pigs, is detrimental to the welfare of those animals. For example, the egg industry representative body Australian Egg Corporation Limited recently described Hungry Jack's decision to stop using eggs from caged hens as 'driven by emotion and

perception, not science or reality' (Cormack). This sentiment reflects the statement some years ago by Andrew Spencer, the Chief Executive Officer of Australian Pork Limited that a decision by the Australian pig industry to voluntarily (partially) phase out sow stalls 'was not about animal welfare and there's no real science to the position held by consumers' (Gadd).

It therefore seems that the driving force improving the welfare of farmed animals is (according to the animal users) pressure exerted by consumers, who the industry says take an emotional, not scientific stance. This raises two questions: firstly, whether the industry position on science is correct and secondly, whether relevant animal welfare science has been reflected in legislative change to raise animal welfare standards.

In Australia, the main vehicle for the regulation of farmed animal welfare has been the relevant animal welfare code. I have elsewhere described the initiation of a review process for animal welfare codes at the Commonwealth level which commenced in 2005 at the instigation of animal use industries (2009, 54). That review ultimately resulted in an acknowledgment of a need to update the code development process and this was coincidentally complemented by the establishment of the Australian Animal Welfare Strategy, having as one of its major objectives 'the development and implementation of animal welfare standards that have a strong scientific basis' (see Caulfield 2009, 55). One of the immediate outcomes of the code review was the production of an animal welfare code for pigs (using the new system by which mandatory 'standards' were separated from optional 'guidelines'), which contemplated (amongst other things) keeping pregnant sows in sow stalls for up to 6 weeks of each pregnancy (Caulfield 2009, 61). The mandatory 'standards' in that code have been expressed in law in all jurisdictions (where they come into effect in 2017) apart from Tasmania, where the Animal Welfare Advisory Committee (of which the author was and is a member), after consideration of relevant science and other factors advised the relevant Minister that sow stalls should be banned (Caulfield 2013, 10).

The incumbent Liberal-National government in Australia has abandoned its leadership role in the animal welfare sphere and thus the Australian Animal Welfare Strategy is no more. It has given overall responsibility for developing animal welfare standards to the states and territories in Australia, which reflects the role of those bodies in enforcing the law relating to

animal welfare. Another separate issue is the development of the successors to the animal welfare codes, the Australian Animal Welfare Standards and Guidelines, has been contracted out for several years to a private company, Animal Health Australia. That organisation has as its members the nine government departments which represent animal use industries (Commonwealth, state and territory), animal industry organisations, 'service delivery and non-program participants' and 'associate members'. The only one of those members which could be said to represent animal welfare interests is the Australian Veterinary Association (Animal Health Australia).

Following on from the incorporation into legislation of the code of welfare for pigs (Caulfield 2013, 10), Standards for land transport of animals have been incorporated into legislation in all Australian jurisdictions with the exception of Western Australia and the Australian Capital Territory (Australian Animal Welfare Standards and Guidelines). Standards for sheep and cattle have been approved by the relevant ministers of the nine Australian legislatures (the 'Agriculture Ministers Forum'); welfare standards in relation to poultry, sale yards and abattoirs are in the final stages of development. This paper will review the science which has been referenced in the development of the law relating to keeping pregnant sows in stalls, allowable time off feed for 'bobby calves' (mostly male calves which are in essence by-products of the dairy industry), mulesing of sheep and caustic paste removal of horn buds in calves, and seek to assess whether that development has indeed been based on science, rather than emotion.

