The University of Melbourne
Faculty of Veterinary and Agricultural Sciences

ANIMAL WELFARE SCIENCE CENTRE (AWSC)

3rd External Review of AWSC
May 2015

TABLE OF CONTENTS

Acknowledgements

The Review Committee is grateful to senior management in AWSC and in particular the Executive Officer, Mr Jeremy Skuse, for the major effort undertaken in assembling the committee, producing documentation and data on AWSC performance and other material relevant to our deliberations, obtaining stakeholder submissions and facilitation of our meeting in Melbourne. We thank the staff and students of the Centre with whom we met for their time and thoughtful input. Similarly, stakeholder and partner input to the review, either in written or oral form, included detailed and informative analyses that were particularly helpful to the committee in its assessment of merit, relevance and impact of the Centre's endeavours. We also thank Lorraine Ryan, the Executive Assistant of Foursight Associates for assistance in bringing the review report together. The Review Committee Chair wishes to also thank Jeremy Skuse in particular but also Board Chair, Dr Mike Rickard; AWSC Director, Prof Paul Hemsworth; and Research Fellow, Dr Rebecca Doyle for meetings and discussions on committee composition and overall process prior to commencement of the review.

Executive Summary

The Animal Welfare Science Centre, AWSC, a joint venture involving University and Government partner organisations, has been in existence for 18 years. It is a research and training Centre of the University of Melbourne in Victoria with a representational Board of Management and an Independent Chair.

The period 2010-2014 has seen the AWSC increase its standing as a national resource in animal welfare research with industry impact (see Conclusions section for a snapshot). The applied nature of its research agenda attracts substantial Victorian Government and intensive animal industry funds with more modest contributions from the host institution, the University of Melbourne. Apparent are heavy teaching loads, large numbers of past and present RHD students and a very good publication record.

Changes have occurred in the partner organisations comprising the AWSC with major developments proposed for mid 2015. Following loss of 3 key personnel, Monash University exited from the Centre in mid 2012; The Ohio State University whilst still a partner organisation in the current and proposed new expanded AWSC, has reduced its contribution to the Centre – though still provides an important international link in terms of specific research, training and industry engagement endeavours. What is seen by many as a highly propitious, strategic move – even a "bright new future" – is the incorporation of SARDI/University of Adelaide as a South Australian node, a new Centre Agreement and a refreshed Board and advisory structures.

This review conducted by an independent Review Committee of 8 members and with substantial stakeholder input has highlighted the unique position that the AWSC occupies in the national animal welfare domain. The Centre's relevance, achievements and importance are widely recognized and applauded with expectations around the planned extended AWSC being high particularly in regard to national reach, critical mass of investigators and teachers, increased scope of endeavours in extensive livestock industries, new technical developments in indicators of positive welfare states to complement assessment of suffering, and, equally important, new high-class research facilities. In intensive animal production, and particularly in the pig industry, the reputation of AWSC for industry-relevant animal welfare research is outstanding.

Our recommendations, for consideration by the AWSC are as follows and are arranged according to the appropriate ToR number:

Recommendation 1.1. The AWSC should continue and enhance its focus on the 2 mechanisms of delivery of research outputs (a) high quality peer-reviewed journals and (b) directly to intensive and extensive livestock industries, zoo managers and companion animal owners and explore "new

media" means to reach a wider community audience. Particular opportunities are apparent for engagement with feedlot farming and stronger engagement in dairy cow management under circumstances of intensification. Exploration of additional engagement is recommended (in time and in the context of an expanded AWSC following operational functionality and appropriate funding support) with aquaculture, pest animals, laboratory animals and companion animals broadly.

Recommendation 2.1. That the AWSC fully consider (and reconsider) all options to assist with 'core' funding and mechanisms to provide a more stable AWSC funding base.

Recommendation 2.2. That the AWSC consider mechanisms to fund and maintain a comprehensive and vibrant online presence showcasing the work of the Centre.

Recommendation 2.3. That the AWSC consider the type and level of public comment that may best serve the Centre and the support (communications expertise, training, and its duty of care to spokespersons) required to achieve this.

Recommendation 2.4. That the AWSC consider the level of course offerings in relation to resources of AWSC scientists during the next strategic planning round.

Recommendation 2.5. That the AWSC consider the composition and role of an Advisory Committee.

Recommendation 2.6. That the AWSC consider an appropriate evaluation method and frequency during its strategic planning process.

Recommendation 2.7. During development of the next Strategic Plan, KPIs incorporate particular levels, growth or improvement targets in addition to only measuring activities.

Recommendation 2.8. During the development of the next Strategic Plan strong consideration be given to sustaining strong communication with relevant Government departments, and effective planning with other research centres (not part of AWSC) to ensure maximum national coordination and efficient use of resources to work on the most important animal welfare issues.

Recommendation 3.1. The AWSC should increase efforts to ensure student projects and theses result in quality peer-reviewed as well as bespoke industry-relevant publications, and in the context of an expanded AWSC, continue to take opportunities provided by host universities to increase biomedical collaboration and potential Category 1 funding support. In addition, the AWSC should continue to carefully monitor student progress and ensure that they receive appropriate mentoring, professional development and opportunities for intellectual exchange and skills development and sharing.

Recommendation 4.1. The AWSC engage a new independent Chair and re-structure itself to include both representatives of the five partner organisations and additional members with particular skills. The Review Committee suggests the Board seek members with skills in risk management, legal, finance, strategic planning, biomedical and animal welfare. Some remuneration for the Chair should be considered.

Recommendation 4.2. The AWSC address governance issues by adopting a Charter or Terms of Reference (which cover aspects such as Director's Duties, Terms of Office, Rotation of Board Members, Training for Directors and key staff Appointment, Performance and Appraisal).

Recommendation 4.3. The AWSC develop a five-year Strategic Plan in consultation with AWSC staff and stakeholders. The Plan should address whether additional committees (such as an Advisory Committee) are required and if so, take responsibility for Terms of Reference and Appointments. The Plan should take into account the capabilities of the two 'nodes' (South Australia and Victoria) and undertake a gap analysis to identify where the next focus should be nationally or internationally,

identifying any potential new partners. The Strategic Plan should also address succession planning.

Recommendation 4.4. The AWSC should continue to address its funding structure and assess whether measures such as endowments, bequests, benevolent funding or the establishment of a foundation would be of benefit to the Centre, increasingly drawing on the University of Melbourne and the University of Adelaide for support.

Recommendation 5.1. The AWSC develop a 5-year Strategic Plan that reflects the changes in the organisation, capabilities of the two 'nodes' (South Australia and Victoria) and the opportunities and challenges as an independent, multi-party, multidisciplinary, evidence-based, ethical animal welfare science centre. The strategic plan should be developed with involvement from key stakeholders to ensure relevance and future support for the organisation and its valuable work.

Recommendation 5.2. After full integration of parties into the new AWSC and its operational functionality, explore developing further collaborations and partnerships, for example CSIRO and others (Syd Uni, UQ, UWA) to ensure a truly national approach to animal welfare science as well as increasing further capacity and value.

Recommendation 5.3. Consider expanding the scope of research activities within budgetary capacity to include a duty of care agenda; quantitative measures of positive animal welfare; novel ways to quantify animal welfare; broadening of the scope of work with red meat, dairy, fish and companion animals; attention to alternative and future farming systems.

Recommendation 5.4. Develop the value proposition, identifying current capacity and capability as a means of embedding the appreciation within current investors as well as promoting to potential new investors.

Recommendation 5.5. Continue to strengthen the relationships with multiple components of the livestock industry, for example the lot feeders industry.

Recommendation 5.6 .Explore potential opportunities to garner support, including funding, from the broader food value chain including the retail sector with a view to underpinning the 'welfare thinking' within this sector with good science.

Recommendation 5.7. The AWSC should assess the feasibility of increased industry placements, securing scholarships support from non-traditional sources (e.g. the food retail sector), and mentoring or professional development and course work aimed at increasing commercial skills/industry awareness for AWSC RHD students.

Recommendation 5.8. The AWSC should explore expanding its extension role to include commercial agribusiness service providers and other professionals in the broad animal welfare domain (e.g. veterinarians, animal health officers).

Recommendation 6.1. In relation to the circumstances in which animal and food industries operate in Australia, it is recommended that the AWSC note (a) how Animal Health Australia (AHA) applies risk management as part of good corporate governance and views animal welfare as a management risk within Australia's animal health system, and (b) risk management strategies of food retailing firms and how AWSC can assist with the necessary input from science and developing process for facilitating this impact.

Recommendation 6.2. In relation to the national scene, it is recommended that the AWSC further note several recent inputs to sociological aspects of animal welfare and their relevance to the AWSC and the AWSC's potential to make innovative contributions to public policy.

Recommendation 6.3. The AWSC should maintain active two-way communication with key animal welfare policy professionals and organisations in Canberra highlighting the progress being made in animal welfare science and training (as well as translation including practice change in industry) that is in the national interest and in which Australia must maintain a high international reputation and active profile.

Recommendation 6.4. Given that replacement of the previous national policy body AAWS remains under consideration, the AWSC should determine its capability and capacity to market its expertise and provide advice to organisations such as RSPCA, AVA, commercial agribusiness service providers and food retailers in regards to the elements of evidence-based policy and/or requirements for "welfare audits".

Recommendation 6.5. It is recommended that in relation to the international scene, the AWSC continue to monitor World Bank, OIE and FAO developments with a view to capturing opportunities for AWSC involvement and beneficial influence.

Recommendation 6.6. The AWSC should provide an information fact sheet highlighting the exceptional complementary expertise to which AWSC has access across Melbourne and Adelaide Universities.

00oo00

Background

The AWSC has been in operation since 1997 and currently comprises 3 partner organisations – the University of Melbourne, the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and The Ohio State University.

In 2015, under a new Centre Agreement, the University of Adelaide and SARDI will join the Centre which will thereafter operate as 2 nodes; the Victorian node and the South Australian node of the AWSC. As currently, the Board of Management will have an Independent Chair, which is viewed as an important component of AWSC governance. The new AWSC Organisational Chart is shown in Appendix 1.

Vision

"Animal welfare and its constant improvement are societal and cultural norms"

Mission

"To contribute to improved animal welfare as a world leading provider of expert information, advice and education underpinned by rigorous research"

Strategic Objectives

1. To conduct rigorous, innovative, basic and applied research to improve animal welfare
2. To establish the AWSC as a leading international source of independent, authoritative animal welfare advice
3. To provide relevant, high quality education and training
4. To constantly improve the capability of the AWSC

With significant changes mooted and the attendant need to develop, inter alia, a refreshed Strategic Plan, the AWSC Board determined that a review of the Centre was timely with a focus on scientific performance and impacts across the animal welfare spectrum over the past 5 years. In addition, the review was to identify issues that will affect the Centre's future performance, impact and sustainability.

This is the 3rd review of the AWSC (and predecessor Animal Welfare Centre) since 1997, prior reviews being conducted in 2002 and 2009.

Objectives and Process

In March 2015, the Board of the AWSC commissioned a review of the Centre covering the 5 year period 2010-2014 and to be conducted by a panel of members external to the University of Melbourne. The Review Committee members (and responsibilities) were as follows (see Appendix 2 for details):-

- Dr Graham Mitchell, Foursight Associates (Chair)
- Dr David Adams, Consultant (ToR6)
- Prof Mary Barton, University of South Australia (ToR3)
- Ms Glenys Oogjes, Animals Australia (ToR2)
- Dr Jim Rothwell, Meat & Livestock Australia (ToR1)
- Ms Alice Skipper, Zinfra Group Victoria (ToR4)
- Prof Kevin Stafford, Massey University, NZ (ToR1)
- Ms Sharon Starick, Kongolia Farms, South Australia (ToR5)

The objectives of the review were two fold, the actual Terms of Reference (ToR) being indicated in Appendix 3.

1. To provide a critical analysis of the Centre's scientific performance, its development and application of scientific outputs and provide recommendations for improvement in its performance
2. To identify issues that may affect the Centre's future performance, such as its scientific capacity for national coordination of welfare RD&E, funding arrangements and national and international recognition of the AWSC, and address these issues in the recommendations.

The importance of engagement with stakeholders in the review process can be gauged from the range of likely players in the animal welfare domain:

- The general public as consumers, owners, concerned observers, zoo patrons or "citizen scientists",
- Special interest groups, activists and lobbyists,
- Commercial enterprises based on supply of animals and their products,
- Legislators and developers of Government policy,
- Compliance and auditing officials,
- Veterinarians, medical and other animal research scientists, and
- funding agencies.

Invitations to submit responses in accordance with the objectives of, and ToR for, the review were sent to 65 organisations embracing AWSC partners, research providers, government, industry/funders and animal welfare groups. The Review Committee met in Melbourne over the period May 17-19, 2015 to interview AWSC staff and RHD students, representatives of current and proposed partner organisations, to take oral submissions from stakeholders and interested parties who had requested such, and to consider 23 written submissions (see Appendix 4).

Herewith are the Review Committee's findings and recommendations.

Findings and Recommendations

ToR1 *Critical analysis of the scientific performance and impact of the AWSC in improving the welfare of farm, companion and captive animals. This includes impact on science, Government, industry and community, including performance of the AWSC in areas of community concern over the 5 year period of the review.*

Impact on science.

The AWSC is one of the major animal welfare science centres in the world and has for many years led

the research into stockmanship and animal behaviour, welfare and productivity. The publication of the 2nd edition of Hemsworth and Coleman's (2011) book suggests that CAB International considered there to be enough new material published to warrant a second edition. Moreover the lists of publications (page 19-39, Appendix 5a) and the breadth of these publications support the thesis that the Centre has had a significant impact on animal welfare science over the review period (2010-2014). The training of many graduate students also supports this thesis. There are 16 PhD candidates enrolled at the Centre at present and their research covers a wide range of species and a wide range of research questions. Moreover, the Centre has graduated 27 PhDs and numerous Masters students over the years. This illustrates perhaps more than anything the impact of the Centre on science.

The Centre published a substantial number of refereed articles and book chapters during the period in journals appropriate to this type of applied animal science (see ToR3). The second edition of Hemsworth and Coleman's (2011) book was a substantial output and one that is extremely valuable to academics, the livestock and poultry industries and forward thinking livestock and poultry managers. The academic output is praiseworthy given the limited staff and funding available to the Centre. It is as good if not better than roughly similar centres worldwide. The breadth of the topics covered in the publications is extraordinary and reflects a wide range of research topics and the many post-graduate students educated in the Centre. Three senior scientists dominate the publications and it would be appropriate to see more publications being authored by other more junior scientists in future. Moreover there appears to be a dearth of publications by doctoral candidates and this should receive some attention.

AWSC delivers 3 undergraduate courses in Melbourne University with about 150 – 200 students per annum enrolled so the increased knowledge of welfare and animal-focused solutions has increased in an intangible yet significant way in many graduates. The seminar series is well attended in Victoria and certainly makes a positive contribution to discussion and debate about welfare

Impact on Government.
The impact of scientific research on government policy is elusive and difficult to assess. Governments develop policy through a whole range of techniques and must integrate material from many sources. Sometimes the evidence base for policy has been inadequate or downplayed. Given the current reductions in spending on animal welfare at the national level, the impact of the Centre on government policy could be underestimated. The Centre was deeply involved in the Federal Government's Australian Animal Welfare Strategy and significantly contributed to the achievements of the AAWS in changing the face of animal welfare in Australia. The AWSC has a record of assisting government with the judicious management of animal welfare in Australia. Members of the Centre are or were on national committees charged with developing welfare standards and providing advice (see page 9, Appendix 5a). The scope of involvement extends to the OIE Collaborative Centre for Animal Welfare.

AWSC staff have contributed to the development of the sheep, cattle and land transport standards and guidelines, Professor Fisher being on the writing groups. Establishing an authoritative reference with legal status to promote and ensure farm animal welfare has a large effect by establishing standards of expected behavior (and a degree of "peer pressure") for stock owners and transporters. They have also contributed to research priority settings by the animal RDCs and the impact of funding research that is aligned with those priorities is enduring and significant.

Impact on industry.
The AWSC has had a significant impact on the pork industry as illustrated by the comments and inputs from APL and the reports from other industry organisations. Its research on stockmanship, the design of pens and feeding systems for dry sows was important in preserving the use of pens in the period after weaning and early pregnancy. Poultry work has looked at stockmanship and more recently research on free range systems. The latter will be most informative for the industry and public. The investigation into the impact of stockmanship on dairy cow behaviour and production

was very important in encouraging improved husbandry of cows that can be gauged objectively. The feedlot industry want to make connections and engage the Centre in research which suggests that it sees the Centre as a potential source of research and information, particularly about the physical and behavioural factors affecting the welfare of cattle.

The list of research projects (page 13-18 and 41-66, Appendix 5a) shows the breadth of research carried out by Centre staff. These projects deal with welfare issues in dairy production, pork and poultry production and the red meat industries. Interestingly no research has been carried out on wool production.

Pig housing
AWSC has had a sustained and enduring influence on the housing of sows and piglets. The AWSC has used science to clarify the welfare impact of a range of changes to ensure improvement of housing for oestrus, pregnant and parturient sows and their piglets. The results exemplify the successful interaction between AWSC and industry facing a problem or issue and making rational improvements based on science. Furthermore, the achievements are well regarded overseas and have benefitted pig husbandry and welfare beyond Australia.

Poultry housing
Once again the community and consumers have been wanting layers housed in a less intensive, less 'factory farming' situation. However, there are a range of solutions with many welfare impacts both positive and negative on the welfare of hens. The use of science to formulate the issues and assess the solutions has been valuable to the egg industry and improved the lot of many hens.

ProHand
The ProHand training program for stockperson handling was cited by numerous stakeholders as an example of moving science into practice with significant impact on both welfare and production performance. The pig and abattoir sectors use ProHand methods to train stockpeople to handle animals under their care correctly. The dairy industry is adopting a suitable variant and the sheep feedlot and live export sectors have also undertaken training. Apparently the ProHand program is also being delivered in North America giving benefits to stock there and further afield.

Dairy
AWSC has assisted the dairy industry as it has intensified with holistic and integrated approaches to the welfare and health issues associated with grain feeding, lameness, rumenitis and feed pad management. Since the arrival of Professor Fisher, the involvement of AWSC in more health/welfare issues had increased and the Centre has good capacity to work on the health end of the welfare continuum.

Impact on community.
The scientific and public seminars are delivered to allow public appreciation of the issues involved in animal welfare. These cover a range of topics and illustrate the breadth of the field of animal welfare and its connection to a range of other matters.

The Centre's research connections extend beyond farm animals. It works closely with the RSPCA and with Zoo organizations, for example. The Centre is a source of information for the public but has minimised its exposure via the traditional mass media with attendant limited impact on the public.

Summary comments:
The effect of the stockmanship research work initiated and developed by this Centre (Hemsworth and Coleman, 2011) has probably had more impact, or the potential for greater impact, on the welfare of pigs, poultry and dairy cows than any other single piece of research classified under the heading animal welfare. That good stockmanship (i.e. calm and patient human behaviour) can modify the behaviour and physiology of pigs and poultry and increase the productivity of pigs, poultry and dairy cows is extremely important as it shows clearly a positive relationship between improved welfare and productivity. This increase in productivity can be used more than perhaps any other

piece of animal welfare research to convince producers of the importance and economic value of good human behaviour around animals. The research into the housing of dry sows has also been significant in providing a counter to the behaviour work done in Europe.

The work of the Centre on the welfare of companion and captive animals is still in its infancy. There is little money available for either groups of animals and both groups are not managed in ways conducive to invasive research. The PhD theses by A Kobelt (dogs) and L Hemsworth (horses) are extremely important is describing how these two companion species are managed in Victoria. The Centre's recent research proposal to ARC to investigate the welfare of dogs could be very important in determining to what extent dog welfare is compromised under modern management circumstances.

AWSC is judged to have had a significant and enduring impact on the welfare of many animals within Australia and overseas. Their science-based, industry-aligned approach has led to practical and significant improvements being widely adopted with positive effects on the welfare of millions of domestic pigs, poultry, cattle and sheep. Effects on zoo and pet animals are likely to have been important but are harder to assess.

Recommendation 1.1. The AWSC should continue and enhance its focus on the 2 mechanisms of delivery of research outputs (a) high quality peer-reviewed journals and (b) directly to intensive and extensive livestock industries, zoo managers and companion animal owners and explore "new media" means to reach a wider community audience. Particular opportunities are apparent for engagement with feedlot farming and stronger engagement in dairy cow management under circumstances of intensification. Exploration of additional engagement is recommended (in time and in the context of an expanded AWSC following operational functionality and appropriate funding support) with aquaculture, pest animals, laboratory animals and companion animals broadly.

ToR2 *Review performance relative to recommendations of the 2009 review and 2012 Strategic Plan*

<u>An assessment of the responses of the AWSC to the 2009 review</u>

The 2009 Review recommendations are stated (and numbered) followed by the findings and recommendations of the 2015 review.

The (2009) Review committee recommends that:

1. *A Transition Strategy is formulated to manage the impending retirement of key senior staff (in addition to the loss of John Barnett) and targeted at replacement, retention, "grooming" from within and filling skills gaps across the AWSC portfolio (intensive and extensive livestock industries and companion animals).*

2. *The AWSC initiate a post-doctoral fellowship program to "bring back the stars" and progressively build a cadre of mid-career animal welfare scientists as funds allow.*

These matters were discussed at length with the Director and key AWSC staff, and is seen to have been proactively addressed with the recruitment in particular of two post-doctoral fellows, Dr Jean-Loup Rault and Dr Rebecca Doyle.

3. *The AWSC makes full use of its Visiting Scientist program to increase the number of carefully selected, international scientists working for short*

periods in the centre (and associated organisations to share overall costs and reinforce collaboration).

The Centre has continued this program with a visit from a key collaborator in 2014 (Prof Lindsay Matthews), another planned for 2015 (Prof Zulfifli Idrus), and formal collaboration in regard to the pork and poultry sectors being developed with the Universidad Federal de Santa Catarina, Brazil. Other opportunities are being pursued.

4. *The AWSC upgrade its attempts to develop and implement a strategy to secure core "foundation funding" particularly through Australian Government agency competitive programs – e.g. ARC Centre of Excellence, CRC in Animal Welfare and including any funding initiatives within the AAWS.*

These proposed government funding opportunities were pursued, as was the proposed establishment of a 'foundation' to attract philanthropic donations, but the Board determined each of these mechanisms was unlikely to be successful.

5. *The AWSC re-examine the merits of incorporation and, inter alia, employment of a (part-time) Business Development Manager/Fund Raiser to assist in broadening and stabilising the AWSC funding base.*

This recommendation was considered by the Board as part of its strategic planning, but further consideration was suspended in 2012 at the commencement of negotiations with new partners SARDI and University of Adelaide.

Recommendation 2.1. That the AWSC fully consider (and reconsider) all options to assist with 'core' funding and mechanisms to provide a more stable AWSC funding base.

6. *The AWSC produce a concise, high-impact brochure that documents its successes and highlights the outcomes of the research particularly through case studies. This should be one ingredient in a concerted fund-raising campaign.*

This recommendation was fulfilled, but changes to the AWSC partners meant it was outdated quickly. In any event, online information about the Centre has increased over the period since 2009 and it is considered this provides a more appropriate vehicle to advise of the work of the Centre than static printed materials (e.g. newsletters).

Recommendation 2.2. That the AWSC consider mechanisms to fund and maintain a comprehensive and vibrant online presence showcasing the work of the Centre.

7. *The AWSC actively promulgate the centre as an independent, multidisciplinary, evidence-based, ethical animal welfare RD&E centre that, in a complex field, is a dispassionate "voice of reason" sensitive to animal welfare and industry imperatives and community expectations as well as knowledgeable and authoritative in the new era of regulated animal welfare, QA programs and compliance auditing.*

During the hiatus caused by the negotiations with new partner institutions, this recommendation was not actively pursued; regardless, key AWSC scientists when called upon provide expert comment and advice on animal welfare matters. Moreover, a new website was launched – www.animalwelfare.net.au

The 2015 Review panel members considered the difficulties of this role, including the absence of funding for communications support and the fine line required in any comments due to the (at times) diverse views and interests in the community and funders.

Recommendation 2.3. That the AWSC consider the type and level of public comment that may best serve the Centre and the support (communications expertise, training, and its duty of care to spokespersons) required to achieve this.

8. *The AWSC market itself as a focussed animal welfare science centre that capitalises on the expertise and interests of its key staff yet is, to a small degree, flexible and opportunistic in regard to collaborative opportunities and new scientific activities. Regarding the latter, the AWSC should establish, through collaboration, a presence in (a) gene expression profiling technology to develop new generation "welfare biomarkers" (this will additionally provide students with important molecular genetics skills) and (b) an identified line of investigation badged as "implementation research" (i.e. posing and addressing a research question around extension and, for example, variable uptake).*

The Centre has conducted regular planning workshops to identify research directions, including new technologies, and the addition of the two new partners with expertise in new areas including immunology, neurophysiology and neuroendocrinology will assist to achieve this recommendation. The variable uptake in research outcomes has been recognised and a 'Program Leader – Industry education and training' is proposed for the new AWSC structure.

9. *The feasibility be determined of taking the highly-regarded seminar series nationally in live format and with sponsorship from the ICT industry.*

This was trialled but poorly attended (e.g. webinar linking AWSC with South Australian collaborators)

10. *The AWSC examine the feasibility of rolling out packaged courses in animal welfare nationally and internationally and the potential for revenue generation.*

The review group was advised that animal welfare subjects were developed and have been maintained at The Ohio State University and James Cook University, and three undergraduate and 2 Masters subjects are offered by the AWSC at the University of Melbourne. Possible graduate courses are under discussion.