As a preliminary comment it is notable that the process by which relevant animal welfare science is considered and reviewed is not public knowledge. However, Glenys Oogjes of animal protection organisation Animals Australia, who has been for over 25 years a member of relevant committees dealing with development of animal welfare legislation, has shared her knowledge and views of the process. She has noted that in all cases the science which is referenced and reviewed as part of the legislation development process (that is in the regulatory impact statements) is selected and summarised not by independent scientists, but by a firm of economic consultants, Tim Harding & Associates (see the regulatory impact statements set out at <http://www.animalwelfarestandards.net.au>). She has expressed the view that animal welfare

science is treated as a ‘public relations shield’, and is often misquoted. Reviews of science are prepared not by independent animal welfare scientists, but by a ‘writing group’ from Animal Health Australia and employees of states Agriculture Departments. Furthermore, animal industry representatives constitute the overwhelming majority on relevant committees (there are only two animal welfare organisations represented on Standards Advisory Groups). In her view, animal welfare representatives, animal welfare scientists and representatives of the Australian Veterinary Association are ‘tolerated but effectively ignored’. She feels that much of this is driven by the need of animal industry representatives to appease those they represent, who represent the ‘lowest common denominator’, and who would oppose any attempt to introduce improved standards. She summarises this position thus: ‘Australia has fallen way behind its European trading partners and our closest neighbours in New Zealand and so still allows appalling practices to continue unabated, but with accompanying rhetoric which misrepresents the biased nature of reviews and, seemingly without embarrassment, states our rock-bottom standards are science-based.’

It will be apparent that the animal use industry approach of advocating that any change in its practices be based on science rather than emotion reflects the opposition by some animal behaviourists to anthropomorphism. Thus Wynne argues that anthropomorphism ‘should have no place in an objective science of comparative psychology’ (125). Contrarily, Burghardt, in recommending ‘critical anthropomorphism’, notes that ‘our stance as a sentient being [is] valuable, if not essential, to the study of behaviour (137).

It is obvious that the current approach to animal welfare science in the development of Australian animal welfare legislation reflects Burghardt’s view of critical anthropomorphism. The 1965 Brambell report to the UK government said ‘we consider that it is morally incumbent upon us to give the animal the benefit of the doubt and to protect it so far as is possible from conditions that may be reasonably supposed to cause it suffering, *though this cannot be proved*’ (emphasis added: 11). Although this view is not expressed in Australian animal welfare legislation relating to farm animals, it is notable that the National Health and Medical Research Council code for use of animals in experiments (which must be complied with by law: Caulfield 2009, 160) also expresses the principle of ‘giving the animal the benefit of the doubt’ by saying:

‘Pain and distress may be difficult to evaluate in animals. Unless there is evidence to the contrary, it must be assumed that procedures and conditions that would cause pain and distress in humans cause pain and distress in animals’ (51).

So it is not heretical to include a critical anthropomorphic approach in the application of animal welfare science. This is self-evident when considering the relevance of considerations of sentience (or otherwise) in framing views of animal welfare. As the eminent animal welfare scientist Donald Broom has pointed out, it is merely a prejudice to think humans are different from other animals, and the abilities and functioning of many animal species show substantial parallels to humans (2014, ix).

Animal Welfare Science

Background

In order to assess whether changes (legislative or otherwise) which purport to improve animal welfare are based on science or ill-informed emotion, it is necessary to have an understanding of the relevant consensus of animal welfare scientists on a particular issue. This in turn requires an understanding of current animal welfare science.

The starting point for the development of modern animal welfare science was the 1965 report by Professor FWR Brambell, commissioned by the British government in response to the public outcry caused by Ruth Harrison’s seminal work ‘Animal Machines’ (Broom, 2011; Woods). The Brambell report notably said:

welfare is a wide term that embraces both the physical and mental well-being of the animal. Any attempt to evaluate welfare therefore must take into account the scientific evidence available concerning the feelings of animals that can be derived from their structure and functions and also from their behaviour. (9)

The report further embraced the need for an approach based on critical anthropomorphism (without using that term), saying ‘the evaluation of the feelings of an animal ... must rest on analogy with our own’ (9). It annexed a paper on the assessment of pain and distress in animals,

authored by one of the committee members, WH Thorpe, who was a pioneer in the field of ethology (71) and incidentally Donald Broom's PhD supervisor.