Recommendation 2.4. That the AWSC consider the level of course offerings in relation to resources of AWSC scientists during the next strategic planning round.

11. *The Advisory Committee be recast as a Strategic Advisory Committee with TORs to embrace advocacy, fundraising, environmental scans, strategic opportunities etc. A separate "Friends of the AWSC" group may be worth creating with less-defined functions.*

The review committee was advised there is an intention once the new partners have joined the centre to reform the Advisory Committee, with experts appointed in their personal capacity (not representative) and be more strategically focussed. The Review Committee concurred.

Recommendation 2.5. That the AWSC consider the composition and role of an Advisory Committee.

12. The AWSC initiate a formal process of project evaluation with assistance from DPIV.

This was not achieved, however currently the Victorian Department (DEDJTR) is conducting formal evaluations of its 3-year investment in the AWSC Dairy and Lamb research.

Recommendation 2.6. That the AWSC consider an appropriate evaluation method and frequency during its strategic planning process.

<u>An assessment of the achievement of key performance indicators in the AWSC Strategic Plan 2007-2012</u>

The Objectives are first stated and then information about whether and to what extent the KPIs were met follows (where available). The information comes primarily from Annual Reports and supplementary material provided to the Review Committee by the Executive Officer.

Objective 1: To conduct rigorous, innovative, basic and applied research to improve animal welfare.

<table>
<tr><th>KPI</th><th>Response</th></tr>
<tr><td>Increase funding by 10%</td><td>Achieved. Funding increased from some $1M to $2M between 2010 and 2014.</td></tr>
<tr><td>Increase invitation to present at conference</td><td>Sustained
<table>
<tr><th>Refereed</th><th>2009/2010</th><th>2010/2011</th><th>2011/2012</th><th>2012/2013</th><th>2013/14</th><th>2014/15</th><th>TOTAL</th></tr>
<tr><td>TOTAL</td><td>25</td><td>16</td><td>22</td><td>25</td><td>14</td><td>18</td><td>120</td></tr>
</table></td></tr>
<tr><td>Increase the publication of papers in high quality journals</td><td>Unlikely to have been an increase; Applied Animal Behaviour Science a key outlet and low impact factor. An internal AWSC review of its performance compared to other similar centres found ‘the research output of the AWSC in the last 5 years is comparable to other similarly sized animal welfare groups internationally’. Appears to be a more relevant KPI</td></tr>
<tr><td>Increase the impact factor of publications</td><td>Sustained
<table>
<tr><th>Journal</th><th>2013 Impact factor</th><th>2010/2011</th><th>2011/2012</th><th>2012/2013</th><th>2013/14</th><th>2014/15</th><th>TOTAL</th></tr>
<tr><td></td><td>TOTAL</td><td>20</td><td>21</td><td>13</td><td>17</td><td>21</td><td>72</td></tr>
<tr><td></td><td>AV Impact Factor</td><td>2.856</td><td>1.908</td><td>1.347</td><td>1.670</td><td>1.630</td><td></td></tr>
</table></td></tr>
<tr><td>Increase the level of ‘repeat business’.</td><td>It would appear that key Victorian Government and industry funders continue to support the Centre, and as income has increased, the KPI could be considered achieved.</td></tr>
</table>

Objective 2: To establish the AWSC as a leading international source of independent, authoritative animal welfare advice.

KPI	Response
Ensure Centre representation on education, research, production animals, AAWS sub-committees	Achieved. The review group was provided with a comprehensive list of steering groups, committees and councils that senior AWSC researchers contribute to (particularly Paul Hemsworth, Andrew Fisher and Graeme Coleman). N.B. AAWS is now disbanded.
Ensure Centre representation on AWAC and sub-committees	Achieved. Paul Hemsworth and Graeme Coleman have sat on the Victorian AWAC and its Sub-Committee.
Publication of quarterly	Achieved. Drop off lately. 2010-4; 2011-4, 2012-3, 2013-3,

electronic newsletter commencing early 2008	2014-1
Establish bi-annual meetings with Minister's advisor	Not achieved
Establish research linkages throughout the value chain, from producer to consumer	Achieved – in part. Developing whole chain approach to AW in the pork industry, working with Temple Grand in US. Model for other industries. Preliminary conversations with Coles Supermarkets.
Measure publications of books and chapters	Achieved. One book was published in 2011. Book chapters were published in 2010 (2), 2011 and 2013 (2). In addition the AWSC scientists had 84 refereed Journal paper and 81 refereed conference paper published in the 5 years 2010-2014.
Measure seminar attendance	Achieved. Seminar attendance is highly variable, and dependent on the speaker/topic; from a low of 21 – to several hundred (people & pets seminar March 2014 and Breeding Dogs Seminar, February 2010)
Measure presentations given at outside conferences/seminars	Not measured but listed in animal reports on website (see Appendix 6)
Maintain a log of contacts for advice.	Not achieved.

Recommendation 2.7. During development of the next Strategic Plan, KPIs incorporate particular levels, growth or improvement targets in addition to only measuring activities.

Objective 3: To provide relevant, high quality education and training.

KPI	Response
Re-launch GAW (Graduate Animal Welfare course) as a 'school certificate' at Monash University and/or as a Graduate Certificate at University of Melbourne.	Not achieved. (as above 2009 Recommendation 10) - The review group was advised that animal welfare subjects were developed and have been maintained at The Ohio State University and James Cook University, and three undergraduate and 2 master subjects are offered by the AWSC at the University of Melbourne. There are current discussions regarding possible graduate courses.
Increase the number of post-graduate students.	Achieved. There has been a steady increase with just 14 in 2006/07, rising to 25 in 2010/11 and 22 in 2011/12 and 26 post-graduate students listed in papers provided to the review Committee in May 2015.

Objective 4: To constantly improve the capability of the Animal Welfare Science Centre

KPI	Response
Sponsor communications with regard to animal welfare strategy between the Department of primary Industries and the Department of Innovation, Industry and Regional Development.	Not applicable. It is noted that this relates to past Victorian Departments. The next Strategic Plan will need to consider communication with Government departments in at least Victoria and South Australia, and perhaps in other states/federally if judged useful.
Formulate succession plan in mid-2008, identify future leaders.	Succession planning is addressed elsewhere in this report.

Undertake 5 year review in 2009.	Achieved.
Monthly Meetings of Executive.	Achieved. The AWSC conducts monthly activity update meetings for all staff. In new structure, regular Program Leader meetings will be scheduled.
Quarterly planning/protocol meetings for all staff.	Achieved. New projects are brought to the monthly AWSC research planning meetings for discussion.
Conduct annual Centre R&D planning meeting	Achieved.
In collaboration with AAWS, work with CAWE and CSIRO, describe current animal welfare R&D capability in Australia, identify future capability requirements and develop a consolidated national plan to achieve this.	Achieved. However with the development of the National Primary Industry Animal Welfare R,D&E Strategy Steering Committee (AWSC is a member and provides executive support) and the demise of the AAWS, the environment has changed considerable.

Recommendation 2.8. During the development of the next Strategic Plan strong consideration be given to sustaining strong communication with relevant Government departments, and effective planning with other research centres (not part of AWSC) to ensure maximum national coordination and efficient use of resources to work on the most important animal welfare issues.

ToR3 *Identify the strengths and weaknesses of the AWSC particularly in relation to its scientific performance and its development and application of scientific outputs*

The documentation provided to the review contained detailed bibliometric data which indicated that overall the centre had published 1 book, 5 book chapters, 84 refereed papers and 81 refereed conference papers since 2010. In addition there were 31 research reports. Of the 84 papers published in journals where journal rankings in field could be identified, 55 were in quartile one journals, 17 in quartile two and 6 in quartile 3, largely in the SJR field of animal science and zoology. The fact that many of the journals have low impact factors is due to the low academic rating of applied research in which the Centre has specialised (and been highly successful). The analysis provided indicated that the output of the six key researchers was comparable with like groups in Australia, New Zealand and the UK but less than that of the Canadian group (see Appendix 5b). The citation rate for some of the key researchers was well above the average for their field. The publication track record relative to opportunity needs to be considered in the light of the teaching and graduate student supervision responsibilities of the staff. Notwithstanding the ranking of the journals in which the Centre currently publishes, an increase in work in more basic sciences could facilitate publication in journals with higher impact factors (and high rankings in their field). It was surprising to see that several of the core researchers in the Centre had few if any first or senior author publications as one would expect core researchers to have more of a leadership role in projects and publications.

The Centre staff have supervised/are supervising a large number of PhD and Masters students from the University of Melbourne, Monash University and The Ohio State University. Past students have gone on to a variety of careers across a range of fields including various industries and academia. However, it would seem that not all PhD students are publishing their results, with most completed students with only one refereed paper and just a small number with three or four papers. It was noted that all of the seven students completing PhDs since 2010 had a refereed conference paper and six of these were international conferences. None of the Masters students appear to have

publications – this may reflect the nature of their projects but is surprising given that a proportion of Honours students do publish from their projects. Publication is a critical issue for completing students (particularly PhD students) as a low publication rate will make it difficult for them to obtain post-doctoral fellowships. The Centre has a low number of post-doctoral fellows and an increase should help the Centre's capacity to publish quality papers.

From discussions with the students it is clear that they generally have good working relationships with their supervisors and that the students on the Parkville campus have a strong mutual support culture facilitated by their sharing an office area. However, some attention may need to be given to ensure students at other locations receive an adequate induction and appropriate support (see also ToR5).

The Centre is almost entirely dependent on external funding and the funding track record indicates a commendable success rate in obtaining funding from industry and other sources. The success in obtaining pig and poultry funding is outstanding, however the dependence on this funding could be a vulnerability if the research priorities or funding capacity in those industries changes. It is pleasing to see one ARC grant, given the highly competitive nature of this funding. Establishment of collaborative research with medical or basic science groups within the Universities of Melbourne and Adelaide could increase opportunities for NHMRC or ARC funding and post-doctoral fellows.

Summary comments:

- Commend the Centre for its publication rate and quality of publications and the number of refereed conference papers/presentations.
- Commend the Centre for numbers of PhD and Masters students
- Ensure PhD students publish 3 or more papers from their PhD projects.
- Encourage core researchers to take a more active role in initiating and leading publications in refereed journals.
- Establish collaborations with medical and basic science groups to increase opportunities for Category 1 funding and post-doctoral fellowship positions
- Ensure student located away from Parkville receive adequate support
- Facilitate and support (by staff participation) development of a student seminar program and journal club

Recommendation 3.1. The AWSC should increase efforts to ensure student projects and theses result in quality peer-reviewed as well as bespoke industry-relevant publications, and in the context of an expanded AWSC, continue to take opportunities provided by host universities to increase biomedical collaboration and potential Category 1 funding support. In addition, the AWSC should continue to carefully monitor student progress and ensure that they receive appropriate mentoring, professional development and opportunities for intellectual exchange and skills development and sharing.

ToR4 *Identify how AWSC has met (or not met) the individual expectations of partner organisations (The Department of Economic Development, Jobs, Transport and Resources, The University of Melbourne, The Ohio State University OSU and Monash University) in relation to their investment*

Monash University: It was determined by the Review Committee that Monash University's expectations of the AWSC would not form part of the 2015 Review given their departure from the Centre in June 2012 and their lack of activity in the year prior. However, several submissions noted that the departure of Monash University was a significant loss to the Centre, particularly in the sociology/psychology area.

The Department of Economic Development, Jobs, Transport and Resources: DEDJTR co-founded the AWSC in 1997 and has continued to invest heavily in the Centre to ensure its aims of collaborative research, teaching, training and animal welfare improvements are met. In both its written and oral submission, DEDJTR advised that the Centre is appropriately delivering what the Victorian Government has asked of it in relation to its investment. DEDJTR has effectively outsourced certain R&D functions to the AWSC for sheep and dairy animal welfare rather than maintain internal capabilities that would duplicate those that exist within AWSC. DEDJTR noted that this has resulted in positive outcomes at Ellinbank (dairy) and to a limited extent at Hamilton (sheep).

DEDJTR expressed some concern that the Centre has not focused on pet or companion animals and the associated public and community perceptions despite the Victorian Government's prioritization of this issue.

Whilst DEDJTR is positive about the governance of the Centre, it sees succession planning as an area needing improvement. Whilst DEDJTR did not see many tangible benefits to the Ohio partnership, it noted that the relationship was of benefit in terms of international reputation and exposure, and it is pleased with the inclusion of the University of Adelaide and SARDI going forward. DEDJTR suggested that the Centre could work more collaboratively with the CSIRO.

The University of Melbourne: A founding partner since 1997, UoM's expectations appear to be met by the AWSC. The Review Committee was notified of examples where UoM significantly benefits from the AWSC and its local, national and international reputation. However according to respondents to the Review, the University does not provide adequate base funding for operating funds such as staff salaries and administration to allow for long-term security of the Centre.

UoM also expect certain AWSC staff to allocate time to teaching which draws on the limited resources of the Centre. UoM staff advised that the University wants to see the balance of funding continue to come from grants and industry. Whilst UoM were supportive of the new partnership with The University of Adelaide and SARDI, there was some concern that the Centre and its reputation would shift away from Victoria towards South Australia, particularly given South Australia's appointment and funding of five full time AWSC-relevant positions. UoM staff admitted that funding from UoM could have been greater in the past and that there is a potential risk of expertise shifting outside of Victoria if long-term secure funding isn't addressed.

UoM also placed great importance on the national and international reputation of the AWSC (and therefore UoM). Some submitters noted that the legal and contractual system within UoM is slow and tedious, and was at times impeding AWSC's ability to conduct business with industry partners.

Submitters also noted that the potential to draw on knowledge, resources and personnel from UoM to benefit the Centre have not been maximized. For example, there is a wealth of knowledge and expertise at UoM in areas that cross over with animal welfare including science, philosophy and biomedical but these have not been actively pursued.

The physical location of the AWSC within UoM also appears to be an issue and does not allow the Centre to have the visual presence it might otherwise have if it were housed with the Faculty of Veterinary and Agricultural Sciences. There are some plans in place, including proposed new buildings for the Faculty, which would address this issue but these changes would not take place for some time.

The Ohio State University: OSU joined the AWSC as a partner in 2010 and collaborates through its Department of Animal Science and the College of Veterinary Medicine. Whilst OSU did not make a written submission, the Review Committee was advised that the University had input into the material presented as part of this review process. It was noted that OSU continue to be enthusiastic about the partnership with AWSC, despite most of the work being initiated and led by the Centre not OSU. Two relevant new staff appointments have recently been made at OSU.

Interviews with AWSC staff indicate that the partnership with OSU has been largely beneficial. Whilst the time zone difference and nature of the partnership has presented some difficulties, students in particular have benefited from participating in the Study Abroad Program (with Pennsylvania University also joining the Study Abroad Program). AWSC staff were confident that the Centre would be able to benefit further from the OSU partnership in the future, including extension activities such as ProHand (i.e. use in abattoirs in the United States).

New Partners: The admission of The University of Adelaide and SARDI appears to be of benefit to the existing partner organisations and allows the Centre to diversify, share resources and broaden its funding, impact and reach. Whilst there was some concern that the entry of the South Australian 'node' may draw some of the focus and attention away from Victoria, AWSC and UoM staff saw mostly positive benefits in the long-term.

Other potential partner organisations were considered in various submissions including West Australian, Queensland and NSW research and academic organisations and international partners like the Scottish Agricultural College (i.e. an EU complement to OSU)

Funding: The AWSC needs to continue to build and secure funding to ensure its partner organisations remain confident in their investment. It is apparent that some partners are more heavily financially invested than others. For example, DEDJTR currently contributes a large majority of base funding compared to UoM's relatively small financial investment. UoM however provide facilities and funds for overheads. Succession planning is a continual challenge if only 'soft' money is forthcoming from partner organisations as it leads to insecurity of AWSC staff.

Governance: Interviews with AWSC Board and Staff members indicated that the Board has been relatively passive for 18 months whilst the partnership with University of Adelaide/SARDI has been finalized, particularly in relation to risk management. A lack of efficiency, direction and commitment from partner organisations has made it difficult for the Board to effectively govern the Centre. The Board does not appear to formally review AWSC and key personnel performance on a regular basis. Administrative functions appear to be performed particularly well by the Executive Officer, Mr Jeremy Skuse. The Advisory Committee has become defunct and ex-members advised of the lack of any direction or terms of reference within which to effectively contribute. The current Independent Chair of AWSC, Dr Mike Rickard, indicated to the Review Committee his desire to step down as Chair after a long period of service.

Some submissions queried the governance structure of the AWSC and noted that there doesn't appear to be adequate processes in place to take advantage of commercialization of animal welfare research. For example, it is not always clear who owns the intellectual property of the AWSC (DEDTJR, UoM, OSU or others) although it was indicated by AWSC that no real issues surround IP ownership or management.

AWSC staff and partners raised succession planning as a key concern as well as a lack of strategic direction and a lack of prioritization of research projects. The need for a successor to Prof Grahame Coleman (either on staff or through collaboration) in sociology/psychology received specific mention. The entry of two new partner organisations provides an opportunity to re-address these issues, taking into account the existing and new capabilities so that they complement but not duplicate each other.

Recommendation 4.1. The AWSC engage a new independent Chair and re-structure itself to include both representatives of the five partner organisations and additional members with particular skills. The Review Committee suggests the Board seek members with skills in risk management, legal, finance, strategic planning, biomedical and animal welfare. Some remuneration for the Chair should be considered.

Recommendation 4.2. The AWSC address governance issues by adopting a Charter or Terms of Reference (which cover aspects such as Director's Duties, Terms of Office, Rotation of Board Members, Training for Directors and key staff Appointment, Performance and Appraisal).

Recommendation 4.3. The AWSC develop a five-year Strategic Plan in consultation with AWSC staff and stakeholders. The Plan should address whether additional committees (such as an Advisory Committee) are required and if so, take responsibility for Terms of Reference and Appointments. The Plan should take into account the capabilities of the two 'nodes' (South Australia and Victoria) and undertake a gap analysis to identify where the next focus should be nationally or internationally, identifying any potential new partners. The Strategic Plan should also address succession planning.

Recommendation 4.4. The AWSC should continue to address its funding structure and assess whether measures such as endowments, bequests, benevolent funding or the establishment of a foundation would be of benefit to the Centre, increasingly drawing on the University of Melbourne and the University of Adelaide for support.

ToR5 *Provide key recommendations to the Board re Strategic direction the AWSC should take over the next 5-10 years to optimize its contribution towards enhancing animal welfare in farm, companion and zoo animals, its delivery of information towards a more informed community and to the strategic plans of partner organisations*

In regard to ToR5, the Committee provides the following recommendations as a result of a review of progress and achievements by the AWSC, submissions during the process and considerations of future challenges and opportunities.

Strategic Plan
The AWSC does not have a current Strategic Plan, with the most recent Strategic Plan being for 2007 - 2012. With the addition of SARDI and Adelaide University as partner organisations and the change of structure of the organisation having two 'nodes', it is an imperative that the AWSC develop a new Strategic Plan. The bedding down of the expanded organisation will be critical to ensure that capacity, capability, resourcing and reach are maximised.

Recommendation 5.1. The AWSC develop a 5-year Strategic Plan that reflects the changes in the organisation, capabilities of the two 'nodes' (South Australia and Victoria) and the opportunities and challenges as an independent ,multi-party, multidisciplinary, evidence-based, ethical animal welfare science centre. The strategic plan should be developed with involvement from key stakeholders to ensure relevance and future support for the organisation and its valuable work.

Recommendation 5.2. After full integration of parties into the new AWSC and its operational functionality, explore developing further collaborations and partnerships, for example CSIRO and others (Syd Uni, UQ, UWA) to ensure a truly national approach to animal welfare science as well as increasing further capacity and value.

Research work
The work undertaken by AWSC is highly valued by the many, diverse stakeholders that have an interest in animal welfare science. The need for independent, evidence-based science to support sound decision making and practice change was recognised as an ongoing need across farm, companion and zoo animals. Identified in a number of submissions was the high impact work that had been undertaken in the area of intensively farmed animals, and that there is an opportunity to expand the scope of the research undertaken with a greater emphasis on extensively farmed and companion animals, and extending to fish/aquaculture.

Recommendation 5.3. The AWSC consider expanding the scope of research activities within budgetary capacity to include a duty of care agenda; quantitative measures of positive animal welfare; novel ways to quantify animal welfare; broadening of the scope of work with red meat, dairy, fish and companion animals; attention to alternative and future farming systems.

Funding
The AWSC needs to continue to build and secure funding to diversify its income and ensure that it's partner organisations remain confident in their investment. A number of new potential partners or investors were identified throughout the review including existing livestock industry sectors, CSIRO and the food value/supply chain.

Recommendation 5.4. Develop the value proposition, identifying current capacity and capability as a means of embedding the appreciation within current investors as well as promoting to potential new investors.

Recommendation 5.5. Continue to strengthen the relationships with multiple components of the livestock industry, for example the lot feeders industry.

Recommendation 5.6 . Explore potential opportunities to garner support, including funding, from the broader food value chain including the retail sector with a view to underpinning the 'welfare thinking' within this sector with good science.

Training

The building of capacity in the animal welfare science space through training was recognised as an important function of the AWSC, including the development of graduates and post graduates. There were a number of areas identified that could further boost this capacity in terms of skills development as well as the potential to expand career opportunities. Relatively limited employment opportunities exist for animal welfare science professionals in either academia or the broader workforce. Potential career diversity that capitalizes on a background training in animal welfare could ensue from a broader training of RHD graduates or at least exposure to the commercial world, business practices and service industries, for example.

Recommendation 5.7. The AWSC should assess the feasibility of increased industry placements, securing scholarships support from non-traditional sources (e.g. the food retail sector), and mentoring or professional development and course work aimed at increasing commercial skills/industry awareness for AWSC RHD students.

Extension and Awareness

The role of extension of animal welfare science through education, training and awareness remains an important function of the AWSC. The extension model within Australia is continuing to change with a shift away from provision of services by State Agencies to a model that involves peak industry bodies, such as RDCs, and the private sector. As such, the AWSC needs to consider the role that it plays in education and awareness raising to enable effective implementation of animal welfare.

Recommendation 5.8. The AWSC should explore expanding its extension role to include commercial agribusiness service providers and other professionals in the broad animal welfare domain (e.g. veterinarians, animal health officers).

ToR6 *Identify changes in the AWSC's operating environment and provide recommendations to the Board taking into account the admission of the University of Adelaide and the South Australian Research and Development Institute into the AWSC under the new Centre agreement*

The fundamental driver of animal welfare as a public issue in Australia has become clearer and more settled over the last 25 years and provides a vantage point for identifying changes in the operating environment of the AWSC and making a set of recommendations to the Board. The Centre's 2007-2012 Strategic Plan encapsulates this driver in its vision that animal welfare and its continual improvement are societal and cultural norms in Australia. The Australian Animal Welfare Strategy[1] embedded the notion of societal and social norms in its consensus view that all Australians have a duty of care to ensure that the welfare of animals is maintained and protected. This notion of animal welfare as a societal norm has been carried forward within the COAG framework. Another legacy of the AAWS is the universal ethic that all stakeholders are obliged to recognize that animals are sentient beings.

An issue identified in the Centre's Strategic Plan was that "consumer and public attitudes to animal

[1] Australian Animal Welfare Strategy and National Implementation Plan 2010-14. Department of Agriculture, Fisheries and Forestry. http://www.australiananimalwelfare.com.au/content/strategy3

welfare have the potential to dramatically affect the use of animals in society, influencing for better or for worse". Four key areas of activity can be seen as necessary for a rational approach to animal welfare: animal welfare science; understanding public and consumer attitudes to animal welfare; public education; and industry education;

The basic settings described for the operating environment in the Centre's 2007-2012 Strategic Plan still apply. The following discussion and recommendations reflect developments that have occurred since the review in 2009. They relate to the operational realities of animal industries, the integrity of the commodity supply chain, the national scene, the international arena, connections with biosecurity and environmental management, and the opportunities opened by symbiosis between AWSC's new nodes in South Australia and Victoria.

Animal industries and commodity supply chain

Animal welfare is one of the six core functions in Australia's Animal Health System[2] and has been voted second as a risk ('the chance of something happening that will have an impact on objectives', AS/NZS 4360:2004[3]), coming behind the core function of emergency preparedness and response and on a par with the core function of trade and market access. This high concern for animal welfare as a risk prompted the CRAW project (Crisis Response for Animal Welfare), which examined what happens when a business is unable to resolve an animal welfare crisis. The CRAW report[4] and its 12 recommendations may have implications for the future activities of the AWSC.

The World Bank sees animal welfare as a component of environmental and social management systems that can improve overall operations[5]. Australia may have an economic handicap if the twentieth century myopia about animal welfare as a source of economic disadvantage were to prevail. The AWSC may have a role in respect of developing an industry capacity for writing effective action plans and procedures for environmental and social management systems.

Australia's major food retailing firms have installed animal welfare into their operating plans as part of good management practice and good corporate governance. The views of customers have been recognized and integrated into decision-making processes. Food retailing firms see the need for an evidence-based approach to animal welfare, hence an emerging role for the AWSC. Food retailing firms also recognize that they bear the consequences of poor animal welfare at earlier stages of the commodity supply chain. Poor animal welfare affects the integrity of commodity supply chains. For this reason, good animal welfare is a matter for risk management by food retailing firms and goes beyond marketing advantage.

Recommendation 6.1. In relation to the circumstances in which animal and food industries operate in Australia, it is recommended that the AWSC note (a) how Animal Health Australia (AHA) applies risk management as part of good corporate governance and views animal welfare as a management risk within Australia's animal health system, and (b) risk management strategies of food retailing firms and how AWSC can assist with the necessary input from science and developing process for facilitating this impact.