The Australian position

The position of the dominant Australian animal welfare science group (the Animal Welfare Science Centre at the University of Melbourne) has for many years been at odds with the views set out by Brambell. As recently as 1991 Barnett and Hemsworth of that group wrote a review which was disparaging about emphasis on behavioural, as opposed to physiological (including biochemical) measures of an animal's welfare. In particular, they expressed the belief that abnormal behaviours of an animal did not indicate a reduction in 'fitness', a concept they felt was useful to the 'welfare debate' (179). They exemplified this by reference to stereotyped behaviours, such as typically occur in animals in restrictive housing (such as bar-biting in stall-housed pigs), which they said could be 'regarded as a mechanism that helps animals to cope with environmental change' and which had not been clearly demonstrated to be detrimental (181). Having criticised the use of behavioural measures, Barnett and Hemsworth went on to espouse the use of measures of stress hormones (corticosteroids) as being particularly useful in assessing welfare status. They estimated that increases in corticosteroids in excess of 40% were detrimental, as according to them such hormonal changes would produce decreases in (amongst others) immune function, glucose levels, growth rate and pregnancy rate (182). The authors presented no evidence to support any of these contentions.

It may be that things have changed for the better, as Hemsworth et al. (2013), in reviewing the science of animal welfare, recently alluded to a need to use multi-disciplinary approaches and to focus more on measurement of positive affective states of animals, rather than emphasising the avoidance of negative states.

Statistical analysis

Animal welfare science studies generate data which is intrinsically variable; this is a characteristic of all biological measures. This variability means that there is a good chance that any apparent

difference between study groups happens just by chance. Experimenters therefore use statistical analysis to assist them to decide objectively whether any observed difference indicates a significant effect. This article is not the proper place for a detailed appraisal of the improper use of statistics in reporting animal welfare science results: I have provided a simplified review of the sorts of statistical tests which can be used (2013, 16). Nevertheless, there are a couple of major points about statistics which need to be made.

Reports of animal welfare science studies often say that the statistical tests used showed ‘trends’ towards significant effects. Such statements can be dismissed outright: they involve the ‘time-honored tactic of circumlocution to disguise the nonsignificant result as something more interesting’ (Hankins, cited in Motulsky, 1021). As Hankins says, ‘there is no ‘trend’, in any direction, and nowhere for the trend to be ‘towards’.

Scientists have traditionally said that a result is not ‘significant’ if the observed difference between the mean values of parameters measured in study groups has a 5% (or greater) chance of occurring by chance alone. This approach is currently the subject of serious criticism, primarily because many tests have a very high ‘false discovery rate’ (Colquhoun). Furthermore, even if the statistical test suggests the result may be ‘statistically significant’, this does not mean to say the effect is biologically significant. It is incumbent on researchers to say why they think a result suggests a real change in animal welfare. These major changes in the view of statistical analysis have been reflected in the editorial policies of several major biology journals (Curtis et al.), although it seems journals reporting animal welfare science studies have yet to make this improvement. In practical terms this means one must be sceptical about claimed differences in animal welfare resulting from treatments, such as different housing conditions, where the 5% cut-off point is used and especially where authors do not say why the results should be regarded as biologically (as opposed to statistically) significant.

The changes set out by the Senior Editors of the British Journal of Pharmacology (Curtis et al.) need to be taken into account by editors of journals reporting animal welfare science, given some of the particular difficulties facing that discipline. For example, the guidelines referred to are very clear about the need to properly assign subjects to particular treatment

groups and to ensure proper randomization of treatments. Ideally, assignments should be blinded so far as the observer is concerned.

There is another danger inherent in relying on statistical analysis to suggest that any particular treatment is not detrimental to animal welfare; this is that scientific studies of animal welfare by definition look at groups of animals. The decision on whether groups have different welfare is made in relation to the mean or average animal. This completely ignores the welfare of individual animals and disregards the possibility that animals which are particularly susceptible in a given situation (for example food deprivation, extremes of temperature, stressful transport, etc) will suffer poor welfare. The scientific position therefore contrasts with the situation in the animal welfare laws of Australia, which uniformly say it is illegal to be cruel to *an animal* (Caulfield 2009, 18).

Pregnant pigs

In 2007, Karlen et al. of the Animal Welfare Science Centre published an industry-funded study which was successfully relied on by the Australian pig farmer representative body to support its claim that legislation should allow pregnant sows to be kept in sow stalls (cages not much bigger than the animal's body) for 6 weeks of any pregnancy. Karlen et al. showed no significant effect of sow stall versus group housing on cortisol, or productivity, while the levels of blood cells involved in the immune response were found to be within normal levels. The authors ignored these observations, saying in the abstract 'there was a trend for higher ... cortisol' in group-housed animals early in pregnancy, 'there was a trend ... for a lower reproductive failure' in the stall-housed animals and the combination of reproductive parameters resulted in sows housed in stalls weaning the equivalent of 39 more piglets per 100 mated sows (87). In other words, a series of results which did not exceed the threshold for statistical significance was transmuted into a result that every farmer would recognise – a claimed decrease in productivity. The repeated reference in this work to statistical 'trends' towards significant effect is arguably meaningless and misleading. This paper formed the foundation of the argument run by the pig industry that pregnant sows should be able to be kept for 6 weeks of a pregnancy in sow stalls; a

view which prevailed in the law (Caulfield 2013, 14). It is worth noting that determining significant effects (in this case of housing) in livestock is often difficult if not impossible in relatively small ‘scientific’ studies. Arguably, comparisons at the herd level are more valuable (Caulfield 2013, 33).

Time off feed for bobby calves

Bobby calves are young, unweaned, mostly male dairy calves which are essentially by-products of the dairy industry (Australian Animal Welfare Standards - Land Transport of Livestock Regulatory Impact Statement, 11). The Australian Animal Welfare Standards – Land Transport of Livestock notes that those involved in the development process did not reach an agreement on the allowable time that bobby calves could be kept off feed prior to slaughter (vii); therefore the Standards are silent on the total time bobby calves can be kept off liquid feed (ie milk). The Standards require that bobby calves over 5 days of age must be delivered to abattoirs less than 18 hours from their last feed, spending no more than 12 hours on transport, representing a possible total of 30 hours off feed (SB 4.5).

Phillips and Petherick have noted that there is a benefit to industry in having long allowable times off feed, as collection of calves from farms would be more economical (135). These authors have criticised the industry-funded research which has been used to support a voluntary industry code allowing bobby calves to be kept off feed for up to 30 hours (Fisher et al.). The measures included various behaviours, changes in some blood metabolites (such as glucose), estimates of dehydration and change in weight. During 30 hours of food deprivation (which included transport periods), blood glucose fell substantially. Similar findings had earlier been reported by Todd et al. As noted by Phillips and Petherick, while Fisher et al. maintained that the glucose levels were within the normal published ranges for calves, 7 of the 60 calves studied had plasma glucose levels below normal ranges. Phillips and Petherick rightly point out that ‘relying on group mean values may not be sufficient for welfare assessment, when individual animals may have impaired welfare’ (136). They also note that even small reductions in blood glucose can produce feelings of hunger in humans; this suggests that the data of Fisher et al. may

indicate that calves begin to feel hunger as soon as 3 hours after feeding. Fisher et al. concluded that 'the calves in the study coped with a period of 30 hours off feed but best practice would be represented by a period of not more than 24 hours' (303). Phillips and Petherick dismiss this, saying 'in our view welfare best practice would be no transport at all, i.e. slaughter on farm' (137). Finally, Phillips and Petherick criticise the use of 'reference ranges' of glucose, rather than the inclusion of an appropriate control group for comparison.