---

[2] National Animal Health Performance Standards http://www.animalhealthaustralia.com.au/programs/livestock-health/national-animal-health-performance-standards/

[3] AS/NZS 4360:2004. Australia/New Zealand Standard Risk Management®. Standards Australia International Limited, Sydney.

[4] Animal Health Australia: Crisis Response for Animal Welfare Final Report 11 July 2014. http://www.australiananimalwelfare.com.au/content/livestock-and-production-animals/crisis-response-for-animal-welfare

[5] International Finance Corporation (2014) *Environmental and Social Management System Implementation Handbook (ANIMAL PRODUCTION)* International Finance Corporation, World Bank Group, Washington DC.

The National Scene

While concern for animal welfare has been given the status of a societal norm in Australia, this notion may not apply through the whole community. Community engagement with animal welfare remains an issue. In market research terminology, recognition of animal welfare as a societal norm may apply only to the early adopters (16% of the population) and 'social proof' is required to engage the 'early' and 'late majority'. This engagement with a possible 84% of the Australian population provides a challenge for RD&E and implies a role for the AWSC.

A monitoring and evaluation framework for Australia's performance in animal welfare may still be a consideration for public policy. A model framework was outlined at the 2013 meeting of the AAWS and was built around a 'common and consistent application of process to build capability to deliver' the outcome of improved 'lived experiences' in animals. 'Capability to deliver' implies animal welfare science, public education and industry education and thus extends to the AWSC.

At a regulatory level, a report to the AAWS in 2008[6] concluded that 'it may better achieve animal welfare outcomes to shift regulation of animal welfare from a legal process approach to a social process approach, leaving anti-cruelty offences regulated according to legal process'. The social process approach to animal welfare has been a recurrent theme of the AWSC and a continuation of this theme within the Centre is highly desirable.

Recommendation 6.2. In relation to the national scene, it is recommended that the AWSC further note several recent inputs to sociological aspects of animal welfare and their relevance to the AWSC and AWSC's potential to make innovative contributions to public policy.

The current animal welfare policy void at the Federal Government level may provide judicious leadership opportunities for the expanded AWSC and positioning as a key component of (informal) networks aiming to reinforce to governments that animal welfare is a "wicked problem". It will continue to impact around production systems, biosecurity and trading partner relationships as well as being a source of contested societal views on companion, captive, feral, recreational and laboratory animals.

Recommendation 6.3. The AWSC should maintain active two-way communication with key animal welfare policy professionals and organisations in Canberra highlighting the progress being made in animal welfare science and training (as well as translation including practice change in industry) that is in the national interest and in which Australia must maintain a high international reputation and active profile.

The dynamic state of animal welfare regulations, audits, policies and best practice guidelines present a challenge to organisations in the animal welfare space as well as the food value/supply chain. For example, some farmers now have to deal with several different "welfare audits" – industry QA, RSPCA, retailers.

Recommendation 6.4. Given that replacement of the previous national body AAWS remains under consideration, the AWSC should determine its capability and capacity to market its expertise and provide advice to organisations such as RSPCA, AVA, commercial agribusiness service providers and food retailers in regards to the elements of evidence-based policy and/or requirements for "welfare audits".

The International Scene.

[6] Geoffrey Bloom and Associates: Regulating animal welfare to promote and protect improved animal welfare outcomes under the Australian Animal Welfare Strategy.

Notable is a converging view from two international bodies, namely the World Bank and the World Organisation for Animal Health, the OIE. A World Bank document[7] suggested that defining the attributes and managing the quality of quality management programs was an emerging issue for animal welfare.

The meeting on 26-27 March 2015 of the coordination group of OIE's Regional Animal Welfare Strategy for Asia, the Middle East and Oceania (RAWS) also considered the attributes and scope of quality management programs for animal welfare. The RAWS recommended that 'as appropriate, OIE Delegates and/or National Focal Points make contact with ISO (international Organisation for Standardisation) contact points in their own countries to gain improved understanding of the detail of ISO developments on an animal welfare technical specification'.

Scoping of what could be entailed in the development of an ISO for animal welfare could show whether there is an opportunity for both the AWSC and Australia. The risk is that quality assurance programs for animal welfare, which do not satisfy minimum requirements, may displace quality assurance programs that are efficacious.

Also notable are World Bank[8] and FAO[9] activities in livestock and climate change mitigation and the implications for animal welfare. Interventions to reduce greenhouse gas emissions can be based on measures to improve production efficiency at animal and herd levels. This includes improved animal health and husbandry that can shrink the 'herd overhead'. Animal welfare can be seen as the integrating discipline for measures to make animal-based agriculture more environmentally friendly. The union of animal health, animal husbandry and animal welfare as a means for climate change management heightens the value of the entry of South Australian institutions into the AWSC.

Considerations by OIE's RAWS involve some cultural aspects of animal welfare. One was the matter of sensitising religious leaders to OIE Standards. Another was Malaysia's Guideline on Religious (Idul Adha) Slaughter of cattle. It would be a tour de force if the unique combination of physiological and ethological skills within the expanded AWSC were to come up with a method for ruminant slaughter that met both animal welfare and religious requirements. Such an innovation would do wonders for social inclusion.

Recommendation 6.5. It is recommended that in relation to the international scene, the AWSC continue to monitor World Bank, OIE and FAO develoments with a view to capturing opportunities for AWSC involvement and beneficial influence.

<u>The expanded AWSC</u>

The impending new AWSC agreement involving integration of SARDI and the University of Adelaide provides a multitude of advantages and is strongly supported by many stakeholders. Respondents made comments about the greater number of active research scientists and students in the new Centre and opportunities for greater animal welfare advocacy and increased professional and community engagement; the attractive combination of research facilities in South Australia with the industry connections of the Victorian node; the capacity of the SA node to develop new (neuro) physiological indicators of stress and positive welfare states than simple cortisone levels. The proposed 2 nodes of the enlarged new AWSC, together with the Victorian node now embedded in the newly established FVAS, provide enhanced opportunities for AWSC to market itself in the context of the 2 host Universities and the broader offering of research and technical expertise and student

[7] International Finance Corporation (2014) '*Improving Animal Welfare in Livestock Operations, Good Practice Note*, International Finance Corporation, World Bank Group, Washington DC.

[8] World Bank (2009) *Minding the Stock: Bringing Public Policy to Bear on Livestock Sector Development* (2009) The International Bank for Reconstruction and Development/The World Bank, Washington, DC.

[9] FAO (2013) *Tackling Climate Change through Livestock – A Global Assessment of Emissions and Mitigation Opportunities*. Food and Agriculture Organization of the United Nations, Rome.

course work. Such expertise would include veterinary science, agricultural science including food science, law/ethics, engineering, sociology/psychology, farm economics. Deeper knowledge of the skills and linkages across the collegiate University environment would be particularly useful for funders, particularly the non-traditional potential funders (e.g. retail sector, international welfare groups).

In terms of the new arrangements and the 2 nodes, the Board should note that for the Victorian node, the partner organization DEDJTR outsources its animal welfare whereas for the South Australian node, the government partner, SARDI, is undertaking research in-house.

Recommendation 6.6. The AWSC should provide an information fact sheet highlighting complementary expertise to which AWSC has access across Melbourne and Adelaide Universities.

As indicated above, numerous opportunities are inherent in the commendable plan to expand the AWSC and create a larger physical and intellectual entity. We highlight an additional feature. A narrowness of view in the twentieth century erected a false barrier between ethology (animal behaviour) and physiology and the notion of comparative psychology lacked traction in some circles. Advances in biological knowledge make this barrier untenable. Physiology can feed off animal behaviour and vice versa and provide the power of consilience or agreement between processes for advancing knowledge. A working culture that values such consilience may provide a bulwark against any vestigial view that physiology has more merit than ethology and vice versa. The new AWSC can be reckoned as globally unique in providing a working interface between animal behaviour and ethology and one that can cover physiology at levels from molecules to whole organisms. We commend the Centre for this strategic, integrative and partial "future-proofing" initiative.

Conclusions

Over the review period 2010-14, the AWSC has posted significant achievements. Competitive funding has doubled (though funding in prior years has approached the $2m current figure); the publication record and seminar series are impressive; contributions to animal industry codes of practice and implementation of the national Animal Welfare RD&E Strategy are widely recognized by respondents to the review; overall feedback from pig and poultry industry organisations is highly positive; significant key appointments have been made since the 2009 review (Fisher, Rault, Doyle); and very apparent is the increased involvement of DA and MLA – i.e. dairy and red meat industries – since the 2009 review. Although an in-depth analysis of comparative metrics relevant to publication quality and impact has not been performed by the Review Committee, comparative analyses with like organisations are favourable for the Centre (see ToR3 and Appendix 5b).

Other positive developments over the review period include the incorporation of AWSC into the newly established Faculty of Veterinary and Animal Sciences (FVAS) and attendant interactions with veterinarians and veterinary students. Also addressed have been the perceptions of some that industry funding to the AWSC biases outputs to "industry –friendly messages" through highlighting its policy, supported by industry, of publishing all results of projects in peer-reviewed journals.
In terms of financial support from existing partner organisations, it is clear that DEDJTR support greatly exceeds that of Melbourne University. Commentary from respondents to the review was that the University was "getting a very good deal". The teaching load in AWSC is substantial and salary and operating support for key individuals is less than what would be considered appropriate for a research-intensive University aspiring to be number 1 in Australia for research excellence.

From 2015 "External Review of Faculty Research", Faculty of Veterinary and Agricultural Science, University of Melbourne

Animal Welfare

Findings and recommendations:

Since its creation some years ago, the Animal Welfare Science Centre (AWSC) has established a national and international reputation as a centre of excellence in "the conduct and interpretation" of animal welfare and behaviour science. Its 3rd quinquennial review as a multi-party research alliance will occur this year. Strong internationally-recognised leadership is apparent as is a large cadre of high quality, highly-motivated, RHD students. It emerged during stakeholder consultations that the decision of the University of Melbourne to establish AWSC with partner organisations (particularly the Victorian Government department responsible for agriculture, veterinary matters and animal welfare), is viewed nationally as a smart strategic investment in an era of intensification of production systems and in an area of increasing public interest if not concern. Clearly, good science can inform debates that involve contentious matters, where societal "license to operate" may be at risk, and in which evidence-based policy is essential.

Within the portfolio of research, intensive (pig and poultry) and extensive livestock husbandry are embraced in addition to significant projects in companion and zoo animals. Human-animal interactions are a focus with guidelines established for animal handlers based on research findings. Integration into FVAS is viewed very positively. Changes are mooted in the AWSC partner organisations with incorporation of the University of Adelaide/SARDI and exit of Monash University. Ongoing DEDJTR support is vital and the entry of the South Australian entities with their proposals for significant investment through several senior appointments should be very positive for AWSC and thus FVAS.

Funding security is the major issue for the Centre with limited core funding (i.e. 80% "insecurity"). Despite funding uncertainties, productivity has been high with publications, students and indeed quantum of funding support increased in recent times. Other challenges include facilities for and costs of conducting extensive research on animal behaviour and welfare indicators. Recruitment of Prof Andrew Fisher has increased capacity for dairy cow welfare research and further opportunities in dairy cow research are obvious – e.g. implications of climate change and increased herd size and confinement (including heat stress); immuno-competence at the pregnancy to lactation stage; neonatal calf rearing.

Executive Summary

The ***Animal Welfare*** group, through AWSC, is internationally recognised for its research on behaviour and welfare of livestock species, especially pigs and poultry. The pending expansion of AWSC to include groups from SARDI and the University of Adelaide will both increase its ability to serve the extensive livestock industries and strengthen its capability in the neurophysiological bases of animal behaviour. The Centre also is nationally regarded as a trusted source for development of sound, science-based policy on animal welfare issues. Its most important needs are to reduce its reliance on external funding of several key appointments and to retain or expand affordable facilities for conducting research on animal behaviour and welfare.

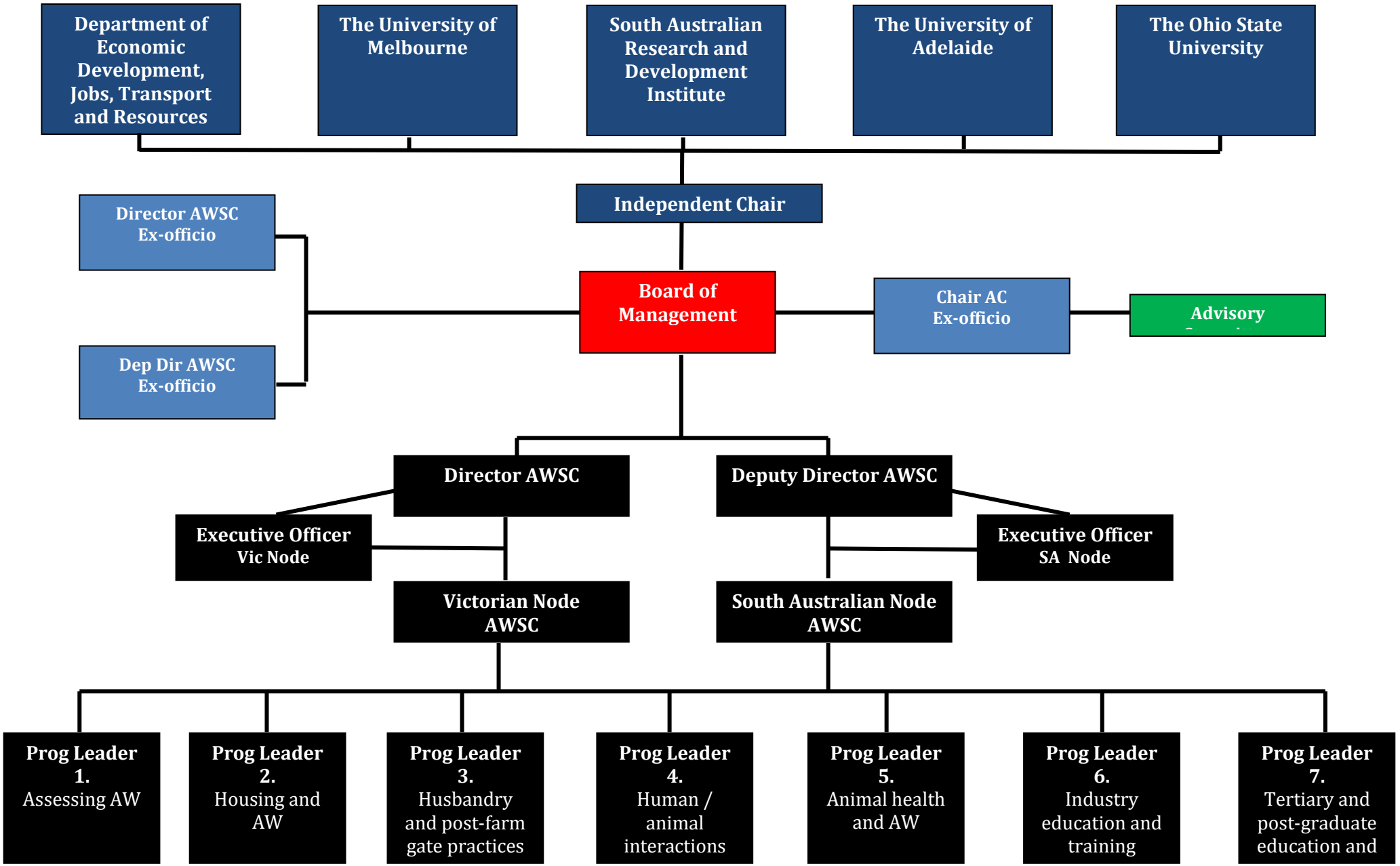
Clearly, the AWSC "paints on a large canvas", even more so with an expanded AWSC of 2 nodes. A strategic plan to guide research direction, scope and priority setting is needed. Several interesting research opportunities were raised with the Review Committee – welfare issues for feedlot operators; dairy cow studies at the welfare-health interface; biosecurity implications of stress (e.g. increased shedding of virus from "carriers"); technical developments (e.g. in the neurosciences) enabling development of new indicators of positive animal welfare states in addition to indicators of suffering; animal welfare issues in recreational and commercial fishing including agriculture (fish and fisheries research being a primary focus for South Australia under the Primary Industries RD&E Framework).

In conclusion, the Review Committee can simply reflect the majority view of respondents to the review that, despite some governance challenges, a small executive and funding constraints, the AWSC has enjoyed a productive period of animal welfare research, training, teaching and extension. It is a recognized national resource for governments, animal industries, academia, and professional associations though not yet for the media and community. Through expansion, the centre is now ready to extend its influence. The Review Committee commends the Centre on its achievements and its standing in the animal welfare sphere as evidenced by the feedback from the sector.

Abbreviations

AAWS	Australian Animal Welfare Strategy, Australian Government
AHA	Animal Health Australia
APL	Australian Pork Limited
APVMA	Australian Pesticides and Veterinary Medicines Authority
ARC	Australian Research Council
ASAG	Australian Animal Health Laboratory Security Assessment Group
AWSC	Animal Welfare Science Centre
COAG	Council of Australian Governments
CAB	Commonwealth Agricultural Bureau
CRC	Corporative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Dairy Australia
DEDJTR	Department of Economic Development, Jobs, Transport and Resources, Victorian Government (also "ecodev")
DEWLP	Department of Environment, Land, Water & Planning, Victorian Government
EU	European Union
FVAS	Faculty of Veterinary and Animal Sciences, The University of Melbourne
IP	Intellectual Property
MLA	Meat and Livestock Australia
NATA	National Association of Testing Authorities
NHMRC	National Health and Medical Research Council
OIE	World Organisation for Animal Health
OSU	The Ohio State University
PhD	Doctor of Philosophy degree
QA	Quality Assurance
R&D	Research and Development
RAWS	OIE's Regional Animal Welfare Strategy
RD&E	Research, Development and Extension
RHD	Research Higher Degree
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SARDI	South Australian Research & Development Institute
SJR	Scilmago Journal and Country ranking
ToR	Terms of Reference
UofA	The University of Adelaide
UoM	The University of Melbourne
WHO	World Health Organisation

Appendix 1
New AWSC Organisational Chart July 2015 - on



Appendix 2

Dr David Adams, Independent Researcher
David graduated from Sydney Vet School in 1964 and has a D. Phil from the University of Oxford. His career has included stints in farm animal practice, CSIRO, and with the Australian Department of Agriculture in the Bureau of Resource Sciences and the Office of Chief Veterinary Officer. David has published widely in the fields of parasitology, immunology, behavioural psychology, animal production and public health and has contributed to the work of the International Organization for Standardization (ISO), the World Organisation for Animal Health (OIE), the South-East Asia China Foot and Mouth Disease Eradication Campaign and the Animal Welfare Committee of the NHMRC. He has a continuing preoccupation with biosecurity, good animal husbandry and processes for feeding science into public policy.

Prof. Mary Barton AO, Emeritus Professor, University of South Australia
Among her many roles and achievements, Mary is Emeritus Professor of Microbiology in the School of Pharmacy and Medical Sciences of the University of South Australia; has served as a board member and director of RSPCA SA; has been a member of the CSIRO Australian Animal Health Laboratory Security Assessment Group (ASAG) since 1990 (and its chair from 1990 to 2002); Science Fellow of the Australian Pesticides and Veterinary Medicines Authority (APVMA) since 2009; and a member of the Veterinary Testing Accreditation Advisory Committee of the National Association of Testing Authorities (NATA) since 2005. Mary also chaired the AAWS Working Group on Animals in Research and Teaching.

Dr Graham Mitchell AO, is a Principal of Foursight Associates, an advisory service in Science, Technology and Innovation with clients in government, academia, the financial sector and industry. Foursight, primarily through Principals Graham Mitchell and Michael Taylor, acts as the outsourced Chief Scientist for the Victorian Government Departments, DEDJTR and DEWLP. He is a graduate of Roseworthy Agricultural College and the University of Sydney Veterinary School, was a researcher at The Walter & Eliza Hall Institute for many years; also the Director of the Melbourne Zoo and Director of Research at CSL Limited. He has worked in many overseas countries and was involved with tropical disease programs of WHO for some 30 years, is the author of more than 350 publications and in 1993 was appointed an officer in the Order of Australia (AO) for services to science.

Ms Glenys Oogjes, Executive Director, Animals Australia
Glenys is one of Australia's most experienced animal advocates. From rural beginnings on a Victorian dairy farm, her interest in animal welfare and work in the field has spanned three decades. After obtaining a degree in Behavioural Science, Glenys turned her attention to animal protection and has spent much of her career getting animal welfare on the government agenda. She has contributed to numerous national reviews of Codes of Practice and animal welfare laws in each State and Territory. Glenys has also worked to achieve greater protection for animals through representation on various committees including the Australian Animal Welfare Advisory Committee, it's Victorian equivalent, Institutional Animal Ethics committees, and on the Advisory Committee of the Animal Welfare Science Centre.

Dr. Jim Rothwell, Program Manager, animal welfare, health and biosecurity, Meat and Livestock Australia
Jim completed his PhD in veterinary parasitology at the University of Sydney in 1993 and following a technical role with a large multi-national moved to the University of

Queensland to take up the position of Professor of veterinary pathology and infectious diseases. Since 2011, Jim has worked as Program Manager, animal welfare, health and biosecurity with Meat and Livestock Australia. Jim sits on the Steering Committee of the National Primary Industries Animal Welfare RD&E Strategy.

Alice Skipper is a former environmental lawyer, having worked as a Senior Associate at DLA Piper, a global law firm, and in the not for profit sector for the Australian Conservation Foundation and the Environment Defenders Office. Alice has applied her legal expertise to various animal welfare issues and sits on a number of Boards and Committees, including Zoo's Victoria's Animal Welfare Peer Review Committee. She is currently the National Environment and Sustainability Manager at a contracting services business called Zinfra Group and specialises in environmental assessment and risk management.

Prof. Kevin Stafford, Co-Director, Animal Welfare Science and Bioethics Centre, Massey University
Kevin is a veterinarian with an interest in animal behaviour and welfare. He is author or co-author of several books, including The welfare of dogs, The sciences of animal welfare and Animal Welfare in New Zealand, and over 200 refereed papers. He is interested in farm animal behaviour and welfare and has a special interest in dog and cat behaviour problems. He teaches animal behaviour and welfare to veterinary, agriculture, ecology and humanities undergraduates. He supervises a number of PhD and Masters students. He is a Fellow of both the Royal College of Veterinary Surgeons and the Australian New Zealand College of Veterinary Scientists.

Ms. Sharon Starick, Kongolia Farms, S.A.
A cereal and pig producer from SA, Sharon Starick has combined primary production interests with natural resources management and community organisations. Sharon is the Chair of the South Australian Murray Darling Basin Natural Resources Management Board and Rural Business Support. She is a current board member of the Royal Automobile Association of SA and Animal Health Australia. In the past, Sharon has served on the Grains Research and Development Corporation, Land and Water Australia, the South Australian Natural Resources Management Council, the National Rural Advisory Council, Mallee Sustainable Farming Board, Pork Industry Development Board, and the Community Advisory Committee for the Murray-Darling Basin Ministerial Council. In 2003, Sharon was awarded the RIRDC Rural Women's Award.

Appendix 3 – **Terms of Reference**

ToR1 Critical analysis of the scientific performance and impact of the AWSC in improving the welfare of farm, companion and captive animals. This includes impact on science, Government, industry and community, including performance of the AWSC in areas of community concern over the 5 year period of the review.

ToR2 Review performance relative to recommendations of the 2009 review and 2012 Strategic Plan

ToR3 Identify the strengths and weaknesses of the AWSC particularly in relation to its scientific performance and its development and application of scientific outputs

ToR4 Identify how AWSC has met (or not met) the individual expectations of partner organisations (The Department of Economic Development, Jobs,

Transport and Resources, The University of Melbourne, The Ohio State University OSU and Monash University) in relation to their investment

ToR5 Provide key recommendations to the Board re Strategic direction the AWSC should take over the next 5-10 years to optimize its contribution towards enhancing animal welfare in farm, companion and zoo animals, its delivery of information towards a more informed community and to the strategic plans of partner organisations

ToR6 Identify changes in the AWCS's operating environment and provide recommendations to the Board taking into account the admission of the University of Adelaide and the South Australian Research and Development Institute into the AWSC under the new Centre agreement.

The performance of the AWSC should be considered in terms of local (Victoria), national and international endeavours.

Appendix 4a – Call for Submissions

AWSC Partners

1. The University of Melbourne
2. Monash University
3. Department of Economic Development, Jobs, Transport and Resources (Vic) - EcoDev
4. The Ohio State University

Research Providers

5. AgResearch NZ
6. CSIRO
7. Charles Sturt University
8. James Cook University
9. Massey University
10. Murdoch University, Animal Welfare Science and Bioethics Centre
11. South Australian Research and Development Institute
12. Queensland Alliance for Agriculture and Food Innovation
13. University of Adelaide
14. University of New England
15. University of Queensland, Centre for Animal Welfare & Ethics
16. University of Sydney
17. University of Western Australia

Government

18. Animal Welfare Advisory Committee, Victoria
19. Animal Welfare Advisory Committee, South Australia
20. Department of Agriculture (Commonwealth)
21. Department of Agriculture and Fisheries, Queensland
22. Department of Agriculture and Food, Western Australia
23. Department of Environment, Water and Natural Resources, South Australia
24. Department of Primary Industries, Parks, Water and Environment, Tasmania
25. Primary Industries and Regions South Australia
26. Department of Primary Industry and Fisheries, Northern Territory

27. NSW Department of Primary Industries
28. BioSecurity Vic

Industry / funders

29. Animal Behaviour Clinics (Robert Holmes)
30. Australian Chicken Meat Federation
31. Australian Dairy Farmers Limited
32. Australian Egg Corporation
33. Australian Livestock and Rural Transporters' Association
34. Australian Livestock Markets Association
35. Australian Lot Feeders Association
36. Australian Meat Processor Corporation
37. Australian Pork Ltd
38. Australian Veterinary Association
39. Australian Wool Innovation
40. Barneveld Nutrition
41. Cattle Council of Australia
42. Coles Supermarkets
43. Dairy Australia
44. Kinross Farm
45. Livecorp
46. Meat & Livestock Australia
47. National Farmers' Federation
48. National Meat Industry Training Advisory Council Limited (MINTRAC)
49. CRC for High Integrity Australian Pork
50. Poultry CRC
51. Rivalea Australia
52. Rural Industries Research & Development Corporation – Chickenmeat (RIRDC)
53. Sheep CRC
54. Sheepmeat Council of Australia
55. Taronga Conservation Society
56. United Dairyfarmers of Victoria
57. Victorian Farmers Federation
58. Victorian Horse Council
59. Zoos Victoria

AW Groups

60. Animals Australia
61. RSPCA Australia
62. RSPCA Victoria
63. Voiceless
64. Compassion in World Farming (CIWF)
65. World Animal Protection

Others

66. Onn Ben David
67. David Adams

Appendix 4b Submissions received

AWSC Partners

1. The University of Melbourne

ORAL in person - Brian Leury, Deputy Dean, Faculty of Vet and Ag Sciences

2. Department of Economic Development, Jobs, Transport and Resources (Vic) – EcoDev (Incorporates Biosecurity Vic)

WRITTEN – Chris Korte, Senior Research Scientist and AWSC Board member
ORAL by phone - Greg Harper, Exec Director ARD

Research Providers

3. AgResearch NZ

WRITTEN – Jim Webster, Team Leader, Farm Systems, North Island

4. James Cook University

WRITTEN – John Cavalieri, Assoc Prof., College of Pub Health, Medical and Vet Sci

5. Massey University

WRITTEN – David Mellor, Director AW Sci and Bioethics Centre

6. Murdoch University, Animal Welfare Science and Bioethics Centre

WRITTEN – Teresa Collins, Postgrad Res Director, College of Vet Med

7. The University of Adelaide and the South Australian Research and Development Institute

WRITTEN – Wayne Hein, Head School of An and Vet Sci, Phil Hynd, Assoc Head Resources School An and Vet Sci and Alan Tilbrook, Chief of Research, Livestock and Farming, SARDI
ORAL by phone – as above

8. University of New England

WRITTEN – Geoff Hinch, Dep Head School of Env and Rural Sci

9. University of Queensland, Centre for Animal Welfare & Ethics

WRITTEN – Clive Phillips, Director CAWE

10. University of Sydney

WRITTEN-Greg Cronin,Senior Lecturer,Faculty of Veterinary Science.v

Government

11. NSW Department of Primary Industries

WRITTEN – Matthew Crane, Leader Exhibited Animals

Industry / funders

12. Animal Behaviour Clinics (Robert Holmes)

WRITTEN and ORAL in person

13. Australian Lot Feeders Association

WRITTEN – Bridget Peachey, Mgr Policy and Projects

14. Australian Pork Ltd

ORAL by phone – Darryl D'Souza, GM Res and Innovation

15. Australian Wool Innovation

WRITTEN – Geoff Lindon, Prog Mgr, Productivity and AW

16. Coles Supermarkets

ORAL in person – Rob Cumine, Agriculture Manager

17. Australian Dairy Farmers Limited and Dairy Australia

WRITTEN – Kevin Shiell, Consultant

18. Meat & Livestock Australia

WRITTEN – Jim Rothwell, Prog Mgr, AW, Health and Biosecurity

19. Australian Meat Processor Corporation and National Meat Industry Training Advisory Council Limited (MINTRAC)

WRITTEN – David Lind, CEO AMPC and Jenny Kroonstuiver, CEO MINTRAC

20. CRC for High Integrity Australian Pork

WRITTEN – Roger Campbell, CEO

21. Rivalea Australia

WRITTEN – Rebecca Morrison, AW Prog Mgr

22. Sheep CRC

WRITTEN – James Rowe, CEO

23. Zoos Victoria

WRITTEN – Jenny Gray, CEO

AW Groups

24. RSPCA Australia and RSPCA Victoria

WRITTEN – Bidda Jones, Chief Scientist

25. World Animal Protection

WRITTEN – Kate Blaszak, WAP, Asia-Pacific

Others

26. Onn Ben David, Caulfield South Vet Clinic

WRITTEN and ORAL by phone

27. David Adams

WRITTEN

Appendix 5a

THE ANIMAL WELFARE SCIENCE CENTRE REVIEW

2010-2014

Department of Economic Development, Jobs, Transport & Resources

THE UNIVERSITY OF MELBOURNE

The Animal Welfare Science Centre is a research centre of the University of Melbourne and was established in 1997 by the University of Melbourne, Monash University and the Department of

Primary Industries (Victoria) as a collaborative Centre for research, teaching and training in animal welfare.

The Centre has three partners –

Department of Economic Development, Jobs, Transport and Resources, Victoria. (DEDJTR), Agriculture Research Division.

The University of Melbourne, (UoM), Faculty of Veterinary and Agricultural Sciences.

The Ohio State University, (OSU), Department of Animal Sciences and College of Veterinary Medicine.

The Centre has considerable research and teaching capacity in animal welfare science and has made a number of important national and international contributions to research, teaching and training.

Operating Environment

Animal welfare awareness continues to increase in society, strongly influencing views on animal use and the acceptability of various animal management practices. Stakeholders in the animal welfare domain include the public, generally as consumers, owners or concerned observers, special interest groups, businesses based on the commercial supply of animals and animal products and those developing, implementing or auditing compliance with relevant policy at government or community level. Thus consumer and public attitudes to animal welfare have the potential to dramatically affect the use of animals in society, influencing the operations of livestock industries, medical research, the management of feral and wild animals and the care of recreational and companion animals.

While consumer and public attitudes to animal welfare ultimately determine society's use of domestic animals, science has a critical role in underpinning society's decisions on animal use and the attendant conditions and compromises. Lack of awareness of factual information means that many people are unaware of the conditions under which domestic animals live, how they are treated and their species-specific requirements.

Thus there are basically four key areas of activity necessary to rationally address animal welfare:

- animal welfare science
- understanding public and consumer attitudes to animal welfare
- public education and
- industry education

It is expected that certain animal production and management practices will be highlighted from time to time by community groups and that their viewpoints will be promoted to the community. It is important that the community is well informed, including the scientific perspective.

While research can be utilised to underpin the establishment, amendment or validation of industry welfare standards and practices, it is critical to deliver industry education, through staff selection and training strategies, and modify legislation, codes of practice and/or welfare QA programs to achieve these welfare standards.

The Centre is recognised by the Australian community, industry and government, as a leading provider of animal welfare research and expert advice and provides representatives who sit on relevant working groups. The Centre has a relationship agreement between the Centre, CSIRO and the Centre for Animal Welfare and Ethics at the University of Queensland (CAWE) whereby each organisation has agreed to collaborate in animal welfare research.

The Centre is also represented on the National Primary Industries Animal Welfare Research Development and Extension Strategy which brings together the core providers of farm animal welfare research with the major funding organisations to deliver targeted cross-sectoral research, development and extension within Australia's livestock industry sector.

The Centre, CSIRO and the University of Queensland (Centre for Animal Welfare and Ethics) are the Australian partners in the OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis which was formed in 2009 with the Animal Welfare Science and Bioethics Centre of Massey University, the Animal Behaviour and Welfare Research Centre of AgResearch and the Ministry for Primary Industries in New Zealand. The OIE Centre supports the OIE region for Asia, the Far East and Oceania by, for example, building regional capacity through "twinning" programs and developing an animal welfare training course.

The Centre has built upon key discipline strengths of animal behaviour, veterinary science, stress physiology and psychology in studying human/animal interaction, animal housing and husbandry and community attitudes and behaviour.

Animal Welfare Science Centre activities

The Centre conducts research in three program areas:

1. **Welfare methodology** or the development and validation of methods to assess animal welfare.
2. **Housing and husbandry effects on animal welfare**.
3. **Attitudinal effects**:
    a. The effects of the attitudes of stockpeople, animal handlers and animal owners on the welfare of their animals.
    b. The effects of attitudes to animal welfare on consumer and community behaviour.

These programs support the fourth program area:

4. **Tertiary, post-graduate and industry education and training**.

Through these programs, the Centre aims to:

- Develop scientifically defensible welfare methodology.
- Use scientifically defensible methodology to establish, amend or validate animal welfare standards and practices.
- Develop and support industry education and training strategies and provide scientific advice to support the modification of codes of practice and the development of quality assurance programs to introduce scientifically defensible welfare standards in the animal industries.
- Understand public and consumer attitudes to animal welfare to assist Governments and industry in:
    - developing animal welfare policy
    - assuring local and international consumers, public and other governments of the sound welfare standards for Australian domestic animals.
- Ensure tertiary students entering the animal industries are better prepared to provide sound, science-based advice on animal welfare practices to industry, interest groups and the public.
- Provide high quality postgraduate and postdoctoral training for the next generation of researchers and teachers in animal welfare science.

The Centre's activities are guided by our vision and mission:

Our Vision

"Animal welfare and its constant improvement are societal and cultural norms"

Our Mission

“To contribute to improved animal welfare as a world leading provider of expert information, advice and education underpinned by rigorous research”

AWSC RESEARCHERS AND STUDENTS

Researchers

Paul Hemsworth	University of Melbourne, (Director AWSC)
Alan Tilbrook	South Australian Research & Development Institute, (Deputy-Director AWSC)
Ian Bland	University of Melbourne
Kym Butler	Department of Economic Development, Jobs, Transport and Resources
Peter Cakebread	University of Melbourne
Grahame Coleman	University of Melbourne
Rebecca Doyle	University of Melbourne
Maurice Eastridge	The Ohio State University
Andrew Fisher	University of Melbourne
Monique Pairis-Garcia	The Ohio State University
Lauren Hemsworth	University of Melbourne
Ellen Jongman	University of Melbourne
Mike Lilburn	The Ohio State University
Steve Moeller	The Ohio State University
Katy Proudfoot	The Ohio State University
Jean-Loup Rault	University of Melbourne
Vanessa Rohlf	University of Melbourne
Henry Zerby	The Ohio State University

Associate Researchers

Greg Cronin	The University of Sydney
Keven Kerswell	The University of Melbourne
Rebecca Morrison	Rivalea Australia

Current Postgraduate students

Josh Aleri (PhD candidate) - Immune and stress responsiveness parameters as predictors of dairy heifers coping ability in their production environment

David Beggs (PhD candidate) – Ensuring dairy cow welfare with increasing scale of production

Beatrice Chang (Masters student) - Visitor-Animal Interactions at an African Wild Dog Exhibit at Melbourne Zoo

Samantha Chiew (PhD candidate) - The effects of zoo visitor-zoo animal interactions at display enclosures on both the animal and the visitor

An Diep (Masters student) - Early behavioural signs of sickness in chickens

Joanna Engel (PhD student) – The importance of rearing environment, space and nests for laying hens (Gallus gallus domesticus) in cages

Kristy Ficken (MPhil student) - The effect of keeper interactions on elephants at Melbourne Zoo

Sally Haynes (PhD candidate) – The relationship between the attitudes and behaviours of human handlers and the behaviour and welfare of shelter dogs

Maria Jorquera (Masters student) - The relationship between heat tolerance, milking times and temperament of dairy cows milked with a robotic milking system

Sarah Kuyken (Masters student) – Validating horse welfare indices

Hannah Larsen (PhD candidate) - Free-range hen welfare: Characterisation of 'outdoor' and 'indoor' hens and physical features in the range

Mark Learmonth (Masters student) - Effects of visitor contact on the behaviour of captive quokka (Setonix brachyurus) in a walk-through exhibit

Jamie Mazur (Masters student) – Measuring cognitive biases in orang-utans

Carolina Munoz (PhD candidate) – Assessing and addressing on-farm sheep welfare

Monoar Sayeed Pallab (PhD candidate) - The assessment and management of calf health and welfare in dairy systems

Jessica Pempek (PhD – Ohio) – The effect of housing systems on dairy heifer calf behaviour and welfare

Lydia Rehnberg (PhD candidate) - Working within the ARC Linkage Project, Human-animal relationships in zoos: Optimising animal and visitor experiences

Maxine Rice (MPhil student) – The relationship between social behaviour, feeding behaviour and stress in lambs in intensive finishing systems

Lauren Roberts (PhD candidate) - Pig stockperson handling and work performance to assess stockperson attitudes, behaviour and technical knowledge

Declan Sega (Masters student) – A Novel Method of Analysing Oxytocin through PCR

Bronwyn Stevens (PhD candidate) – Does restricting an animal's access to a highly preferred resource result in altered biological function?

Peta Taylor (PhD candidate) - The characteristics of free-range systems on the welfare of the broiler chicken

Amelia Thompson (Masters student) – Effects of handling programs on Green Tree frog (Litoria caerulea) behaviour and welfare

Catherine Webb (PhD candidate) – The welfare implications of physical versus psychological punishment in dog training

Dennis Wormald (PhD candidate) – Assessment and key features of anxiety traits in dogs

Rebecca Woodhouse (MPhil student) CO2 stunning of pigs

Past post-graduate students

Adele Arnold (PhD, Melbourne)

Rachael Bindloss (Masters, Melbourne)

Rachel Bloomfield (Masters, Melbourne)

Naomi Botheras (PhD, Melbourne)

Kate Breuer (PhD, Monash)

Mia Cobb (PhD, Monash)

Sara Crawford (PhD, Ohio)

Jo Coombe (PhD, Melbourne)

Peter Cransberg (Masters, Melbourne)

Anoma Dilrukshi (PhD, Melbourne)

Fleur Dwyer (D.Psych, Monash)

Lauren Edwards (PhD, Melbourne)

Lauren Hemsworth (PhD, Monash)

Tiffani Howell (PhD, Monash)

Renee Huggard (Masters, Melbourne)

Marcus Karlen (Masters, Melbourne)

Keven Kerswell (PhD, Melbourne)

Tammie King (PhD Monash)

Amanda Kobelt (PhD, Melbourne)

Sonja Laine (PhD, Melbourne)

Mariko Lauber (PhD, Melbourne)

Jacqui Ley (PhD, Monash)

Linda Marston (PhD, Monash)

Andrew McLean (PhD, Melbourne)

Kate Mornement (PhD, Monash)

Naomi Pearson (Masters, Melbourne)

Jessica Pempek (Masters, Ohio)

Bree Pierce (PhD, Monash)

Candice Powell (Masters, Melbourne)

Cameron Ralph, PhD, Melbourne

Vanessa Rohlf (PhD, Monash)

Sabine Roussel (PhD, Melbourne)

Rebecca Sargent (PhD, Melbourne)

Sally Sherwen (PhD, Melbourne)

Ken Smith (Masters, Ohio)

Anne Turner (PhD, Monash)

Neva Van de Kuyt (Masters, Melbourne)

Megan Verdon (PhD Melbourne)

Catherine Webb (Masters, Melbourne)

REPRESENTATION ON COMMITTEES

AECL Hen Welfare Advisory Group	Paul Hemsworth Alan Tilbrook
APL Specialist Group 2 (Genetics, reproduction and welfare)	Paul Hemsworth Alan Tilbrook
Animal Welfare Advisory Committee	Paul Hemsworth Jean-Loup Rault (alt)
Animal Welfare Advisory Committee *Responsible Pet Ownership Advisory Committee*	Grahame Coleman Paul Hemsworth
Animal Welfare Advisory Committee *Animal welfare education working group*	Grahame Coleman Jeremy Skuse
Australian Cattle Welfare Standards Reference Group	Andrew Fisher
Australian Sheep Welfare Standards Writing Group	Andrew Fisher
Council for Sustainable Egg Farming	Paul Hemsworth Jean-Loup Rault
DEDJTR Beef and Sheep Industry Leadership Group	Paul Hemsworth
DEDJTR Dairy Industry Leadership Group	Andrew Fisher
DEDJTR Livestock Industry Consultative Committee	Andrew Fisher
Dairy Moving Forward Animal Husbandry Steering Group	Paul Hemsworth Andrew Fisher
Hassad-Australia Animal Welfare Committee	Paul Hemsworth
International Society of Applied Ethology	Jean-Loup Rault (sec)
International Society of Applied Ethology, Australasia-Africa	Rebecca Doyle (sec)
National Pork Board Animal Science Committee	Steve Moeller
National Pork Board Extension Educators Executive Committee	Steve Moeller
National Pork Board Youth Pork Quality Assurance Committee	Steve Moeller
National Primary Industry Animal Welfare R,D&E	Alan Tilbrook (Chair)
Strategy Steering Committee	Paul Hemsworth
OIE Collaborating Centre for Animal Welfare **Science and Bioethical Analysis Management Committee**	Paul Hemsworth
Pork CRC R&D Committee	Alan Tilbrook
Red Meat Co-investment Committee	Alan Tilbrook

AWSC BOARD OF MANAGEMENT

Prof. Mike Rickard	Chair
Dr. Chris Korte	Department of Economic Development, Jobs, Transport and Resources
Prof. Ken Hinchcliffe	The University of Melbourne
Prof. Henry Zerby	The Ohio State University
Prof. Paul Hemsworth	Director AWSC
Prof. Alan Tilbrook	Deputy Director AWSC
Dr. Robert Holmes (ex officio)	Animal Behaviour Clinics

FUNDING FOR AWSC RD&E PROJECTS (2010 – 2014)

(See appendix III)

Animals for Life Foundation (ALF)
$ 4,294

ANZ Trustees – Kathleen Agnes Back Estate (ANZ Trustees)
$ 75,131

Australian Egg Corporation Ltd (AECL)
$ 768,093

Australian Meat Processor Corporation (AMPC)
$ 133,416

Australian Pork Limited (APL)
$ 1,367,405

Australian Poultry CRC (Poultry CRC)
$ 8,333

Australian Research Council (ARC)
$ 301,419

Australian Wool Innovation (AWI)
$ 23,416

Bureau of Animal Welfare (BAW)
$ 100,000

CRC for High Integrity Australian Pork (Pork CRC)
$ 606,823

Dairy Australia (DA)
$ 115,373

Department of Agriculture
$ 88,173

Department of Economic Development, Jobs, Transport and Resources (DEDJTR)
$ 2,864,559

Meat and Livestock Australia (MLA)
$ 246,717

Monash University (Monash)
$ 129,815

Ohio Agricultural Research and Development Centre (OARDC)
$ 5,875

Rural Industries Research and Development Corporation (RIRDC Chicken meat)
$ 353,036

The Ohio State University (OSU)
$ 75,000

University of Melbourne (UoM)
$ 305,938

TOTAL RD&E FUNDING FROM 2010–2014 - $ 7,572,816

AWSC RD&E PROJECTS

2010-2014

Only those projects where AWSC is the lead organization are included. The AWSC participates in many collaborative projects led by other organisations. For example, Charles Sturt University, CSIRO, INRA, Murdoch University, The French National Research Agency, The South Australian Research and Development Institute, The University of Sydney, The University of Western Australia, and the US Department of Agriculture.

(For summaries, see appendix I)

1. Dairy industry

1.1. Overstocking the feeding area may affect the welfare and productivity of dairy cows and calves - OARDC

1.2. Ensuring dairy cow welfare with increasing scale of production - DA

1.3. Review and report on animal welfare measures for the Australian dairy industry - DA

1.4. Dairy systems welfare: Ensuring animal welfare in Victorian dairy systems - DEDJTR

1.5. Metabolic Welfare of Calves - DEDJTR

1.6. Support the delivery of ProHand® Dairy - DA

1.7. Design and delivery of a Day 2 Powerpoint Presentation for ProHand® Dairy - DA

1.8. Optimising dairy cow behaviour and welfare within flexible feeding systems - DEDJTR

1.9. Determining a suitable time off feed for bobby calf transport under Australian conditions - DA

1.10. Effect of age on physiology and recovery behaviour of calves transported for 10 hours in individual pens - DEDJTR

1.11. Transport of bobby calves - DEDJTR

1.12. Benchmarking welfare indicators for the dairy industry – DEDJTR

2. Pork industry

2.1. Pre-weaning social exposure: effects on aggression, injuries and growth of weaner and growing pigs – Dept of Ag

2.2. Oxytocin effects on the response of piglets to weaning - APL

2.3. Delivery of Pork Quality Assurance+ Advisor Training and Certification Programs - NPB

2.4. Delivery of Transportation Quality Assurance Advisor Training and Certification - NPB

2.5. Validation of practical measures to benchmark pig welfare in the Australian Pork Industry - APL

2.6. The sensitivity of sows to stressors throughout gestation – Pork CRC

2.7. Learning to be social: Oxytocin and socio-behavioural development in pigs - UoM

2.8. Welfare and productivity of sows and litters housed in farrowing pens compared to farrowing crates – Pork CRC

2.9. Literature review and collaboration with the Danish Pig Research Centre on effects of group housing both post-weaning and post-insemination on sow productivity and welfare – Pork CRC

2.10. Effects of group housing after weaning on sow welfare and sexual behaviour – Pork CRC

2.11. Metrics to benchmark stock handling – Field Trial - APL

2.12. Redevelop ProHand® for the pork industry – APL, AMPC

2.13. Nitrous oxide for piglet euthanasia: validation by electroencephalography (EEG) - NPB

2.14. ProHand® Pigs technical support - APL

2.15. Review of registered ProHand® Pigs facilitators - APL

2.16. Animal welfare monitoring in research settings – Pork CRC

2.17. The development of practical measures to benchmark pig welfare in the Australian Pork Industry - APL

2.18. Evaluation of sow and piglet behaviour and performance in individual follow-on lactation pens – APL, Pork CRC

2.19. Effects of floor space on the welfare of group-housed sows – Pork CRC

2.20. Assessing public metrics to benchmark stock handling - APL

2.21. ProHand® Pigs in US - OSU

2.22. Usefulness of preference for resources and biological functioning to assess animal welfare - APL

2.23. Effects of aggressive characteristics of individual sows and mixing strategies on the productivity and welfare of group-housed gestating sows - APL

2.24. Validating the use of proximity loggers in measuring feeder visits, displacements and social interactions in pigs in competitive feeding situations - APL

2.25. The influence of human-animal interactions on the behavioural and physiological responses of piglets to a stressor - UoM

2.26. The effects of group housing during gestation on sow welfare and reproduction - APL

3. Poultry

3.1. Review of evidence to underpin development of welfare standards and guidelines – RIRDC Chicken meat

3.2. Assessment of factors influencing behaviour and welfare of birds in free range systems (broilers) - RIRDC Chicken meat

3.3. The effects of time off feed and water on the welfare of spent laying hens - AECL

3.4. Free-range hen welfare: Characterisation of 'outdoor' and 'indoor' hens and physical features in the range - AECL

3.5. The effects of up to 32 hrs food and water deprivation on the physiology of spent laying hens - AECL

3.6. Animal preferences: effect of environmental and animal factors on the choice behaviour of laying hens – Poultry CRC

3.7. Importance of rearing environment, space and nests for laying hens in cages - AECL

3.8. Human-animal interactions in the turkey industry - MPRP

4. Beef and sheep industries

4.1. Assessing and Addressing On-Farm Sheep Welfare - MLA Develop and evaluate a model to monitor and benchmark the welfare of animals in research institutions - MLA

4.2. Quantifying welfare improvements in the live export industry - MLA

4.3. Assessment of pain responses associated with castration of 10-week old lambs using the Callicrate 'Wee Bander' compared to a standard elastrator - MLA

4.4. Relationships between fear of humans, temperament and handling pre-slaughter and lamb welfare and meat quality - AMPC

4.5. Alternative stunning - MLA

4.6. Lamb systems welfare: Ensuring animal welfare in Victorian lamb systems - DEDJTR

4.7. Welfare of lambs in intensive finishing systems Part 2 - DEDJTR

4.8. Welfare of lambs in intensive finishing systems. Part 1 - DEDJTR

4.9. Develop and evaluate a model to monitor and benchmark the welfare of animals in research institutions – Dept of Ag (AAWS)

5. Companion, zoo and work animals

5.1. Human-animal relationships in zoos: Optimising animal and visitor experiences - ARC

5.2. Development of husbandry and management educational material for Victorian recreational horse owners – ANZ Trustees

5.3. Human-animal relationships in zoos: understanding the impact of visitors on the welfare of non-human primates in Australian zoos – Dept of Ag (AAWS)

5.4. The relationship between attitudes and behaviour of human care-takers and animal behaviour of dogs in a shelter environment – Dept of Ag (AAWS)

5.5. Identifying 'ideal' companion dogs for Australia – PIAS, BAW

5.6. Identification of Risk Factors for Racetrack Injuries in Greyhounds in Victoria – UoM, GRV

5.7. Effect of Cage Enrichment and Predictability on Health Outcomes of Shelter Cats - MAF

5.8. The welfare of recreational horses in Victoria: the occurrence of and factors associated with horse welfare - BAW

5.9. Behavioural assessment of adult shelter dogs: Development and validation of the Behavioural Assessment for Re-homing K9's (B.A.R.K.) protocol – Monash Univ, RSPCA

6. General/Other

6.1. Human and animal interactions course impact study - ALF

6.2. Monitoring public attitudes to inform animal welfare policy development – APL, AMPC, AWI, Dept of Ag (AAWS)

6.3. Professor in Human-Animal relations at the University of Melbourne - BAW

6.4. Animal Welfare Science Centre – DEDJTR, OSU, UoM

6.5. Research Fellow (pigs and poultry) at the University of Melbourne – APL, AECL, RIRDC Chicken meat, UoM

6.6. Mapping ProHand® stockperson training packages against current livestock industry competencies and establishing recommendations for future accreditation – Dept of Ag (AAWS)

6.7. Novel peptide mediates the inhibitory effects of stress on female reproduction - ARC

6.8. Animal Welfare Education Project - DEDJTR

6.9. Delivery of “Animals in Society” as a breadth subject at the University of Melbourne - UoM

6.10. Delivery of “Animals in Society” as part of the “Human and animal interactions” cluster at The Ohio State University - OSU

6.11. Assessing animal welfare: understanding biological functioning and preferences in animals – DEDJTR, APL, Poultry CRC

6.12. Farm animal welfare in Ohio: Assessing public concern and implications for the food animal industry - OARDC

AWSC RD&E COMMUNICATIONS

Books and chapters
(n = 6)

1. Coleman, G.J. and Hemsworth, P.H. (2014). Training to improve stockperson beliefs and behaviour towards livestock enhances welfare and productivity. Rev.sci.tech.Off cint Epiz, 33(1), 131-137.
2. Cronin, G.M., Glatz, P. and Rault, J-L. (2014). Lessons learned from past experience with intensive livestock management systems. Rev.sci.tech.Off cint Epiz, 33(1), 139-151.
3. Hemsworth, P.H. and Coleman, G.J. (2011) Human-Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensively Farmed Animals, 2nd Edition, CAB International, Oxford, UK.
4. Hemsworth, P.H. and Boivin, X. (2011). Human contact. In "Animal Welfare", edited by M. C. Appleby, J. A. Mench, I. A. S. Olsson and B. O. Hughes. CAB International, Oxon UK. pp 246-262.
5. Hemsworth, P.H. and Coleman, G.J. (2010) Managing poultry: Human-bird interactions and their implications : In The Welfare of Domestic Fowl and Other Captive Birds. Eds IJH Duncan, P Hawkins. Springer Science+Business Media(New York)
6. Hemsworth, P.H. and the late Barnett, J.L., (2010). Valutazione del benessere negli animali d'allevamento (Human-pig relationships). Benessere Animale (Animal Welfare), a cura di F. Fulvio Biancifiori, Instituto Zooprofilattico Spermentale Umbria e Marche Editore, pp. 131-158.