The study of Todd et al. is also relevant. The authors noted that many of the animals used suffered from diarrhoea, which resolved after treatment with electrolyte solution before the commencement of the experiment. They observed that diarrhoea 'commonly occurs in newborn calves', which raises the question whether the experimental conditions (ie treating calves to eliminate normally-occurring diarrhoea) adequately reflected on-farm practice prior to bobby calf transport.

The Bobby Calf Regulatory Impact Statement, in considering the option of allowing a maximum of 24 hours of time off feed (TOF), said 'there is no scientific evidence to suggest that 24hrs TOF provides any more additional animal welfare benefits than 30 hrs TOF...The ethical questions and value judgements of hypothetical animal 'hunger' and 'discomfort' are beyond the scope of the RIS...'. This is a misleading statement. As Phillips and Petherick point out, there were 'substantial changes in metabolite levels...particularly between 24 and 30 hours after feeding' (136).

The science considered in the development process for legislation governing bobby calf time off feed was therefore flawed, and the conclusions were unjustifiable.

Mulesing

Mulesing is the cutting off of wrinkled skin around the perineum and anus of lambs, with resultant formation of smooth and scarred tissue. It is done to prevent urine and faecal soiling of the area, which in turn reduces flystrike. Flystrike occurs when blowflies lay eggs on the sheep and the hatched maggots feed on the affected area; it is a serious welfare problem (see Phillips, 2009). Mulesing is a very painful procedure (Paull et al.). In 2004, People for the Ethical

Treatment of Animals (PETA) campaigned against the Australian sheep industry, claiming that mulesing was a barbaric and unnecessary practice (see Sneddon and Rollin, 372). PETA's action resulted in several clothing retailers refusing to use wool from mulesed sheep (Sneddon and Rollin, 375). Following an out of court settlement in the case of *Australian Wool Innovation Ltd v Newkirk* (see Caulfield 2009, 220.), the Australian wool industry undertook to phase out mulesing by 2010. That has not happened. The view expressed during the relevant review was that flystrike was a very serious animal welfare issue and mulesing of lambs remained an important husbandry practice – in other words, the pain of mulesing was to be preferred to the negative welfare consequences of flystrike (Sheep Decision Regulation Impact Statement, 27). This decision may have been based on the observation that the overall pain caused by mulesing would be less than that experienced by sheep suffering flystrike (Fisher, 238). The Sheep Decision Regulation Impact Statement expressed the view that 'available scientific research suggests that it is possible to achieve pain relief in conjunction with mulesing' (41). The Statement also said that there are no non-steroidal anti-inflammatory drugs registered for use in sheep in Australia (41).

The Australian Animal Welfare Standards and Guidelines for Sheep (s. 7.3) in effect say that sheep younger than 6 months can be mulesed without the use of pain relief. The vast majority of sheep endure mulesing at less than 6 months of age.

The study of Paull et al. examined the pain-relieving effect of a local anaesthetic, lignocaine, alone or in combination with either carprofen or flunixin. These latter compounds are analgesics of the non-steroidal anti-inflammatory class. The authors made various behavioural measures indicative of pain, such as 'stiff walking' and 'hunched standing'; their data indicated that the most effective treatment was a combination of the local anaesthetic and carprofen (103, 105). Using somewhat different behavioural measures of pain, Lomax et al. claimed that local anaesthetic alone was more effective than observed by Paull et al., and suggested that the local anaesthetic reduced mulesing pain for up to 24 hours after dosing. Windsor et al. have reported that over 40 million sheep have been treated with the registered local anaesthetic formulation Tri-Solfen since its introduction in 2005, 'as it clearly addresses pain and improves healing of mulesing wounds' (56). Windsor et al. suggested that inclusion of

a non-steroidal anti-inflammatory drug was a 'logical additional strategy' (57). In July 2016 the Australian Pesticides and Veterinary Medicines Association approved the use of the non-steroidal anti-inflammatory drug meloxicam for use in sheep and lambs.