Research publications in refereed journals
(n = 86, total citations 352, av citations/pub 4.2 - WoS)

1. Colditz, I.G., Ferguson, D.M., Collins, T., Matthews, L. and Hemsworth, P.H. (2014). A prototype tool to enable farmers to measure and improve the welfare performance of the farm animal enterprise: The Unified Field Index. Animals 2014, 4(3), 446-462; doi:10.3390/ani4030446
2. Conley, M.J., Fisher, A.D., and Hemsworth P.H. (2014). Effects of human contact and toys on the fear responses to humans of shelter-housed dogs. Applied Animal Behaviour Science 156, 62–69

3. Fisher, A.D., Stevens, B.H., Conley, M.C., Jongman, E.C., Lauber, M.C., Hides, S.J., Anderson, G.A., Duganzich, D.M. and Mansell, P.D. (2014) The effects of direct and indirect road transport consignment in combination with feed withdrawal in young dairy calves. Journal of Dairy Research, 81,pp 297-303.

4. Hetti Arachchige, A. D., Fisher, A. D., Wales, W. J., Auldist, M. J., Hannah, M. C., & Jongman, E. C. (2014). Space allowance and barriers influence cow competition for mixed rations fed on a feed-pad between bouts of grazing. Journal of Dairy Science 97: 3578-3588.

5. Rowell, Z.E. (2014). Locomotion in captive Asian elephants (Elephas maximus). Journal of Zoo and Aquarium Research, Vol 2, No 4, pp130-135. http://www.jzar.org/jzar/article/view/50/48

6. Jongman, E.C. and Butler, K.L. (2014). The Effect of Age, Stocking Density and Flooring during Transport on Welfare of Young Dairy Calves in Australia. Animals 2014, 4(2), 184-199.

7. Larsen, M.J., Sherwen, S.L. and Rault, J.L. (2014). Number of nearby visitors and noise level affect vigilance in captive koalas. Applied Animal Behaviour Science, Feb 2014 Available online http://dx.doi.org/10.1016/j.applanim.2014.02.00

8. Pighin, D. G., Brown, W., Ferguson, D. M., Fisher, A. D. and Warner, R. D. (2014). Relationship between changes in core body temperature in lambs and post-slaughter muscle glycogen content and dark-cutting. Animal Production Science, 2014, 54, 459–463. Available online http://dx.doi.org/10.1071/AN12379

9. Ralph, C.R., Hemsworth, P.H., Leury, B.J. and Tilbrook, A.J. (2014). Relationship between plasma and tissue corticosterone in laying hens (Gallus gallus domesticus): implications for stress physiology and animal welfare. Domestic Animal Endocrinology 50 (2015) 72–82.

10. Rault, J-L., Morrison, R.S., Hansen, C.F., Hansen, L.U. and Hemsworth, P.H. (2014). Effects of group housing after weaning on sow welfare and sexual behavior. Journal of Animal Science, 92(12):5683-5692. DOI: 10.2527/jas2014-8238

11. Rault, J-L., Hemsworth, P.H., Cakebread, P.L., Mellor, D.J. and Johnson, C.B. (2014). Evaluation of microwave energy as a humane stunning technique based on electroencephalography (EEG) of anaesthetised cattle. Animal Welfare 2014, 23: 391-400, doi: 10.7120/09627286.23.4.391

12. Sherwen, S.L., Magrath, M.J.L., Butler, K.L., Phillips, C.J.C. and Hemsworth, P.H. (2014). A multi-enclosure study investigating the behavioural response of meerkats to zoo visitors. Applied Animal Behaviour Science, 156, 70-77

13. Ellingsen, K., Coleman G.J., Mejdell, C.M. and Lund, V. (2014). Using Qualitative behaviour assessment to explore the link between stockperson behaviour and dairy calf behaviour. Applied Animal Behaviour Science.153, 10-17

14. Mornement, K., Coleman, G., Toukhsati, S. and Bennett,P. (2014). Development of the behavioural assessment for re-homing K9's (B.A.R.K.) protocol. Applied Animal Behaviour Science. 151, 75–83

15. Arnold, N.A. and Hemsworth, P.H. (2013). Examining the usefulness of a Y-maze choice method to measure the preferences of laying hens. Animal Production Science 53(12) pp 1283-1290. Available online http://dx.doi.org/10.1071/AN12390

16. Coombe JE, Pyman MF, Mansell PD, Auldist MJ, Anderson GA, Wales WJ, Malmo J, Conley MJ, Fisher AD. (2013). The effects on claw health of supplement feeding grazing dairy cows on feed pads. The Veterinary Journal 198(3) pp 672-677.

17. Edwards, L.E., Coleman, G.J. and Hemsworth, P.H. (2013). Close human presence reduces avoidance behaviour in commercial caged laying hens to an approaching human. Animal Production Science 53(12) pp 1276-1282. Available online http://dx.doi.org/10.1071/AN12342

18. Fisher A. D., Webster J. R. (2013) Dairy cow welfare: the role of research and development in addressing increasing scrutiny. Animal Production Science 53, 924–930. Available online http://dx.doi.org/10.1071/AN12276

19. Fisher, A.D., Giraudo, A., Martin, P.A.J. and Paton, M.W. (2013). The use of quantitative risk assessment to assess lifetime welfare outcomes for breech strike and mulesing management options in Merino sheep. Animal Welfare, 22: pp275-275.

20. Fraser, D., Duncan, I.J.H., Edwards, S.A., Grandin, T., Gregory, N.G., Guyonnet, V., Hemsworth, P.H., Huertas, S.M., Huzzey, J.M., Mellor, D.J., Mench, J.A., Špinka, M. and Whay, H.R. (2013). General Principles for the welfare of animals in production systems: The underlying science and its application. The Veterinary Journal. 198: pp19–27.

21. Gunaseelan, S., Coleman, G.J. and Toukhsati, S. (2013). Attitudes towards responsible pet ownership behaviours in Singaporean cat owners. Anthrozoos, 26 199-211

22. Hawken, P.A.R., Luckins, N., Tilbrook, A.J., Fiol, C., Martin, G.B., Blache, D.P. (2013). Genetic selection for temperament affects behaviour and the secretion of adrenal and reproductive hormones in sheep subjected to stress. Stress-the international journal on the biology of stress, 16, 1, pp. 130-142.

23. Hemsworth, P.H., Rice, M., Nash, J., Giri, K., Butler, K.L.,Tilbrook, A.J. and Morrison, R.S. (2013). Effects of group size and floor space allowance on group housed sows: aggression, stress, skin injuries and reproductive performance. Journal of Animal Science 91, 4953-4964.

24. Hetti Arachige, A.D., Fisher, A.D., Auldist, M.J., Wales, W. J. and Jongman, E.J.(2013). Effects of different systems of feeding supplements on time budgets of cows grazing restricted pasture allowances. Applied Animal Behaviour Science 148,13-20. Available online http://dx.doi.org/10.1016/j.applanim.2013.08.002

25. Jongman, E.C. and Butler, K.L. (2013). Ease of moving young calves at different ages. Australian Veterinary Journal. 91 (3), pp 94-98.

26. Lee, C., Fisher, A.D., Colditz, I.G. , Lea, J.M. and Ferguson, D.M. (2013). Preference of beef cattle for feedlot or pasture environments. Applied Animal Behaviour Science, 145, pp53-59. Available online http://dx.doi.org/10.1016/j.applanim.2013.03.005

27. Kerswell, K.J., Bennett, P., Butler, K.L and Hemsworth, P.H. (2013). Self-reported comprehension ratings of dog behaviour by owners of adult dogs. Anthrozoos, 26 (1), pp 5-11.

28. McGregor. B.A. and Butler, K.L. (2013). Eruption of first permanent incisors and live weight gain in grazing yearling Angora goats. Australian Veterinary Journal, 91, 179-184.

29. Paton, M.W., Martin, P.A.J. and Fisher, A.D. (2013). Risk assessment principles in evaluation of animal welfare. Animal Welfare, 22: pp277-285.

30. Pempek, J.A., M. L. Eastridge, N. A. Botheras, C. C. Croney, and W. S. Bowen Yoho. (2013). Effects of alternative housing and feeding systems on the behavior and performance of dairy heifer calves. Professional Animal Scientist 29:278-288.

31. Rault, J-L., van de Wouw, A. and Hemsworth P. (2013). Fly the coop! Vertical structures influence the distribution and behaviour of laying hens in an outdoor range. Aust Vet Jnl. Vol 91, No.10 pp423-426

32. Rault, J-L., Elmore, M. R. P., Biehl, D. J., Russell, M. A., Garner, J. P. (2013), The World is a Natural Laboratory, and Social Media is the New Petri Dish. Ethology 119(10) pp803-806

33. Rault, J-L., Carter, C.S., Garner, J.L., Marchant-Forde, J.N., Richert, B.T. and Lay Jr., D.C. (2013). Repeated intranasal oxytocin administration in early life dysregulates the HPA axis and alters social behaviour. Physiology and Behaviour 2013 Mar 15; pp40-48. Available online http://dx.doi.org/10.1016/j.physbeh.2013.02.007

34. Rault, J-L., Mack, L.A., Carter, C.S., Garner, J.L., Marchant-Forde, J.N., Richert, B.T. and Lay Jr., D.C. (2013). Prenatal stress puzzle, the oxytocin piece: Prenatal stress alters the behaviour and autonomic regulation in piglets, insights from oxytocin. Applied Animal Behaviour Science 148(1-2) Sep 2013, pp99-107. Available online http://dx.doi.org/10.1016/j.applanim.2013.07.001

35. Coleman, G.J., Rice, M. and Hemsworth, P.H. (2012). Human-animal relationships at sheep and cattle abattoirs. Animal Welfare, 21, 15-21.

36. Cronin, G.M, the late Barnett, J.L. and Hemsworth, P.H. (2012). The importance of pre-laying behaviour and nest boxes for laying hen welfare: a review. Animal Production Science, 52(7) pp 398-405. Available online http://www.publish.csiro.au/paper/AN11258.htm

37. Hemsworth, P.H., Cronin, G.M., the late Barnett, J.L., Butler, K.L., Jongman, E.C., Karlen, G.A., Coffey, A. and Arnold, N.A. (2012). Behavioural

responses of lambs to plastic clips as an alternative procedure to mulesing. Australian Veterinary Journal, 90:373-380

38. Howell, T., Conduit, R., Toukhsati, S., and Bennett, P.C. (2012). Auditory stimulus discrimination recorded in dogs, as indicated by mismatch negativity (MMN). Behavioural Processes, 89 (1): p. 8-13.

39. King, T., Marston, L. C. and Bennett, P. C. (2012). Breeding dogs for beauty and behaviour: Why scientists need to do more to develop valid and reliable behaviour assessments for dogs kept as companions. Applied Animal Behaviour Science. 137, 1-12.

40. Lauber, M. Nash, J.A., Gatt, A. and Hemsworth, P. H. (2012). Prevalence and incidence of abnormal behaviours in individually housed sheep. Animals 2, 27-37.

41. Matthews, L.R. and Hemsworth, P.H. (2012). Drivers of change: law, international markets, and policy. Animal Frontiers 2, 40-45.

42. McGreevy, P.D, Starling, M., Branson, N.J., Cobb, M.L. and Calnon, D. (2012) An overview of the dog–human dyad and ethograms within it. Journal of Veterinary Behavior: Clinical Applications and Research.7(2): pp.103-117.

43. Rault, J.L., McMunn, K.A, Marchant-Forde, J.N. and Lay Jr., D.C. (2012). Gas alternatives to carbon dioxide for euthanasia: A piglets perspective. Journal of Animal Science. Available online. DOI 10.2527/jas.2012-5761.

44. Rault, J-L. (2012). Friends with benefits: Social support and its implications for farm animal welfare. Applied Animal Behaviour Science. Applied Animal Behaviour Science 136(1): 1-14.

45. Rohlf, V.I., Bennett, P.C., Toukhsati, S. and Coleman, G.J. (2012). Beliefs underlying dog owners' health care behaviors: Results from a large, self-selected, internet sample. Anthrozoos, Volume 25, Number 2, June 2012, pp. 171-185.

46. Toukhsati, S.R, Young, E., Bennett, P.C. and Coleman, G.J. (2012). Wandering cats: Attitudes and behaviours towards cat containment in Australia. Anthrozoos, 25, 61-74.

47. Betts, K.S., Moeller, S.J., Zerby, H.N. DeRouchey, J.M., Cressman, M.D., Bishop, M.J., Gress, A.I. and Fluharty, F.L. (2011). Effects of ractopamine on performance, carcass and meat quality in purebred Berkshire swine. Journal of Animal Science, Volume 89, E-Supplement 1: 460.

48. Bland, I. (2011). Dog Obesity: Keeping the weight off. The Veterinary Journal 192:3.

49. Bland, I. and Hill. J. (2011). Review - Tackling dog obesity by tackling owner attitudes. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources 2011 6, No. 006.

50. Barnett, J. L., Hemsworth, P. H., Butler, K. L., Schirmer, B. N., Borg, S. S. and Cronin, G. M. (2011). The effects of stall dimensions on the welfare of pregnant sows. Animal Production Science 51, pp. 471-480.

51. Crawford, S.M., Moeller, S.J., Hemsworth, P.H., Croney, C.C. Botheras, N.A. and Zerby, H.N. (2011). Characteristics of the work habits and demographics of caretakers on swine finishing facilities in Ohio. Journal of Animal Science, Volume 89, E-Supplement 1: 463.

52. Croney, C.C. and Anthony, R. (2011). Invited review: ruminating conscientiously: scientific and socio-ethical challenges for US dairy production. J Dairy Sci. 2011 Feb 94(2), pp. 539-46.

53. Doyle, R.E., Lee, C., Deiss, V., Fisher, A.D., Hinch, G.N. and Boissy, A. (2011). Measuring judgment bias and emotional reactivity in sheep following long-term exposure to unpredictable and aversive events. Physiology and Behavior 102 (5), pp. 503-510.

54. Doyle, R.E., Hinch, G.N., Fisher, A.D., Boissy, A., Henshall, J.M. and Lee, C. (2011). Administration of serotonin inhibitor p-Chlorophenylalanine induces pessimistic-like judgment bias in sheep. Psychoneuroendocrinology 36, pp. 279-288.

55. Dunshea, F.R., Cronin, G.M., Barnett, J.L., Hemsworth, P.H., Hennessy, D.P., Campbell, R.G., Luxford, B., Smits, J., Tilbrook, A.J., King, R.H. and McCauley, I. (2011). Immunisation against gonadotrophin-releasing hormone (GnRH) increases growth and reduces variability in group housed boars. Animal Production Science 51, 695–701.

56. Edwards, L.E., Arnold, N.A., Butler, K.L. and Hemsworth, P.H. (2011). Acute effects of mulesing and alternative procedures to mulesing on lamb behaviour. Applied Animal Behaviour Science 133, pp. 169-174.

57. Fisher, A.D. (2011). Addressing pain caused by mulesing in sheep. Applied Animal Behaviour Science, Volume 135, pp. 232-240.

58. Hemsworth, P.H., Rice, M., Karlen, M.G., Calleja, L., Barnett, J.L., Nash, J. and Coleman, G.J. (2011). Human- animal relationships at abattoirs II: relationships between handling and animal stress in sheep and cattle. Applied Animal Behaviour Science 135, pp. 24-33.

59. Hemsworth, P.H., Smith, K., Karlen, G., Arnold, N.A., Moeller, S.J. and Barnett, J.L. (2011). The choice behaviour of pigs in a Y maze: Effects of deprivation of feed, social contact and bedding. Behavioural Processes, Volume 87, pp. 210-217.

60. Howell, T.J., Conduit, R., Toukhsati, S. and Bennett, P.C. (2011). Development of a minimally-invasive protocol for recording mismatch negativity, (MMN), in the dog, (Canis Familiaris) using electroencephalography (EEG). Journal of Neuroscience Methods, Volume 201, pp. 377-380.

61. Howell, T.J. and Bennett, P.C. (2011). Puppy power! Using social cognition research tasks to improve socialization practices for domestic dogs, (Canis Familiaris). Journal of Veterinary Behaviour, Volume 6, pp. 195-204.

62. Howell, T. J. and Bennett, P.C., (2011). Can dogs (Canis familiaris) use a mirror to solve a problem? Journal of Veterinary Behaviour: Clinical Applications and Research, Volume 6, pp. 306-312.

63. Lambert, E., Lambert G., Ika-Sari C., Dawood, T., Lee, K., Chopra, R., Straznicky, N., Eikelis, N., Drew, S., Tilbrook, A. and Dixon, J. (2011). Ghrelin modulates sympathetic nervous system activity and stress response in lean and overweight males. Hypertension 58 43-50.

64. Li, J., Wijffels, G., Yu, Y., Nielsen, L.K., Niemeyer, D.O., Fisher, A.D., Ferguson, D.M. and Schirra, H.J. (2011). Altered fatty acid metabolism in long duration road transport: An NMR-based metabonomics study in sheep. Journal of Proteome Research 10: 1073-1087.

65. Papargiris, M. M., Rivalland, E. T. A., Clarke, I. J., Smith, J. T., Pereira, A., Tilbrook, A. J. (2011). Evidence that RF-Amide Related Peptide-3 is not a Mediator of the Inhibitory Effects of Psychosocial Stress on Gonadotrophin Secretion in Ovariectomised Ewes. Journal of Neuroendocrinology, 23 (3), pp.208-215.

66. Papargiris, M. M., Rivalland, Hemsworth, P.H., Morrissey, A. D. and Tilbrook, A. J. (2011). Acute and chronic stress-like levels of cortisol inhibit the oestradiol stimulus to induce sexual receptivity but have no effect on sexual attractivity or proceptivity in female sheep.Horm Behav. 2011 Sep;60(4):336-45. Epub 2011 Jun 29.

67. Pempek, J., Eastridge, M., Botheras, N.A., Croney, C.C. and Bowen, W. (2011). Effects of alternative housing and feeding systems on the performance of dairy heifer calves. J. Dairy Sci. 94 (E. Suppl. 1):8.

68. Spencer, S.J. and Tilbrook, A.J. (2011). The glucocorticoid contribution to obesity. Stress, published online DOI: 10.3109/10253890.2010.534831.

69. Bland, I.M., Guthrie-Jones, A, Taylor, R.D. and Hill, J., (2010). Dog obesity: Veterinary practices' and owners' opinions on cause and management. Preventative Veterinary Medicine 94: 310-315.

70. Brien, F.D., Hebart, M.L., Smith, D.H., Hocking Edwards. J.E., Greeff, J.C., Hart, K.W., Refshauge, G., Bird-Gardiner, T.L., Gaunt, G., Behrendt, R., Robertson, M.W., Hinch, G.N., Geenty, K.G. and van der Werf, J.H.J. (2010). Opportunities for genetic improvement of lamb survival Animal Production Science 50(12), pp. 1017-1025.

71. Coleman, G.J., (2010). Educating the Public: Information or Persuasion? Journal of Veterinary Medical Education. 37, 74-82

72. Croney, C.C., (2010). Words matter: implications of semantics and imagery in framing animal welfare issues. Journal of Veterinary Medical Education. Journal of Veterinary Medical Education. 37 (1): 101-106.

73. Doyle, R.E., Vidal, S., Hinch, G.N., Fisher, A.D., Boissy, A. and Lee, C., (2010). The effect of repeated testing on judgement biases in sheep. Behavioural Processes 83: 349-352.

74. Edwards, LE, Botheras, NA, Coleman, GJ &Hemsworth PH (2010) Behavioural and physiological responses of laying hens to humans. Animal Production Science, 50: 557-559

75. Fisher, A.D., Niemeyer, D.O., Lea, J.M., Lee, C., Paull, D.R., Reed, M.T. and Ferguson, D.M., (2010). The effects of 12, 30, or 48 hours of road transport on the physiological and behavioral responses of sheep. Journal of Animal Science 88: 2144-2152.

76. Keating, C., Tilbrook, A. and Kulkarni, J. (2010). Oestrogen: an overlooked mediator in the neuropsychopharmacology of treatment response? International Journal of Neuropsychopharmacology, published online doi:10.1017/S1461145710000982.

77. Kerswell, K.J., Butler, K.L., Bennett, P. and Hemsworth P.H. (2010). The relationships between morphological features and social signalling behaviours in juvenile dogs: The effect of early experience with dogs of different morphotypes. Behavioural Processes, 85 (1), pp. 1-7.

78. Lord, L., Walker, J., Croney, C.C. and Golab, G.C., (2010). A Comparison of Veterinary Students Enrolled and Not Enrolled in an Animal Welfare Course. Journal of Veterinary Medical Education. 37 (1): 40-48.

79. McGregor, B.A. and Butler, K.L. (2010). Relationship of weaning weight to the mature liveweight of cashmere does on Australian farms. Animal Production Science, 50, pp. 581-584.

80. Mornement, K.M., Coleman, G.J., Toukhsati, S.R., and Bennett, P.C. (2010). A review of behavioural assessment protocols used by Australian animal shelters to determine the adoption suitability of dogs. Journal of Applied Animal Welfare Science, 13(4), pp. 314-329.

81. Morris, J.E., Fisher, A.D., Doyle, R.E. and Bush, R.D. (2010). Determination of sheep learning responses to a directional audio cue. Journal of Applied Animal Welfare Science 13, pp. 347-360.

82. Papargiris, M. and Tilbrook, A.J. (2010) Effect of RF-related peptide-3 on luteinizing hormone and follicle stimulating hormone synthesis and secretion in ovine pituitary gonadotropes. Asia-Pacific Journal of Endocrinology, 150 5549-5556.

83. Rohlf, V.I., Bennett, P.C., Toukhsati, S.R. and Coleman, G.J., (2010). Why do even committed dog owners fail to comply with some responsible ownership practices? Anthrozoos. Vol.23(2), Jun 2010, pp. 143-155.

84. Rohlf, V., Bennett, P., Toukhsati, S.R., and Coleman, G.J. (2010). Addressing dog obesity: can dog owners' feeding and exercise intentions and behaviours be predicted from attitudes? Journal of Applied Animal Welfare Science, 13(3), pp. 213-236.

85. Turner, A.I., Rivaland, E.T.A., Clarke, I.J. and Tilbrook, A.J. (2010). Stressor specificity of sex differences in hypothalamo-pituitary-adrenal axis activity: cortisol responses to exercise, endotoxin, wetting, and isolation/restraint stress in gonadectomised male and female sheep. Endocrinology, 151 4324-4331.

86. Wagenmaker, E.R., Breen, K.M., Oakley, A.E., Tilbrook, A.J. and Karsch, F.J. (2010). The estrous cycle of the ewe is resistant to disruption by repeated, acute psychosocial stress. Biology of Reproduction, 82 1206-1215.

Refereed Conference publications
(n = 81)

1. Chiew, S., Hemsworth, P.H., Magrath, M. and Sherwen, S. (2014). The effect of zoo visitors on reptile behaviour. ISAE Regional Meeting, Sydney, p17

2. Coleman, G.J., Roberts, L. and Rohlf, V. (2014). Benchmarking stockmanship for welfare assessment. Proceedings of the 6th International Conference on the Assessment of Animal Welfare at the Farm and Group Level (WAFL), France, p64

3. Doyle, R.E, Primmer, T., Casey, R., Freire, R., Neilsen, S. and Mendl, M. (2014). Using judgment bias to assess positive affect in dogs. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p21

4. Ficken, K., Jongman, E.C., Moss, D. and Magrath, M. (2014). Effects of change in management approach on elephant welfare at Melbourne Zoo. ISAE Regional Meeting, Sydney, p24

5. Hartcher, K., Wilkinson, S., Hemsworth, P.H. and Cronin, G.J. (2014). The association between feather-eating and severe feather-pecking in free range laying hens. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p293

6. Hartcher, K., Tran, M. Wilkinson, S.J, Hemsworth, P.H. and Cronin, G.M. (2014). The attractiveness of loose feathers to free-range laying hens exhibiting severe feather-pecking. Proceedings, Australian Poultry Science Symposium 25, p. 117.

7. Hemsworth, L. and Skuse, J. (2014). The development of practical measures to benchmark pig welfare in the Australian pork industry. Proceedings of the 6th International Conference on the Assessment of Animal Welfare at the Farm and Group Level (WAFL), France, p69

8. Hemsworth, P.H. and Doyle, R.E. (2014). The effects of human-ruminant interactions on animal welfare and productivity in the tropics. 16th Asian-Australasian Association of Animal Production Societies, Yogyakarta, Indonesia, pp 73-83.

9. Holmes, R. (2014). Interpretation of clinical observations on the effect of backyard confinement on the behaviour and welfare of dogs. ISAE Regional Meeting, Sydney, p6

10. Jongman, E.C. and Fisher, A.D. (2014). Effect of feeding frequency and total amount of milk replacer on young calves. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p269

11. Larsen, H., Cronin, G., Hemsworth, P.H., Smith, C. and Rault, J-L. (2014). Behaviour of free-range laying hens in distinct outdoor environments. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p186

12. Larsen, H. and Rault, J-L. (2014). Go outside and play? Behavioural time budget of free-range laying hens in a natural shrub structure. Proceedings, Australian Poultry Science Symposium 25, pp. 113-116.

13. Lee, C. Fisher, A.D., Colditz, I.G. Lea, J and Ferguson, D.M. (2014). Assessment of cattle motivation for access to pasture or feedlot environments. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p95

14. Ly, L., Larsen, H. and Rault, J-L. (2014). Should I stay or should I go? Ranging distance in free-range laying hens. ISAE Regional Meeting, Sydney, p28

15. Oliva, J.L., Rault, J.L., Appleton, B. and Lill, A. (2014). Owner perceived closeness and owner perceived intelligence of dog can predict dog's performance on object choice task. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p120

16. Rault, J-L. and Taylor, R. (2014). Nature of agonistic behaviours between sows mixed at different space allowances. 48th Congress of the International Society for Applied Ethology (ISAE), Spain, p189

17. Rice, M., Ng, C. and Hemsworth, L. (2014). The assessment of animal welfare in pig research settings. Proceedings of the 6th International Conference on the Assessment of Animal Welfare at the Farm and Group Level (WAFL), France, p122

18. Webb, C., Holmes, R. and Hemsworth, P.H. (2014) An investigation into the efficacy and welfare implications of associative learning in puppies using positive and negative conditioning. ISAE Regional Meeting, Sydney, p21

19. Wormald, D, Lawrence, A, Carter, G. and Fisher, A.D. (2014). Validation of modified open field behaviour as a measure of trait anxiety in the dog. ISAE Regional Meeting, Sydney, p12

20. Hartcher, K.M., Tran, K.T.N., Wilkinson, S.J., Hemsworth. P.H. and Cronin, G. (2013). Effect of rearing conditions on the development of feather-pecking behaviours in free-range laying hens. Proceedings, Australian Poultry Science Symposium 24, pp. 192-195.

21. Hemsworth, P.H. (2013). The role of science in improving animal welfare. A.C. Dunkin Memorial Lecture, Manipulating Pig Production XIV. Proceedings of the 14th Biennial Conference of the Australasian Pig Science Association, pp. 3-16.

22. Lay, D.C jr., Rault, J-L., McMunn, K.A. and Marchant-Forde, J.N. (2013). A search for humane gas alternatives to carbon dioxide for euthanizing piglets: a piglet perspective. Proceedings of 47th Congress of the International Society of Applied Ethology, 2 June - 6 June 2013, Florianopolis, Brazil. P108.

23. Morrison, R.S., Sawyer, K.S.B., Kells, N.J., Johnson, C.B. and Hemsworth, P.H. (2013). Stress responses of two-day old piglets to tail docking. Manipulating Pig Production XIV. Proceedings of the 14th Biennial Conference of the Australasian Pig Science Association, p. 128.

24. Rault, J-L., Van de Wouw, A. and Hemsworth, P.H. (2013). Fly the ccop! Vertical structures influence the distribution and behaviour of laying hens in an outdoor range. Proceedings, Australian Poultry Science Symposium 24, p. 247.

25. Rault, J-L, McMunn, K.A., Marchant-Forde, J.N. and Lay, D.C. (2013). Gas alternatives to carbon dioxide for euthanasia: A piglet perspective.

Manipulating Pig Production XIV. Proceedings of the 14th Biennial Conference of the Australasian Pig Science Association, p. 130.

26. Sherwen, S., Magrath, M., Butler, K, Kerswell, K. and Hemsworth, P.H. (2013). A multi-zoo study on the effect of manipulated visitor behaviour on zoo meerkats. Proceedings of 47th Congress of the International Society of Applied Ethology, 2 June - 6 June 2013, Florianopolis, Brazil. P52.

27. Singh, C. and Hemsworth, P.H. (2013). Comparison of the behaviour of piglets housed in loose pens and farrowing crates. Manipulating Pig Production XIV. Proceedings of the 14th Biennial Conference of the Australasian Pig Science Association, p. 241.

28. Verdon, M., Morrison, R., Rice, M. and Hemsworth, P.H. (2013). Group-housed sows who engage in aggression after mixing have reduced injuries and gain more weight. Proceedings of 47th Congress of the International Society of Applied Ethology, 2 June - 6 June 2013, Florianopolis, Brazil. P68.

29. Verdon, M., Morrison, R., Rice, M. and Hemsworth, P.H. (2013). Aggressive strategies in grouped sows: The relationship between individual aggressive behaviour and welfare. Manipulating Pig Production XIV. Proceedings of the 14th Biennial Conference of the Australasian Pig Science Association, p. 245.

30. Webb, C., Hemsworth, P.H. and Holmes, R. (2013). An investigation into the training methods used by professional dog trainers. Proceedings of 1st Australian Working Dog Alliance Conference, Sydney, p20.

31. Coombe, J.E, Pyman, M., Mansell, P.D., Auldist, M.J., Anderson, G.A. Wales, W.J. Malmo, J. and Fisher, A.D. (2012). The effects of feeding systems on the hoof health of dairy cows in South Eastern Australia. Proceedings of XXVII World Buiatrics Congress, 3-8 June 2012, Lisbon, Portugal.

32. Cronin, G.M., Barnett, J.L., Storey, T.H., Thomson, P.C and Hemsworth, P.H. (2012). The relationship between pre-laying activity and corticosterone concentrations and the interpretation for laying hen welfare. Proceedings, Australian Poultry Science Symposium 23, pp. 168-171.

33. Haynes, S.J., Coleman, G.J. and Hemsworth, P.H. (2012). The relationship between human and dog behavior in animal shelters. Proceedings of 46th Congress of the International Society of Applied Ethology, 31 July-4 Aug 2012, Vienna, Austria. P33.

34. Hemsworth, P.H., Rice, M., Giri, K. and Morrison, R. (2012). Effects of group size and floor space allowance on aggression and stress in grouped sows. Proceedings of 46th Congress of the International Society of Applied Ethology, 31 July-4 Aug 2012, Vienna, Austria. P154.

35. Hetti Arachchige, A.D., Jongman, E., Wales, W.J., Fisher, A.D. and Auldist, M.J. (2012). Time budget of dairy cows in feeding systems based on total mixed ration fed in conjunction with reduced grazed pasture. Proceedings of 46th Congress of the International Society of Applied Ethology, 31 July-4 Aug 2012, Vienna, Austria. P156.

36. Jongman, E., Butler, K., Rice, M. and Hemsworth, P.H. (2012). Early adaption of lambs to a feedlot system. Proceedings of 46th Congress of the International Society of Applied Ethology, 31 July-4 Aug 2012, Vienna, Austria. P152.

37. Muns Vila, R., Farish, M., Rault, J-L. and Hemsworth, P.H. (2012). A positive mindset in the face of stress. Proceedings of 46th Congress of the International Society of Applied Ethology, 31 July-4 Aug 2012, Vienna, Austria. P26.

38. Oliva, J.L., Marston, L. Rault, J.L., Appleton, B. and Lill, A. (2012). Central oxytocin function and behaviour in the canine. 8th Federation of European Neurosciences, Barcelona, Spain. Poster.

39. Oliva, J.L., Marston, L. Rault, J.L., Appleton, B. and Lill, A. (2012). Increasing our understanding of the role of oxytocin in dogs-human bonding. International Society for anthrozoology, Cambridge, U.K. Oral communication.

40. Webb, C.L. and Hemsworth, P.H. (2012). Effects of citronella and odourless cold airspray on aversion in dogs. Proceedings of 46th Congress of the International Society of Applied Ethology, 31 July-4 Aug 2012, Vienna, Austria. P88.

41. Betts, K.S.,Moeller, S.J., Zerby, H.N., Crwaford, S.M., Bishop, M.J. and Cressman, M.D. (2011). Effects of ractopamine on behavior of purebred Berkshire swine. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 134.

42. Botheras, N.A., Pempek, J., Enigk, D. and Hemsworth, P.H.H. (2011). Relationship between amount of human contact and fear of humans in turkeys. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 88.

43. Brown, J. S., Telbisz, R.M. and Toukhsati, S.R. (2011). When A Shelter Becomes A Home: The Ethical Considerations Surrounding Environmental Enrichment. Proceedings of The Australasian Society for the Study of Animal Behaviour, Australia, Adelaide, April 11th – 13th 2011.

44. Chamberlain, T.S., Hughes, P.E., Dunshea, F.R. and Hemsworth, P.H. (2011). The influence of boar sexual behaviour at the time of exposure on the induction of puberty in gilts. Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association, p. 78.

45. Coleman, G.J. and Hemsworth, P.H. (2011). The attitudes and behaviour of stockpeople at Australian sheep and cattle abattoirs. HSA International Symposium: Recent advances in the welfare of livestock at slaughter.

46. Crawford, S.M., Moeller, S.J. and Hemsworth, P.H.H. (2011). Characteristics of stockperson interactions with pigs in swine finishing facilities. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 89.

47. Cronin, G.M., Downing, J.A., Storey, T.H., Borg, S.S., Schirmer, B.N. and Barnett, J.L. (2011). A retrospective study of the impact of injurious pecking on stress response in hens, measured via egg corticosterone. Proceedings, Australian Poultry Science Symposium 22, pp. 135-138.

48. Edwards, L. E. (2011). The relationship between shed cleanliness and hen productivity. Proceedings, Australian Poultry Science Symposium 22, pp. 118-121.

49. Engel, J., Bont, Y. and Hemsworth, P.H.H. (2011). Effect of cage design on consistency of orientation and location during oviposition of laying hens. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 118.

50. Engel, J., Widowski, T.M., Tilbrook, A.J. and Hemsworth, P.H. (2011). Further investigation of non-invasive measures of stress in laying hens. Proceedings, Australian Poultry Science Symposium 22, pp.126-129.

51. Hemsworth, L., Jongman, E.J. and Coleman, G.J (2011). Factors predicting horse welfare outcomes from a recreational horse owner's performance of key horse husbandry practices. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 147.

52. Jongman, E. J., Hemsworth, L. ans Borg, S. (2011). The effects of space allowance and exercise for greyhounds on welfare. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 108.

53. Karlen, G.M., Lee, Z.Z., Nash, J.A. and Hemsworth, P.H. (2011). The relationships between agonistic behaviour, injuries and stress in group-housed sows. Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association, p. 97.

54. King,T., Marston, L.M. and Bennett, P. (2011). The development of a behavior assessment to identify "amicable" dogs. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 25.

55. Laine, S.M., Cronin, G.M., Petherick, J.C., Hemsworth, P.H., Croney, C., Botheras, N.A. and Zerby, H. (2011). Individual variation in how hens interact with a dust substrate. Proceedings, Australian Poultry Science Symposium 22, pp.130.

56. Mellor, D. J., Hemsworth, P. H., Barnett, J. L. and Young, I. R.1. (2011). Species-specific Approaches Aid Effective Implementation of the Three Rs in Farm Animal Research. Proceedings of the 8th World Congress on Alternatives and Animal Use in the Life Sciences, Montreal, Canada, 21-25 August 2011, Session IV-1.

57. Mornement, K., Coleman, G., Toukhsati, S., Bennett, P. 'A new perspective on assessing shelter dogs'. National G2Z Summit to End Companion Animal Overpopulation. September 2011. Gold Coast QLD Australia.

58. Morrison, R.M., Cronin, G.M. and Hemsworth, P.H. (2011). Sow housing in Australia – current Australian welfare research and future directions. Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association, pp. 219 - 238.

59. O'Keefe, L., Rice, M. and Hemsworth, P.H. (2011). A study of the relationships between social and feeding behaviour and injuries in group-housed gestating gilts. Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association, p. 101.

60. Pempek, J., Eastridge, M., Botheras, N.A., Croney, C.C. and Bowen, W. (2011). Effects of alternative housing and feeding systems on the performance and behavior of dairy heifer calves. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 130.

61. Ralph, C.R., Tilbrook, A.J., Hemsworth, P.H. and Leury, B.J. (2011) An Acute Increase in Plasma Corticosterone-Induced Tissue-Specific Changes in Corticosterone and Glucose Metabolism in Select Target Tissue of the Laying Hen (Gallus domesticus). ENDO 2011: The 93rd Annual Meeting & Expo, June 4-7 in Boston, Massachusetts.

62. Rice, M., Chow, J. and Hemsworth, P.H.H. (2011). Changes in aggression over time in pregnant sows post-mixing. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 140.

63. Stella, J., Croney, C.C. and Buffington, T. (2011). Behavior and Physiologic Measures in Domestic Cats in Enriched and Stressed Environments. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 128.

64. Stevens, B.H., Tilbrook, A.J. and Hemsworth, P.H. (2011). Effects of deprivation of a preferred resource, social contact or dustbathing substrate on the biological functioning of laying hens. Proceedings, Australian Poultry Science Symposium 22, pp.131-134.

65. Verdon, M.and Hemsworth, P.H.H. (2011). The relationship between aggression, feeding time and injuries in pregnant group-housed sows. Proceedings of the 45th Congress of the International Society for Applied Ethology, 1-4 August 2011, Indianapolis, USA, p. 139.

66. Verdon, M., Madrange, P., Nash, J.A. and Hemsworth, P.H. (2011). Changes in aggression in groups of sows within and between days two and eight post-mating. Manipulating Pig Production XIII. Proceedings of the 13th Biennial Conference of the Australasian Pig Science Association, p. 244.

67. Botheras, N.A, Pempek, J.A., Enigj, D.K. and Hemsworth, P.H. (2010). Relationship between fear of humans and amount of human contact in commercially reared turkeys. Proceedings of the 44th Congress of the International Society for Applied Ethology, 4-7 August 2010, Uppsala, Sweden, p. 127.

68. Croney, C., Morris, H. and Newberry, R. (2010). Effects of early rearing environment on learning ability and behavior of laying hens. Proceedings of the 44th Congress of the International Society for Applied Ethology, 4-7 August 2010, Uppsala, Sweden, p. 33.

69. Croney, C.C., (2010). Bioethics: Should animal welfare be law or market driven? 2010. J.Anim. Sci. 92 (E. Suppl. 1). Annual Mtg American Dairy Science Association, Denver, CO.

70. Croney, C.C., (2010). Words matter: implications of semantics and imagery in framing animal welfare issues. Journal of Veterinary Medical Education.

71. Cronin, G.M., Borg, S.S., Storey, T.H., Downing, J.A. and the late Barnett, J.L., (2010). The effects of two light-dark schedules on egg laying time and synchrony, the incidence of laying in the dark and hen welfare. In: Proceedings, Australian Poultry Science Symposium 21: pp 130-133.

72. Deemer, D.R., Pempek, J.A., Lobao, L.M., Coleman, G.J. and Eastridge, M.L., (2010). Farm Animal Welfare: Assessing Public Concern and Attitudes. J.Dairy Sci. 92 (E. Suppl. 1). Poster accepted for presentation at July2010 Annual Mtg American Dairy Science Association, Denver, CO.

73. Doyle, R.E., Hinch, G.N., Fisher, A.D., Boissy, A., Henshall, J.M. and Lee, C. (2010). Administration of serotonin inhibitor p-Chlorophenylalanine induces pessimistic-like judgement bias in sheep. Proceedings of the 44th Congress of the International Society for Applied Ethology, 4-7 August 2010, Uppsala, Sweden, p. 63.

74. Jongman, E. (2010). The effect of age on young calves on the ease of movement through an obstacle course. Proceedings of the 44th Congress of the International Society for Applied Ethology, 4-7 August 2010, Uppsala, Sweden, p. 167.

75. Jongman, E.C. and Butler, K.L., (2010). Effects of extended lactation on milk production and milk cortisol in the first production cycle. Proceedings of the 28th Australian Society of Animal Production conference, Armidale, Australia. (in press).

76. Laine, S.M., Cronin, G.M., Petherick, J.C. and Hemsworth, P.H. (2010). The effects of interval of testing and quality of resource on the choice behaviour of Hy-Line Brown laying hens in a Y-maze preference test. Proceedings of the 44th Congress of the International Society for Applied Ethology, 4-7 August 2010, Uppsala, Sweden, p. 186.

77. Laine. S.M, Cronin, G.M., Petherick, J.C. and Hemsworth, P.H., (2010). The effects of interupting a dustbathing bout on the choice behaviour of laying hens in a Y – maze test. In: Proceedings of the Australian Poultry Science Symposium, Vol 21, p. 85.

78. Papargiris, M.M., Hemsworth, P.H., Rivalland, E.T.A., Morrissey, A.D., and Tilbrook, A.J. (2010). Cortisol inhibits sexual receptivity, but has no effect on attractivity or proceptivity in ovariectomized ewes treated with different doses of estradiol benzoate. Proceedings of the 43rd Conference of the Society for the Study of Reproduction (Milwaukee, USA, July 2010). Presentation 573.

79. Toukhsati, S.R., Coleman, G.J., Podberscek, A.L., Phillips, C., & Cargill, C.F. (2010). Attitudes and behaviours towards companion animals in Thailand: Results from interviews. Proceedings for the 19th Annual Conference of the International Society of Anthrozoology, Stockholm, 30th June 2010, p16.

80. Windschurner, I., Boivin, X., Coleman, G.J., Ruis, M., Mounaix, B. and Waibelinger, S. (2010). Modifying attitudes and behavior towards dairy cattle by multi-media based cognitive-behavioural intervention. Proceedings of the 44th Congress of the International Society for Applied Ethology, 4-7 August 2010, Uppsala, Sweden, p. 52.

81. Verkerk G.A. and Hemsworth, P.H. (2010). Managing cow welfare in large dairy herds. Proceedings of the 4th Australasian Dairy Science Symposium (Lincoln University, Christchurch, New Zealand, August-September, 2010), pp. 436-443.

Research Reports
(n = 31)

1. Hemsworth, P.H. and Rault, J-L. (2014). National Welfare RD&E Capacity Building Project. Final report to Australian Pork Limited. 2011/2204.

2. Hemsworth, P.H., Morrison, R., Tilbrook, A. Butler, K., Rice, M. and Moeller, S. (2014). Effects of floor space on the welfare of group housed sows. Final report to the Co-operative Research Centre for High Integrity Australian Pork. 1C-105.

3. Jongman, E. and Hemsworth, P.H. (2014). Assessment of pain responses associated with castration of 10-week-old lambs using the Callicrate 'Wee Bander' compared with a standard elastrator. Final report to Meat and Livestock Australia. B.AWW.0232.

4. Jongman, E., Hemsworth, L.M. and Skuse, J.M. (2014). Validation of on-farm pig welfare indices. Final report to Australian Pork Limited. 2013/062.

5. Rault, J-L. and Lay, D.C. (2014). Nitrous Oxide for piglet euthanasia: validation by electroencephalography (EEG). Final report to the National Pork Board. NPB #13-109.

6. Rault, J-L. and Matthews, L. (2014). Review of evidence to underpin development of Welfare Standards and Guidelines. Final report to RIRDC Chicken meat. PRJ-009533.

7. Rault, J-L., Dunshea, F. and Pluske, J. (2014). Oxytocin effects on the response of piglets to weaning. Final report to Australian Pork Limited. 2014/2136.

8. Rault, J-L., Hemsworth, P.H., Morrison, R., Tilbrook, A. and Hansen, C. (2014). Effects of group housing after weaning on sow welfare and sexual behaviour. Final report to the Co-operative Research Centre for High Integrity Australian Pork. 1C-111.

9. Rault, J-L., Plush, K. and Langendijk, P. (2014). The sensitivity of sows to stressors throughout gestation. Final report to the Co-operative Research Centre for High Integrity Australian Pork. 1C-108.

10. Coleman, G.J., Hemsworth, P.H., Roberts, L. and Rohlf, V. (2013). Metrics to benchmark stock handling. Final report to Australian Pork Limited. 2010/1022.362.

11. Fisher, A.D. (2013). A review of pre-export shearing of sheep. Final report to Meat and Livestock Australia and Livecorp.

12. Hemsworth, P.H., Morrison, R., Verdon, M. and Rice, M. (2013). Effects of aggressive characteristics of individual sows and mixing strategies on the productivity and welfare of group-housed gestating sows. Final report to the Co-operative Research Centre for High Integrity Australian Pork. 1C-102.

13. Hemsworth, P.H. and Tilbrook, A. (2013). Usefulness of preference for resources and biological functioning to assess animal welfare. Final report to Australian Pork Limited. 2011/1018.438.

14. Hemsworth, P.H., Hansen, C., Verdon, M., Rault, J-L., Jongman, E., Hansen, L. and Plush, K. (2013). Effects of group housing on sow productivity and welfare: review. Final report to the Co-operative Research Centre for High Integrity Australian Pork. 1C-112.

15. Hemsworth, P.H. and Singh, C. (2013). Welfare and productivity of sows and litters housed in farrowing crates compared to farrowing pens. Final report to the Co-operative Research Centre for High Integrity Australian Pork. 1C-104.

16. Jongman, E. (2013). Review and report on animal welfare measures for the Australian dairy industry. Final report to Dairy Australia.

17. Jongman, E., Hemsworth, P.H. and Rice, M. (2013). Welfare of lambs in intensive finishing systems - Study 2. Final report to Department of Environment and Primary Industries, Future Farming Systems Research. CMI No. 103159.

18. Rault, J-L., Hemsworth, P.H., Tilbrook, A. and Scott, P. (2013). The effects of time off feed and water on the welfare of spent laying hens. Phase 2: Behavioural indicators. Final report to the Australian Egg Corporation Limited. 1UM122.

19. Rice, M., Hemsworth, P.H., Rault, J-L, Skuse, J.M, Jongman, E., Hemsworth, L.M. and Ng, C. (2013). Animal welfare monitoring in pig research. Final report to the Co-operative Research Centre for High Integrity Australian Pork.

20. Skuse, J.M and Hemsworth, L.M. (2013). The development of practical measures to benchmark pig welfare in the Australian Pork Industry. Final report to Australian Pork Limited. 2012/1025.

21. Skuse, J.M, Stevens, B. and Singh, C. (2013). Group demonstration award - Lactation Pens. Final report to Australian Pork Limited. 2011/2311.

22. Skuse, J.M (2013). Review of registered 'ProHand Pigs' facilitators. Final report to Australian Pork Limited. 2011/2222.

23. Beggs, D.S., Pyman, M.P., Mansell, P.D. and Fisher, A.D. (2012). A review of disbudding and dehorning in the dairy industry. Final report to Dairy Australia.

24. Fisher, A.D., Auldist, M., Jongman, E.J., Mansell, P., Pyman, M., Wales, W., Coombe, J. and Dilrukshi, A. (2012). Welfare of dairy cows in new semi-intensive farming systems. Final report to Department of Primary Industries. CMI 103170.

25. Hemsworth, P.H., Widowski, T., Tilbrook, A. and Engel, J. (2012). Importance of rearing environment, space and nests for laying hens in cages - Welfare implications of floor space and nest boxes. Final report to the Australian Egg Corporation Limited. 1UM091.

26. Skuse, J.M., Edge, M. and Brown, R. (2012). Mapping ProHand stockperson training packages. Final report to Australian Animal Welfare Strategy, May 2012.

27. Hemsworth, P.H., Rice, M. and Jongman, E.J. (2011). Welfare of lambs in intensive finishing systems – Study 1. Final report to Department of Primary Industries, Victoria, August, 2011.

28. Edwards. L. E., Hemsworth, P.H. and Tilbrook, A.J. (2011). The effects of time off feed and water on the welfare of spent laying hens. Final report to the Australian Egg Corporation Limited. MCCP: 2009-320.

29. Hemsworth, P.H., Morrison, R., Cakebread, P., Tilbrook, A.J., Karlen, M.G., Rice, M., Nash, J., Butler, K.L. and Giri, K. (2011). The effects of group housing during gestation on sow welfare and reproduction. Final report to the Australian Pork Limited. 2011/2193.

30. Edwards, L. E., (2010). The relationship between shed cleanliness and hen productivity – submitted to the Australian Poultry CRC, February 2010. 09-32: UMelb.

31. Fisher, A., Mansell, P., Stevens, B., Conley, M., Jongman, E., Lauber, M. and Hides, S., (2010). Determining a suitable time off feed for bobby calf transport under Australian conditions. Final Report to Dairy Australia. TIG124.