The conclusion is that the development process for the Australian Animal Welfare Standards and Guidelines for Sheep, in approving the continued use of mulesing without pain relief, has ignored the scientific evidence which strongly supports the use of local anaesthetic to relieve pain in mulesed sheep. Furthermore, the recent registration of the non-steroidal anti-inflammatory meloxicam for use in sheep indicates that in any case the assessment process is outdated and should be reviewed.

Caustic paste disbudding of calves

For many years farmers have taken steps to remove horns from cattle. One such step involves the application of caustic paste to dissolve the horn buds in young cattle. This paste contains very strong alkaline agents, such as sodium hydroxide or calcium hydroxide (Stafford and Mellor). These agents have been shown to cause pain when used for disbudding in calves (Morisse et al.; Vickers et al.; Stilwell et al. ('caustic paste disbudding'; 'comparing plasma cortisol')).

The existing Australian Model Code of Practice for the Welfare of Animals: Cattle says that caustic paste should not be used for disbudding young calves. This prohibition is reversed in the endorsed Australian Animal Welfare Standards and Guidelines for Cattle (s. 6.5), which permits the use of caustic chemicals, without pain relief, for disbudding young calves (under 14 days of age). It has been claimed that this change was stimulated by recent scientific findings. There was a de-emphasis of the significance of a (relatively) early paper (Morisse et al., 1995), replaced by emphasis on a study by Vickers et al. Thus, the Cattle Decision Regulation Impact Statement says, referring to Vickers et al., 'more recently, a study concluded that caustic paste causes pain, but that it is *less* than that caused by the hot iron, even when using local anaesthetic. Moreover, caustic disbudding has a lower impact in younger animals... Furthermore, chemical burns pain may be transient.'

The emphasis on the paper by Vickers et al. is misplaced, as those authors gave all the subject animals a sedative which is also a painkiller (ie xylazine), which therefore makes interpretation of pain effects impossible (see Bayer Animal Health New Zealand information sheet). Moreover, Morisse et al. found that caustic paste was more painful than hot-iron disbudding and Stafford and Mellor (2011) concluded that chemical disbudding was more painful than hot iron disbudding. Importantly, the study of Stilwell et al (2009) showed that ‘inert lying’ was commonly seen in young calves treated with caustic paste, and they suggested this behaviour ‘relates to the intense distress felt during the first few hours after the caustic burn’ (44).

For these reasons the conclusion in the Cattle Decision Regulation Impact Statement that the relevant scientific research supports its recommendation that caustic paste disbudding in young calves be allowed is false.

Conclusions

The information and examples presented show that the development process for laws governing farm animal welfare in Australia is flawed. The reviews which form part of that process (the regulatory impact statements) have variously misrepresented the actual scientific findings, or have relied on scientific publications which are flawed in experimental design or interpretation. In the latter case, this may have happened because the work is funded by industry (Phillips and Petherick, 139). It is apparent that the situation as it stands is unacceptable, primarily because the animal use industries have an overarching influence in the legislative development process. What is needed is a ‘completely independent, nationally-based animal welfare commission, with responsibility for advising on legislation’ (Caulfield 2009, 17). It is apparent that a key part of the procedures adopted by such a commission should include setting up an independent scientific advisory body which would develop a review of the relevant scientific literature as required for whichever issue is being considered.

Afterword

The Productivity Commission on 28 March 2017 released its final report into 'Regulation of Agriculture': <http://www.pc.gov.au/inquiries/completed/agriculture/report>. Many of the criticisms in the present article were referred to, as were the concerns of bias in references to science in the process for the development of animal welfare standards. One of the recommendations (5.1) was directly relevant:

To facilitate greater rigour in the process for developing national farm animal welfare standards, the Australian Government should take responsibility for ensuring that **scientific principles guide the development of farm animal welfare standards**. To do this, **a stand-alone statutory organisation — the Australian Commission for Animal Welfare (ACAW) — should be established**. (emphasis added).

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