Theses
(n = 7)

1. Coombe, J. (2014). The effect of flexible feeding systems on the health and welfare of dairy cows. PhD Thesis, The University of Melbourne.
2. Hetti Arachchige, A.D. (2014). Defining dairy cow behaviour and welfare in feeding systems based on mixed ration fed in conjunction with grazed pasture in south eastern Australia. PhD Thesis, The University of Melbourne.
3. Verdon, M. (2014). Sow aggression in groups: predicting and implications for sow welfare. PhD thesis, The University of Melbourne.
4. Ralph, C.R. (2013) Circulating plasma glucocorticoid concentrations did not consistently predict intracellular glucocorticoid concentrations or their effect on glucose metabolism in the pig (Sus scrofa) or the laying hen (Gallus gallus domesticus). PhD Thesis, The University of Melbourne.
5. Crawford, S.M. (2012). Improving the attitudes and behavior of stockpersons toward pigs and the subsequent influence on animal behavior and production characteristics of commercial finishing pigs in Ohio. Ph.D. Thesis, The Ohio State University.
6. Hemsworth, L.M. (2012). The welfare of recreational horses in Victoria: the occurrence of and factors involved with horse welfare. PhD Thesis, Monash University.
7. Laine, S. M. (2011). Animal preferences: effects of environmental and animal factors on the choice behaviour of laying hens, Gallus gallus domesticus. PhD thesis, The University of Melbourne.

AWSC SCIENTIFIC SEMINARS

2010-2014

(For titles and speakers, see appendix II. For attendance, see appendix III)

2014

3 seminars featuring 11 presentations

2013

3 seminars featuring 9 presentations

2012

4 seminars featuring 6 presentations

2011

3 seminars featuring 7 presentations

2010

8 seminars featuring 48 presentations

APPENDIX I

AWSC RD&E PROJECT SUMMARIES 2010-2014

1. Dairy industry

1.1. Overstocking the feeding area may affect the welfare and productivity of dairy cows and calves

Investigators: M. Eastridge, G. Habing, K. Proudfoot, K. Daniels

Student: J. Pempek (PhD)

Funding: OARDC Research Enhancement Competitive Grants Program

2014 - $ 5,875

Commencement date: 2014

Completion date: 2014

The main objectives of this study were to: 1) determine the effect overstocking the feeding area during the dry period may have on cow comfort, stress, fecal pathogen shedding, udder health and milk production during the subsequent lactation, and 2) determine the effect overstocking of the feeding area for the dam during the dry period has on the postnatal growth, physiology, and stress reactivity of dairy calves.

1.2. Ensuring dairy cow welfare with increasing scale of production

Investigators: A.Fisher

Student: D. Beggs (PhD)

Funding: Dairy Australia

2013 - $ 19,395, 2014 - $ 36,021

Commencement date: 2013

Completion date: 2016

This 3 year project supports a PhD student who will be undertaking on-farm studies to determine relationships between farm characteristics and practices associated with scale of production and animal welfare measures.

1.3. Review and report on animal welfare measures for the Australian dairy industry

Investigator: E. Jongman

Funding: Dairy Australia

2013 - $ 6,500

Commencement date: 2013

Completion date: 2013

This project detailed potential on-farm tools which might be used by the dairy industry to monitor dairy cow welfare

1.4. Dairy systems welfare: Ensuring animal welfare in Victorian dairy systems

Investigators: A. Fisher, P. Hemsworth, E. Jongman

Students:	A. Dilrukshi (PhD) and J. Coombe (PhD)
Funding:	Department of Economic Development, Jobs, Transport and Resources 2012 - $ 154,952, 2013 - $ 309,904, 2014 - $ 601,769
Commencement date:	2012
Completion date:	2015

This 3 year project has provided information in the areas of flexible feeding systems and bobby calf management. Two University of Melbourne students within the flexible feeding project were awarded their PhD theses and graduated in December 2014:

- Joanne Coombe, The effect of flexible feeding systems on the health and welfare of dairy cows.

- Anoma Hetti Arachchige, Defining dairy cow behaviour and welfare in feeding systems based on mixed ration fed in conjunction with grazed pasture in south eastern Australia.

The project on flexible feeding systems has addressed specific questions relating to cow comfort and behaviour within PMR systems as well as the effect of intensive feeding systems on hoof health and acidosis. The anticipated outcome of this large project is to facilitate the ability of dairy producers to adopt more flexible, more profitable feeding systems while achieving appropriate standards of cow health and welfare.

Two other University of Melbourne students have commenced their PhD:

- David Beggs, Ensuring dairy cow welfare with increasing scale of production (a project with co-investment from Dairy Australia).

- Josh Aleri, Assessing phenotypic and genetic adaptive immune response in Australian Friesian heifers in a pasture-based production system.

As part of the project on increased scale of production an industry wide survey has been conducted on management strategies of large herds and the effect on risks to animal welfare. This ongoing project aims to provide information on reducing risks to animal welfare in large herds. In addition a project on the effect of calf feeding management relating to amount and frequency of feeding calves in the first week of life was completed and the results will provide information on the effect of calf feeding management on calf welfare. These projects ensure animal welfare concerns will be addressed in a fashion to ensure community acceptance of increased intensification in the dairy industry.

1.5. Metabolic Welfare of Calves

Investigators: E. Jongman, A. Fisher

Funding: Department of Economic Development, Jobs, Transport and Resources

2012 - $ 160,000

Commencement date: 2012

Completion date: 2014

The objective of this project was to determine the effect of feeding management of calves less than 10 days of age, in terms of feed allowance and feeding frequency, on metabolic state, growth and welfare as part of the bobby calf supply chain.

1.6. Support the delivery of ProHand® Dairy

Investigator: J. Skuse

Funding: Dairy Australia

2012 - $ 5,000, 2013 - $ 2,000

Commencement date: 2012

Completion date: 2013

This project supported ProHand® Dairy as it was rolled out to industry.

1.7. Design and delivery of a Day 2 Powerpoint Presentation for ProHand® Dairy

Investigators: J. Skuse

Funding: Dairy Australia

2012 - $ 12,000

Commencement date: 2012

Completion date: 2013

This project developed a multimedia presentation to deliver Day 2 ProHand Dairy content.

1.8. Optimising dairy cow behaviour and welfare within flexible feeding systems

Investigators: A. Fisher, E. Jongman, P. Mansell, M. Pyman, M. Auldist and W. Wales

Students: A. Dilrukshi (PhD) and J. Coombe (PhD)

Funding: Department of Economic Development, Jobs, Transport and Resources

Commencement date: February 2010

Completion date: June 2012

2011 Funding $ 199,676

Dairy farmers in south eastern Australia are challenged by the need to feed their dairy cows profitably in the face of increased climate variability which directly impact on the availability of water for grazed forage production. More recently, that grazed pasture constitutes less than 50% of a cow's diet annually, with the remainder being made up of expensive, high-energy concentrates. By necessity this simple system is being replaced with flexible systems that integrate mixed

rations, fed on feed pads with grazed pastures (Partial Mixed Rations-PMR), while optimizing cow behaviour and welfare.

This project addressed specific questions relating to cow comfort and behaviour within PMR systems and the success of this project will enable dairy farmers to adopt strategies that optimize cow behaviour and welfare within flexible feeding systems.

1.9. Determining a suitable time off feed for bobby calf transport under Australian conditions

Investigators: A. Fisher, P. Mansell, E. Jongman, S. Hides and M. Lauber

Funding: Dairy Australia

2010 - $ 34,457

Commencement date: 2009

Completion date: 2010

The objectives of this project were: 1) to determine the welfare and metabolic state of 5- to 10-day-old dairy calves in response to increasing time off feed- up to 30 hours, in conjunction with three transport scenarios; and 2) to use these results to provide objective scientific evidence, along with published information, to support the Australian development of an appropriate standard for maximum permissible time off feed for the bobby calf supply chain.

1.10. Effect of age on physiology and recovery behaviour of calves transported for 10 hours in individual pens

Investigator: M. Lauber and the late J. Barnett

Funding: Department of Economic Development, Jobs, Transport and Resources

2010 – $ n/a

Commencement date: 2009

Completion date: 2010

This study examined the physiological and behavioural effects of transport on young calves comparing age, transport or no transport, and time.

1.11. Transport of bobby calves

Investigator: E. Jongman

Funding: Department of Economic Development, Jobs, Transport and Resources

2010 – n/a

Commencement date: 2008

Completion date: 2011

This project provided scientifically-validated recommendations for the stocking density, age and conditions for the transport of bobby calves.

1.12. Benchmarking welfare indicators for the dairy industry

Investigator: E. Jongman

Funding: Department of Economic Development, Jobs, Transport and Resources

2010 – $ n/a

Commencement date: 2007

Completion date: 2010

The aim of this project was to identify a select few indicators of welfare that can be used in company QA and benchmarking exercises to monitor the welfare of dairy cows.

2. Pork industry

2.1. Pre-weaning social exposure: effects on aggression, injuries and growth of weaner and growing pigs

Investigator: M. Verdon, P. Hemsworth

Funding: Department of Agriculture

2014 - $ 19,477

Commencement date: 2014

Completion date: 2015

This experiment will assessed whether housing piglets in group-housed sow lactation systems reduces aggression and injuries, and increases piglet growth, following mixing at the weaning and growing stages of production, in comparison to piglets raised in a non-group lactation system.

2.2. Oxytocin effects on the response of piglets to weaning

Investigator: J-L. Rault, J. Pluske, F. Dunshea

Funding: Australian Pork Limited

2014 - $ 32,747

Commencement date 2014

Completion date: 2015

The weaning transition in the pig is often an abrupt process associated with poor performance, stress, and growth restriction at least for the first week post-weaning. This project found no advantages for the use of oxytocin at weaning,

either through subcutaneous or intranasal administration, on the performance and welfare of pigs after weaning based on growth, stress or aggressive behaviour.

2.3. Delivery of Pork Quality Assurance+ Advisor Training and Certification Programs

Investigators: S. Moeller, D. Ricker

Funding: The National Pork Board

Commencement date: 2014

Completion date: ongoing

PQA Plus is a producer-driven program they can use to ensure U.S. pork products are of the highest quality and safe, and animals raised for food are cared for in a way ensuring their well-being. Modeled after the Hazard Analysis Critical Control Point (HACCP) programs used by food manufacturers to ensure the safety of food products, PQA was then customized for on-farm use.

2.4. Delivery of Transportation Quality Assurance Advisor Training and Certification

Investigators: S. Moeller, D. Ricker

Funding: The National Pork Board

Commencement date: 2014

Completion date: ongoing

The TQA program was developed for on-farm animal handlers, transporters and those who handle pigs at the destination site. It is a voluntary education-certification program, through which more than 13,000 individuals have been certified. Most of the major packers in the United States require TQA certification of all transporters delivering hogs to their facilities

2.5. Validation of practical measures to benchmark pig welfare in the Australian Pork Industry

Investigators: E. Jongman, L. Hemsworth, P. Hemsworth, R. Morrison, J. Skuse

Funding: Australian Pork Limited

2013 - $ 58,000, 2014 - $ 30,799

Commencement date: 2013

Completion date: 2014

This 1 year project examined the external validity of the modified animal-based welfare indices (body condition score, body lesion score and lameness score) identified by APL project 2012/1025 as on-farm measures of pig welfare in the Australian Pork Industry and investigated the inter- and intra-observer reliability of the modified animal-based welfare indices included in the on-site pig welfare benchmarking protocol.

2.6. The sensitivity of sows to stressors throughout gestation

Investigators: J-L. Rault, A. Tilbrook, P. Langendijk

Funding: CRC for High Integrity Australian Pork

2013 - $ 62,310

Commencement date: 2013

Completion date: 2014

The best timing and method to mix gestating sows is still controversial. This project investigated the behavioural and physiological mechanisms regulating the stress response of sows during gestation and its implications for stress-coping ability and reproductive performance. Overall, these experiments support the hypothesis that sows habituate to different housing conditions through behavioural adaptation by changing their social strategies. However, there is no physiological adaptation to stress during the first trimester of gestation which would suggest a best time to mix.

2.7. Learning to be social: Oxytocin and socio-behavioural development in pigs

Investigator: J-L. Rault

Funding: Melbourne Early Career Researcher Grant Scheme, The University of Melbourne

2013 - $ 38,694

Commencement date: 2013

Completion date: 2013

This project investigated how post-natal experiences affect the developments and subsequent social behaviour of piglets, with an emphasis on the oxytocin system. This project was used to develop an ARC Linkage project application.

2.8. Welfare and productivity of sows and litters housed in farrowing pens compared to farrowing crates

Investigators: P. Hemsworth, G. Charles

Funding: CRC for High Integrity Australian Pork

2013 - $ 23,354

Commencement date: 2013

Completion date: 2013

This project assessed the viability of improving the welfare conditions for lactating sows by eliminating the use of farrowing crates from 3 days of lactation.

2.9. Literature review and collaboration with the Danish Pig Research Centre on effects of group housing both post-weaning and post-insemination on sow productivity and welfare

Investigators: P.Hemsworth, C.Hansen, J-L.Rault, L.Hansen, A.Tilbrook, P.Hughes, M. Verdon

Funding: CRC for High Integrity Australian Pork

2013 - $ 12,825

Commencement date: 2013

Completion date: 2013

This project reviwed the effects of group housing on sow productivity and welfare and will assist in collaboration between Australian and Danish researchers.

2.10. Effects of group housing after weaning on sow welfare and sexual behaviour

Investigators: J-L. Rault, P. Hemsworth, R. Morrison, A. Tilbrook, C. Hansen

Funding: CRC for High Integrity Australian Pork

2013 - $ 30,000, 2014 - $ 39,000

Commencement date: 2013

Completion date: 2014

This project examined the effects of grouping sows either after weaning or after insemination on sexual behaviour, aggression, injuries, stress and reproductive performance. Mixing sows after weaning resulted in higher levels of aggression and stress than mixing within 5 days after insemination. The detection of oestrus was also more difficult in group-weaning systems.

2.11. Metrics to benchmark stock handling – Field Trial

Investigators: G. Coleman, P. Hemsworth, S. Toukhsati

Student: L. Roberts (PhD)

Funding: Australian Pork Limited

2013 - $ 8,255, 2014 - $ 19,760

Commencement date: 2013

Completion date: 2014

It has been established that stockpeople have a major impact upon animal welfare. Monitoring stockpeople as part of welfare monitoring schemes may improve current welfare monitoring schemes that do not take stockpeople into account and should result in improvements in animal welfare.

This project trialled the ProHand benchmark program developed in an earlier project.

2.12. Redevelop ProHand® for the pork industry

Investigators: G. Coleman, P. Hemsworth and J. Skuse

Funding: Australian Pork Limited, Australian Meat Processor Corporation

2014 - $ 143,008

Commencement date: 2013

Completion date: 2015

The objectives of this project are to design and deliver a stable, effective platform for the delivery of ProHand Pigs and ProHand Pork Abattoir. The project also aims to deliver an intregrated program which will target stockperson attitudes and introduce low stress handling concepts throughout the production chain

2.13. Nitrous oxide for piglet euthanasia: validation by electroencephalography (EEG)

Investigators: J-L. Rault, D. Lay, C. Johnson, M Sutherland

Funding: National Pork Board (US)

Commencement date: 2013

Completion date: 2014

Collaborating with USDA, Massey University and AgResearch NZ, this project aimed to assess gas alternatives to carbon dioxide for piglet euthanasia on-farm. This project showed that nitrous oxide is a humane alternative to carbon dioxide, as it is much less aversive to piglets based on behavioural and neurophysiological (EEG) evidence.

2.14. ProHand® Pigs technical support

Investigators: J. Skuse and G. Coleman

Funding: Australian Pork Limited

2012 - $ 20,700, 2013 - $ 11,500, 2014 - $ 11,500

Commencement date: 2012

Completion date: 2016

This project provides technical support to ProHand® Pigs facilitators and make recommendations on program improvements.

2.15. Review of registered ProHand® Pigs facilitators

Investigators: J. Skuse

Funding: Australian Pork Limited

2012 - $ 8,970, 2013 - $ 2,300

Commencement date: 2012

Completion date: 2013

This project audited ProHand® Pigs facilitators to ensure the program was being delivered to an acceptable standard. Future training needs were also be identified and a refresher course was provided for facilitators.

2.16. Animal welfare monitoring in research settings

Investigators: M. Rice, P. Hemsworth, J-L. Rault, J. Skuse, E. Jongman

Student: C. Ng (Masters)

Funding: CRC for High Integrity Australian Pork
2012 - $ 37,446

Commencement date: 2012

Completion date: 2013

This 1 year project conducted a comprehensive review of the literature of current welfare assessment tools and identify those indices that could be used to assess the welfare of sows and their piglets in husbandry and housing systems under study in Pork CRC-funded projects. A welfare index was compiled from the scores of the identified welfare indices to assess the welfare of pregnant sows and parturient/lactating sows and their litters.

2.17. The development of practical measures to benchmark pig welfare in the Australian Pork Industry

Investigators: J. Skuse, L. Hemsworth

Funding: Australian Pork Limited
2012 - $ 13,672, 2013 - $ 8,425

Commencement date: 2012

Completion date: 2013

This 1 year project delivered a literature review of welfare outcome assessment measures in use in the global pork industry and a set of practical on-farm measures which were trialled for their ease of use.

2.18. Evaluation of sow and piglet behaviour and performance in individual follow-on lactation pens

Investigators: J. Skuse, P. Hemsworth, G. Charles

Funding: Australian Pork Limited and CRC for High Integrity Australian Pork
2012 - $ 17,888, 2013 - $ 2,000

Commencement date: 2012

Completion date: 2013

Observations on maternal behaviour and piglet suckling behaviour was recorded together with performance data. Knowledge gained through this project has been provided to the Australian pork industry and will assist in designing and managing follow-on lactation pens.

2.19. Effects of floor space on the welfare of group-housed sows

Investigators: P. Hemsworth, A. Tilbrook, JL. Rault, S. Moeller, R. Morrison, P. Hughes

Funding: CRC for High Integrity Australian Pork
2011 - $ 13,000, 2012 - $ 171,000,
2013 - $208,000

Commencement date: 2011

Completion date: 2014

The aim of this project was to provide the Australian pork industry and Government with scientifically-sound and scientifically-defensible recommendations on spatial requirements of group-housed gestating sows.

2.20. Assessing public metrics to benchmark stock handling

Investigators: G. Coleman, P. Hemsworth and S. Toukhsati

Student: L. Roberts (PhD)

Funding: Australian Pork Limited

2010 - $ 32,367, 2011 - $ 44,103, 2012 - $ 52,997, 2013 - $ 32,367

Commencement date: 2010

Completion date: 2013

Research has shown that stockpeople have a major impact on the welfare of their livestock, however the topic of 'stockmanship' has received relatively little attention. While welfare monitoring schemes are likely to improve animal welfare, the impact of such schemes will only be realised by recognising the limitations of stockpeople and including stockperson benchmarking in welfare audits. Monitoring This project developed a supervisor questionnaire for assessing stockperson handling and general work performance and a self report questionnaire to assess stockperson attitudes and knowledge.

2.21. ProHand® Pigs in US

Investigators: S. Moeller, N. Botheras, P. Hemsworth and G. Coleman

Student: S. Crawford (PhD)

Funding: The Ohio State University

2010 - $ n/a

Commencement date: 2010

Completion date: 2012

This project assessed baseline stockperson/contract grower beliefs, attitudes and behaviour toward grower-finisher pigs and how they they influenced pig fear responses. The project also assessed the efficacy of ProHand Pigs stockperson training in modifying existing attitudes, beliefs and behaviors of stockperson toward pigs, with the ultimate goal of developing a version directed toward contract grower-finisher production settings.

2.22. Usefulness of preference for resources and biological functioning to assess animal welfare

Investigators: A. Tilbrook, P. Hemsworth and C. Lee

Funding: Australian Pork Limited

2010 - $ 54,000, 2011 - $ 54,000, 2012 - $ 65,000, 2013 - $ 43,000

Commencement date: 2010

Completion date: 2013

The general objective of this project was to improve our understanding of the relationship between these two main methodologies of AW by testing the hypothesis that deprivation of highly preferred resources results in biological

dysfunction. This fundamental research may assist in reducing the interpretative differences in AW science.

2.23. Effects of aggressive characteristics of individual sows and mixing strategies on the productivity and welfare of group-housed gestating sows

Investigators:	P. Hemsworth, R. Morrison, G. Cronin, A. Tilbrook and T. Widowski
Student:	M. Verdon (PhD)
Funding:	Australian Pork Limited
	2010 - $ 145,981, 2011 - $ 117,442, 2012 - $ 65,856
Commencement date:	2010
Completion date:	2012

This project provided fundamental knowledge to the Australian pig industry on basic principles of mixing pregnant sows. Such knowledge is essential as the industry moves to more use of group housing systems for breeding females. Furthermore, such knowledge is required to develop and defend science-based recommendations on sow housing during gestation.

2.24. Validating the use of proximity loggers in measuring feeder visits, displacements and social interactions in pigs in competitive feeding situations

Investigators:	P. Hemsworth, E. Jongman and R. Morrison
Student:	M. Rice (MPhil)
Funding:	Australian Pork Limited
	2010 - $ $44,000, 2011 - $ 11,000
Commencement date:	2009
Completion date:	2011

The project examined the practicability and accuracy of using proximity loggers with intensively group housed pigs.

2.25. The influence of human-animal interactions on the behavioural and physiological responses of piglets to a stressor

Investigators:	P. Hemsworth, R. Muns Vila
Student:	R. Muns Vila
Funding:	University of Melbourne
	2012 - $ 16,000
Commencement date:	2009
Completion date:	2013

This study examined the effects of providing piglets with the opportunity to associate humans with feeding during the first day of life on their response to subsequent stressors imposed by humans and was conducted to inform an ARC Linkage project application.

2.26. The effects of group housing during gestation on sow welfare and reproduction

Investigators: P. Hemsworth, R. Morrison, P. Cakebread and A. Tilbrook

Student: M. Karlen (PhD)

Funding: Australian Pork Limited

2010 - $ 88,000

Commencement date: 2007

Completion date: 2010

This project examined the effects of floor space and group size on aggression, stress, injury, lameness and reproduction in sows housed in groups during gestation.

3. Poultry and egg industries

3.1. Review of evidence to underpin development of welfare standards and guidelines

Investigators: J-L. Rault, L. Matthews

Funding: Rural Industries Research & Development Corp. (Chicken meat)

2014 - $ 43,264

Commencement date: 2014

Completion date: 2014

The standards and guidelines for the welfare of meat chickens are soon to be under development in Australia. The standards are to be based, in part, on verifiable evidence yet there is no up-to-date review of the scientific literature on key welfare topics to inform the process. This project provides a summary of the up-to-date verifiable evidence.

3.2. Assessment of factors influencing behaviour and welfare of birds in free range systems (broilers)

Investigators: J-L. Rault, P. Hemsworth

Student: P. Taylor (PhD)

Funding: Rural Industries Research & Development Corp. (Chicken meat)

2013 - $ 174,520, 2014 - $39,790

Commencement date: 2013

Completion date: 2015

This 3 year project aims to increase our understanding of both the physical attributes of the environments and the attributes of the meat chicken and how they affect the utilisation of the outdoor environment in free range systems.

3.3. The effects of time off feed and water on the welfare of spent laying hens

Investigators: J-L. Rault, P. Hemsworth, P. Scott, G. Parkinson, A. Tilbrook

Funding: Australian Egg Corporation Limited

2012 - $ 26,000, 2013 - $ 51,000

Commencement date: 2012

Completion date: 2013

This 1 year project equated physiological changes induced by time off water with behavioural changes in order to understand potential welfare implications. The project estimated the time off water after which the welfare of laying hens is compromised, thus establishing a benchmark from which policies can be established to ensure acceptable welfare outcomes.

3.4. Free-range hen welfare: Characterisation of 'outdoor' and 'indoor' hens and physical features in the range

Investigator: J-L. Rault, P. Hemsworth, G. Cronin

Student: H. Larsen (PhD)

Funding: Australian Egg Corporation Limited

2012 - $ 47,420, 2013 - $ 93,729, 2014 - $ 94,757

Commencement date: 2012

Completion date: 2015

This 3 year project aims to increase our understanding of both the physical attributes of the environments and the attributes of the laying hen and how they affect the utilisation of the outdoor environment in free range systems.

3.5. The effects of up to 32 hrs food and water deprivation on the physiology of spent laying hens

Investigators: L. Edwards, P. Hemsworth, A. Tilbrook and M. Rice

Funding: Australian Egg Corporation Limited

2010 - $ 116,725

Commencement date: 2010

Completion date: 2010

This experiment was conducted to examine the physiological effects of up to 32 hrs food and water deprivation in laying hens, and to specifically compare the effects of 24 hrs vs. 28 and 32 hrs of deprivation for significant differences.

3.6. Animal preferences: effect of environmental and animal factors on the choice behaviour of laying hens

Investigators: P. Hemsworth, G. Cronin and C. Petherick

Student: S. Laine (PhD)

Funding: Poultry CRC

2010 – $ n/a

Commencement date: 2009

Completion date: 2010

The results of this research have important implications for the design of preference test methodology and interpretation of results. If scientists are to use preference tests to determine what is necessary for improved welfare, it must be assured that it is a rigorous methodology that reflects true preferences. The current work has demonstrated the Y-maze design factors, which may have been overlooked in the past, such as the quantity of reward, interval of testing and

quality of resource on offer, are likely to be important influences on choices made by animals. It is apparent that preference test design requires further research.

3.7. Importance of rearing environment, space and nests for laying hens in cages

Investigators: P. Hemsworth, A. Tilbrook and T. Widowski

Student: J. Engel (PhD)

Funding: Australian Egg Corporation Limited
2010 - $ 94,000, 2011 - $ 103,000,
2012 - $ 46,000

Commencement date: 2009

Completion date: 2012

This project used the 2 most common methodologies to assess animal welfare, measuring animal preferences and biological functioning. Preference tests are used by scientists to draw inferences on animal welfare on the basis that these preferences are influenced by the animal's emotions (or feelings), which are prime determinants of its welfare. Measuring biological functioning involves the integrated use of behavioural, physiological, health and fitness measures.

Determining how space allowance and nests in cages affect hen welfare will assist the egg industry both by demonstrating that cages may be an appropriate environment for laying hens and in any negotiations with Government on future space allowances and/or requirement for nests for laying hens.

3.8. Human-animal interactions in the turkey industry

Investigators: N. Botheras and P. Hemsworth

Students: J. Pempek (MSc)

Funding: Midwest Poultry Research Program, Cooper Farms, Ohio Poultry Association
2010 - $ n/a

Commencement date: 2009

Completion date: 2010

This study aimed to investigate fear of humans in commercially-raised turkeys, and the possible relationships with bird welfare and productivity, and stockperson behaviour.

4. Beef and sheep industries

4.1. Assessing and Addressing On-Farm Sheep Welfare

Investigators: R. Doyle, P. Hemsworth, G. Coleman, J. Webb-Ware, A. Fisher, L. Kubeil

Student: C. Munoz (PhD)

Funding: Meat and Livestock Australia
2014 - $ 78,000

Commencement date: 2014

Completion date: 2017

The welfare and survival of sheep are vital to both farming profits and community acceptance of products. This project will examine the relationships between farmer attitudes, other job-related characteristics, farm management, profits and animal welfare. This project will also assess the efficacy of an intervention method on improving management and welfare on farm in an effort to encourage practice change, reduce mortalities and improve farm production and profitability.

4.2. Quantifying welfare improvements in the live export industry

Investigators: R. Doyle, P. Hemsworth, G. Coleman

Funding: Meat and Livestock Australia
2014 - $ 34,560

Commencement date: 2014

Completion date: 2016

The way workers handle animals presents the greatest risk to an animal's welfare. MLA provides extensive support in live export markets to educate workers on the best and safest ways to handle animals and improve animal welfare. This project aims to gather objective data of the changes in animal handling following the delivery of MLA's Live Export Training Program to workers. To do this, data on the behaviour and physiology of animals during handling, the behaviour of workers and their understanding of good animal welfare will be collected before and after training.

4.3. Assessment of pain responses associated with castration of 10-week old lambs using the Callicrate 'Wee Bander' compared to a standard elastrator

Investigators: E. Jongman, P. Hemsworth, A. Fisher

Funding: Meat and Livestock Australia
2013 - $ 20, 000, 2014 - $ 67,765

Commencement date: 2013

Completion date: 2014

This project examined the behaviour and stress of lambs castrated using a new method (the 'Wee-Bander') compared to traditional castration by elastrator.

4.4. Relationships between fear of humans, temperament and handling pre-slaughter and lamb welfare and meat quality

Investigators: P. Hemsworth, G. Coleman, E. Ponnampalam

Funding: Australian Meat Processor Corporation
2013 - $ 30,000, 2014 - $ 50,000

Commencement date: 2013

Completion date: 2016

The objectives of this project are to determine the relationships between

- key animal characteristics and handling pre-slaughter on lamb welfare (on the basis of stress and behaviour) and meat quality.
- behavioural measures pre-slaughter and stress pre-slaughter and consequently poor welfare and meat quality.

4.5. Alternative stunning

Investigators: P. Hemsworth, JL Rault, C. Johnson

Funding: Meat and Livestock Australia

2012 - $ 46,392

Commencement date: 2012

Completion date: 2013

This commercial-in-confidence study examined the efficacy of a novel stunning method in cattle.

4.6. Lamb systems welfare: Ensuring animal welfare in Victorian lamb systems

Investigators: P. Hemsworth, A. Campbell, E. Jongman

Funding: Department of Economic Development, Jobs, Transport and Resources

Student: M. Rice (MPhil)

2012 - $ 111,985, 2013 - $ 223,970, 2014 - $ 330,283

Commencement date: 2012

Completion date: 2015

This 3 year project will study both lamb behaviour and stress in order to understand potential effects of design features on lamb welfare and productivity in feedlots. The information will be used to provide a sound scientific basis for decisions by policy makers on any regulation of the industry and by industry to implement best practice management of lambs in feedlots.

4.7. Welfare of lambs in intensive finishing systems Part 2

Investigators: P. Hemsworth, A. Tilbrook, E. Jongman, A. Campbell, B. Leury

Funding: Department of Economic Development, Jobs, Transport and Resources

2011 - $ 94,970, 2012 - $96,118

Commencement date: 2010

Completion date: 2013

The first study validated remote proximity sensors (radio frequency identification tags) to measure feeding behaviour and social interactions (e.g. displacements from feeders). The second study examined the effects of floor and feeder trough space on lamb welfare in an 'industry best practice intensive finishing system'.

4.8. Welfare of lambs in intensive finishing systems. Part 1.

Investigators: G. Coleman, E. Jongman, P. Hemsworth, A. Campbell, B. Leury and S. Toukhsati

Funding: Department of Economic Development, Jobs, Transport and Resources

2010 - $ 96,190

Commencement date: 2010

Completion date: 2010

In this preliminary project, the most contentious issues in intensive feeding systems and containment of lambs were identified through conducting a literature review of the relevant scientific literature on the welfare implications of confinement systems together with the use of attitude questionnaires assessing both the public and farmers attitudes to farm animal welfare, particularly those welfare issues concerning the lamb production in intensive finishing systems.

The results of the project were used by the Centre and DEDJTR to assist in the planning of a proposed subsequent major animal experiment studying intensive feeding of lambs.

4.9. Develop and evaluate a model to monitor and benchmark the welfare of animals in research institutions

Investigator: E. Jongman

Funding: Department of Agriculture (AAWS)

2010 - $ 10,000

Commencement date: 2009

Completion date: 2010

This project developed and evaluated a model to monitor and benchmark the welfare of animals in research.

5. Companion, zoo, work animals

5.1. Human-animal relationships in zoos: Optimising animal and visitor experiences

Investigators: G. Coleman, P. Hemsworth, R. Rassool, K. Fanson, K. Butler, M. Magrath, V. Melfi, D. Peake, W. Shaw

Students: S. Chiew (PhD), L. Rehnsberg (PhD)

Funding: ARC Linkage

2014 - $ 61, 419

Commencement date: 2014

Completion date: 2017

Extensive research on human-animal relationships in agricultural and domestic settings shows that human-animal interaction affects animal behaviour and welfare, which in turn affect human attitudes to animals. As conservation and welfare organisations, zoos aim to provide visitors with opportunities to closely interact with animals to improve visitor experience and conservation outcomes,

whilst maintaining good animal welfare. Some visitor interactions may be stressful for some animals creating conflict between animal welfare and visitor experience. By determining visitor effects, this project aims to provide zoos with practical animal management and educational strategies to optimise both animal welfare and visitor experience.

5.2. Development of husbandry and management educational material for Victorian recreational horse owners

Investigators: E. Jongman, and L. Hemsworth

Funding: ANZ Trustees, Kathleen Agnes Back Trust
2013 - $ 50,131, 2014 - $ 25,000

Commencement date: 2013

Completion date: 2015

This 2 year project will develop and provide Victorian horse owners with the resources necessary to appropriately manage the health, husbandry and welfare of their recreational horses by developing a horse welfare benchmarking tool to enable recreational horse owners to benchmark their horses welfare/time and monitor their husbandry and management practices.

5.3. Human-animal relationships in zoos: understanding the impact of visitors on the welfare of non-human primates in Australian zoos

Investigators: P. Hemsworth, C. Phillips, M. Magrath

Student: S. Sherwen (PhD)

Funding: Department of Agriculture (AAWS)
2011 - $ 3,170, 2012 - $ 5,000

Commencement date: 2011

Completion date: 2012

Zoo visitors are an integral part of life for zoo animals but we have limited understanding of how visitor numbers and behaviour influence their welfare. This project will fill a major gap in our knowledge and be the first to thoroughly investigate visitor effect on animal welfare using preference testing, behavioural observations, physiological assessment and replication.

In this preliminary study, five target zoos across Australia were visited to define enclosure characteristics and create an ethogram of animal behaviours (with visitors present and absent).

5.4. The relationship between attitudes and behaviour of human care-takers and animal behaviour of dogs in a shelter environment

Investigators: P. Hemsworth, G. Coleman

Student: S. Haynes (PhD)

Funding: Department of Agriculture (AAWS)

2012 - $ 14,110

Commencement date: 2011

Completion date: 2012

This study identifyied training opportunities (e.g. cognitive-behavioural intervention) that target key attitudes and behaviours of animal shelter attendants when interacting with dogs during their first eight days. Attitudes and behaviours of animal attendants towards shelter dogs were measured in addition to measurements of fear of humans and stress in these shelter dogs.

5.5. Identifying 'ideal' companion dogs for Australia

Investigators: P. Bennett and L. Marston

Student: T. King (PhD)

Funding: Pet Industry Advisory Service and Bureau of Animal Welfare

09/10 Funding $ n/a

Commencement date: 2009

Completion date: 2014

The aim of this study was to a) determine what behavioural characteristics people consider 'ideal' in a pet dog today, b) develop a standardised behaviour assessment to measure a desirable canine personality trait and c) evaluate the assessment's reliability and validity.

5.6. Identification of Risk Factors for Racetrack Injuries in Greyhounds in Victoria

Investigators: A. Campbell, A. Fisher and K. Stafford

Student: Beer (MSc)

Funding: University of Melbourne, Greyhound Racing Victoria

2010 – 2013 $ n/a

Commencement date: 2009

Completion date: 2013

This project analysed data collected at greyhound race tracks across Victoria to determine the prevalence of injuries sustained by greyhounds during racing, and to identify possible factors that may increase or decrease the likelihood of a greyhound sustaining a serious injury during a race.

5.7. Effect of Cage Enrichment and Predictability on Health Outcomes of Shelter Cats.

Investigators: C. Croney and L. Lord

Students: J. Stella (PhD)

Funding: Morris Animal Foundation
2010 - $ n/a
Commencement date: 2009
Completion date: 2010

The goal of this project was to improve the behavior and well-being of shelter cats using environmental enrichment as an intervention.

5.8. The welfare of recreational horses in Victoria: the occurrence of and factors associated with horse welfare

Investigators: G. Coleman and E. Jongman
Student: L. Hemsworth (PhD)
Funding: Bureau of Animal Welfare
2010 - $ n/a
Commencement date: 2007
Completion date: 2012

This study highlighted the opportunity to reduce welfare issues in domestic horses by understanding owner characteristics and informed a later project to develop educational material for recreational horse owners in Victoria.

5.9. Behavioural assessment of adult shelter dogs: Development and validation of the Behavioural Assessment for Re-homing K9's (B.A.R.K.) protocol

Investigators: P. Bennett, S. Toukhsati and G. Coleman
Student: K. Mornement (PhD)
Funding: Monash University (AWSC) and RSPCA Australia
2010 - $ n/a
Commencement date: 2007
Completion date: 2010

This research had several aims: To review shelter dog assessment protocols currently used in Australian shelters and to develop and validate a standardised shelter dog assessment protocol. We also investigated the attitudes of the Australian public towards shelter dogs, their behaviour and the assessment of their behaviour to ascertain what they considered to be important for inclusion in a shelter dog assessment protocol.

6. General/Other

6.1. Human and animal interactions course impact study

Investigators: K. George and S. Moeller

Funding: Animals for Life Foundation

2014 - $ 4,294

Commencement date: 2014

Completion date: 2014

Research is focused on post-participation assessment of specific learning outcomes when comparing groups of students that have participated in study abroad programs with contemporary groups of students who were not enrolled in study abroad programs offered by the Department of Animal Sciences.

6.2. Monitoring public attitudes to inform animal welfare policy development

Investigators: G. Coleman, V. Rohlf, S. Toukhsati, D. Blache

Funding: Australian Pork Limited, Australian Meat Processor Corporation, Australian Wool Innovation, Department of Agriculture (AAWS)

2013 - $ 46,832, 2014 - $ 46,832

Commencement date: 2013

Completion date: 2014

This National Primary Industry Animal Welfare RD&E Strategy project examined the relationship between attitudes and community behaviour and will assist in development of community education and awareness activities to demonstrate the importance of animal welfare. Improving community understanding of arrangements and measures with the appreciation that good animal welfare is essential for ecosystems, recreation, industry profitability and sustainability.

6.3. Professor in Human-Animal relations at the University of Melbourne

Investigator: G. Coleman

Funding: Bureau of Animal Welfare

2013 - $ 50,000, 2014 - $ 50,000

Commencement date: 2012

Completion date: 2015

6.4. Animal Welfare Science Centre

Investigators: J. Skuse, and P. Hemsworth

Funding: Department of Economic Development, Jobs, Transport and Resources, The Ohio State University, The University of Melbourne, Monash University

2010 – $ 215,000, 2011 - $ 205,000, 2012 - $ 204,000, 2013 - $ 163,000, 2014 - $ 158,000

Commencement date: 2012

Completion date: 2015

6.5. Research Fellow (pigs and poultry) at the University of Melbourne

Investigator: J-L. Rault

Funding: Australian Pork Limited, Australian Egg Corporation Limited, Rural Industries Research and Development Corporation (Chickenmeat), The University of Melbourne

2011 - $ 68,181, 2012 - $ 136,363, 2013 - $ 136,363, 2014 - $ 68,181

Commencement date: 2011

Completion date: 2015

6.6. Mapping ProHand® stockperson training packages against current livestock industry competencies and establishing recommendations for future accreditation

Investigators: J. Skuse, and M. Edge

Funding: Department of Agriculture (AAWS)

2010 - $ 2,600, 2011 - $ 10,400

Commencement date: 2010

Completion date: 2011

This project mapped, all of the available ProHand program(s) to all of the relevant livestock industry.

6.7. Novel peptide mediates the inhibitory effects of stress on female reproduction

Investigators: A. Tilbrook, I. Clarke and P. Hemsworth

Students: Papargiris (PhD) and Keating (PhD)

Funding: ARC Discovery

2010 - $ 120,000, 2011 - $ 120,000

Commencement date: 2009

Completion date: 2011

This project offers a novel approach to elucidating stress-induced inhibitors of reproduction. The impact of stress on the synthesis and secretion of GnIH was

determined the effects of GnIH in mediating the inhibitory effects of stress on reproduction in females were quantified.

6.8. Animal Welfare Education Project

Investigators: M. Lauber, G. Coleman, P. Hemsworth and J. Skuse

Funding: Department of Economic Development, Jobs, Transport and Resources and the Telematics Trust

2010 - $ n/a

Commencement date: 2009

Completion date: 2010

The project developed a pilot on-line introduction to key concepts in animal welfare and human-animal interactions and the impacts of these interactions on animal.

6.9. Delivery of "Animals in Society" as a breadth subject at the University of Melbourne.

Funding: The University of Melbourne

Commencement date: 2008

Completion date: ongoing

This course is offered as a breadth subject throughout the University and is designed to encourage students to begin to think about how and why animals are so integral to human society. The course investigates the human-animal relationships, where they originated, during domestication, and where they are now.

6.10. Delivery of "Animals in Society" as part of the "Human and animal interactions" cluster at The Ohio State University.

Funding: The Ohio State University

Commencement date: 2007

Completion date: ongoing

"Animals in Society" (AIS) is an introductory course designed to introduce students to the social, cultural, economic and legal frameworks within which current human-animal relationships exist. The course was developed by the Animal Welfare Science Centre in collaboration with the Department of Animal Sciences at OSU.

6.11. Assessing animal welfare: understanding biological functioning and preferences in animals.

Investigators:	P. Hemsworth, A. Tilbrook and B. Leury
Students:	B. Stevens (PhD) and C. Ralph (PhD)
Funding:	Department of Economic Development, Jobs, Transport, Australian Pork Limited and Poultry CRC
	2010 - $ 25,000
Commencement date:	2006
Completion date:	2010

This project supported two PhD programs – one, (Stevens), provided limited evidence that deprivation of a highly preferred resource may result in biological dysfunction. The other program, (Ralph), studied the relationship between plasma glucocorticoids and intracellular glucocorticoids to improve our understanding of the connection between changes in plasma glucocorticoids and the pathway to physiological changes in the animal. Such knowledge is important in studying and appreciating the impact of stress on the biological fitness of animals and consequently the welfare implications.

6.12. Farm animal welfare in Ohio: Assessing public concern and implications for the food animal industry

Investigators:	L. Lobao, G. Coleman, M. Eastridge, P. Hemsworth and N. Botheras
Students:	J. Pempek (MSc)
Funding:	Ohio Agricultural Research and Development Center
	2010 - $ n/a
Commencement date:	2006
Completion date:	2010

This project examined the public's knowledge of farm animals, as well as other key covariates and their relationship to attitudes and food consumption behaviour. Along with variables measuring knowledge about farm animal production, the relevance of key demographic variables, such as rural-urban residence, gender, income, and ethnicity were also measured.

APPENDIX II

AWSC SCIENTIFIC SEMINARS

TITLES AND SPEAKERS (as reported on WEBSITE)

2014

October '14

Isabelle Veissier, INRA, France
Animal welfare - Towards transdisciplinarity - PDF VIDEO
Research at INRA - PDF VIDEO

AWSC Dairy cow and calf welfare seminar

Dan Weary, University of British Columbia
Cow comfort and lameness PDF VIDEO
Farm size and animal welfare PDF VIDEO
Understanding public views PDF VIDEO

Andrew Fisher, AWSC, The University of Melbourne
Dairy cow welfare in new farm feeding systems PDF VIDEO

Ellen Jongman, AWSC, The University of Melbourne
Feeding and transport of bobby calves PDF VIDEO

March '14

AWSC / Lort Smith Animal Hospital Public Seminar
People and Pets - Their behaviour and emotions

Sally Haynes, (PhD student) AWSC, The University of Melbourne
It's a (shelter) dog's life: Just how important is human contact? PDF VIDEO

Dennis Wormald, (PhD student) AWSC, The University of Melbourne
Measuring anxiety in dogs PDF VIDEO

Miranda Coffey, (Masters student) AWSC, The University of Melbourne
Food for thought – why do people feed stray cats? PDF VIDEO

Robert Holmes, Animal Behaviour Clinics
The emotional lives of dogs - particularly those confined to backyards

Kevin Stafford, Massey University
The welfare of dogs; what's the problem? PDF VIDEO

2013

April ‘13

David Fraser, Professor, AW Program, University of British Columbia
The prince, the rose and the fox: an ethic for animals and nature PDF VIDEO

February ‘13

AWSC/RSPCA Public lecture

James Yeates, **Chief Veterinary Officer, RSPCA UK**
How happy does a happy animal have to be, and how can we tell? PDF VIDEO

AWSC Zoo animal welfare seminar

Sally Sherwen (**PhD Student) AWSC, The University of Melbourne**
The effect of visitors on zoo animals PDF VIDEO

Vicky Melfi, Taronga Conservation Society
Human-animal bonds in the zoo environment PDF VIDEO

Rosie Martin, Masters student, Plymouth University
Zoo animal behaviour in the presence of familiar and unfamiliar people.

Roger Rassool, School of Physics, The University of Melbourne
Practical applications to remotely observe animal behaviour PDF VIDEO

Grahame Coleman, AWSC, The University of Melbourne
Interactions between zoo animal behaviour and human attitudes PDF VIDEO

Andrew Tribe, CAWE, University of Queensland
Visitors’ view of the captive environment PDF VIDEO

Katie Pahlow, Director, Visitor & Community Development, Zoos Victoria
Zoos Victoria programs which target visitors’ attitudes to assist in wildlife conservation PDF VIDEO

2012

July ‘12

Dairy welfare and training seminar

Neil Chesterton, VET Services, Inglewood, NZ
Lameness in dairy cows PDF VIDEO

Jeremy Skuse, AWSC, The University of Melbourne
ProHand Dairy training PDF

Neil Aird, NCDEA
Training opportunities in the Australian dairy industry PDF VIDEO

June ‘12

Paul B. Thompson, W. K. Kellogg Chair in Agricultural, Food and Community Ethics, Michigan State University, USA.
Animal ethics and the evolution of standards for laying hens in the US PDF

March ‘12

AWSC/RSPCA Public lecture

Peter Sandøe, Professor of Bioethics, University of Copenhagen, Denmark
Animal welfare – where does science end and ethics begin? PDF VIDEO

Professor David J Mellor, Animal Welfare Science and Bioethics Centre, Massey University, NZ
Broadening our perspectives on negative and positive animal welfare impacts PDF VIDEO

2011

November ‘11

Public trust seminar

Siobhan O'Sullivan, Research Fellow in the School of Social & Political Sciences at the University of Melbourne
Economically productive animals and the community’s right to know PDF

Charlie Arnot, CEO, Center for Food Integrity
Lost in translation – Learning to speak 'consumer' in a way that builds trust in agriculture PDF VIDEO

July ‘11

Animal welfare - Drivers and assessment seminar

Jackie Healing, Head of Quality, Policy and Governance, Coles, Supermarkets
Customer insights - how customers make purchasing decisions and what that has meant for Coles in terms of animal welfare initiatives and how we communicate them PDF VIDEO

Grahame Coleman, AWSC, Monash University
Monitoring stockpeople attitudes and their relationship with animal welfare PDF VIDEO

Ellen Jongman, AWSC, Department of Primary Industries, Victoria
Welfare assessment of dairy cows and how it may be used to benchmark their welfare PDF VIDEO

Kirsty Richards, Chris Richards & Associates, Bendigo, Victoria
Welfare monitoring in the Australian pork industry PDF VIDEO

February '11

Don Broom, Professor of Animal Welfare, Department of Veterinary Medicine, University of Cambridge, UK
Animal welfare research indicators and welfare outcome indicators on farm and at slaughter PDF VIDEO

2010

November '10

Animal Welfare Symposium - The Ohio State University

Dr. Linda Lobao & Ms. Danielle Deemer, School of Environment and Natural Resources, The Ohio State University
Ohioans' perceptions of farm animal welfare – results of recent surveys VIDEO

Charlie Arnot, CEO, Center for Food Integrity
U.S. consumers' perceptions of animal agriculture – implications for Ohio VIDEO

Dr. Jan Shearer, College of Veterinary Medicine, Iowa State University
Making decisions about when to euthanize animals, and correct euthanasia techniques VIDEO

Dr. Tony Forshey, State Veterinarian and member of the Ohio Livestock Care Standards Board
Update on the Ohio Livestock Care Standards Board VIDEO

Dr. Temple Grandin, Department of Animal Sciences, Colorado State University
Humane animal handling, including handling of ill, injured, non-ambulatory or otherwise compromised animals VIDEO

October '10

Australian Poultry Welfare Research Seminar PDFS

Phil Glatz, SARDI
Update on beak trimming research and alternatives VIDEO

Joanna Engel, PhD student, AWSC, The University of Melbourne
Non-invasive measures of stress in poultry VIDEO

Greg Cronin, The University of Sydney,
Nest boxes for laying hens and their effects on hen behaviour and stress physiology VIDEO
Lauren Edwards, PhD student, AWSC, The University of Melbourne
Opportunities to improve the human – animal relationship in poultry VIDEO

Peter Groves, The University of Sydney
Lameness in meat chickens VIDEO

September ‘10

Alternative Farrowing Systems seminar - identifying the gaps in knowledge

PDFS

Greg Cronin, The University of Sydney, Hugh Payne, DAGFWA
An Australian perspective on non-crate farrowing systems
The Norwegian UMB farrowing pen system and gaps in knowledge

VIDEO

Emma Baxter, Scottish Agricultural College
The PigSAFE pen design - derivation, principles and practicalities

VIDEO

Sandra Edwards, Newcastle University
Commercial PigSAFE performance to date and how these fit in the UK/EU industry context

VIDEO

Melina Tensen, RSPCA Australia
RSPCA views on traditional and alternative farrowing systems

VIDEO

Rebecca Morrison, Rivalea Australia
Industry perspective on housing of farrowing sows and gaps in knowledge

VIDEO

BAW / AWSC Seminar
Alistair Lawrence, Scottish Agricultural College, UK.
Animal Welfare Education - why, what and how?

VIDEO1 VIDEO2 VIDEO3 VIDEO4 VIDEO5

July ‘10

AWSC Pig Welfare Seminar

PDFS

Paul Hemsworth, AWSC, The University of Melbourne
Australian research on group housing of gestating sows

VIDEO

Greg Cronin, The University of Sydney
Reducing pain associated with husbandry procedures in piglets

VIDEO

Graeme Pope, Rural Solutions SA
Benchmarking ProHand Implementation – What are the benefits for pigs & people?

VIDEO

Prof Knut Bøe, Norwegian University of Life Sciences
Loose-housing of lactating sows: Piglet requirements for space and thermal conditions, and experience with a birth-to-slaughter-system in Norway

VIDEO

Rebecca Morrison, Rivalea Australia
Commercially viable non-crated farrowing systems

VIDEO

A/Prof Inger Lise Andersen, Norwegian University of Life Sciences
Piglet survival in individual, loose-housed sows – the impact of sow behaviour, farrowing environment and management

Kathleen Plowman, Australian Pork Limited
PigCare: pig welfare and quality assurance VIDEO

Roger Campbell, Pork CRC
Pig Welfare Considerations in the Pork CRC Rebid –responding to customer and community desires VIDEO

June '10

AWSC Student Presentations PDFS

Anoma Dilrukshi, PhD candidate, AWSC, The University of Melbourne
Defining dairy cow behaviour and welfare in feeding systems based on total mixed ration fed in conjunction with grazed pasture

Jo Coombe, PhD candidate, AWSC, The University of Melbourne
The effects of flexible feeding systems on the health and welfare of dairy cows

Catherine Webb, Masters student, AWSC, The University of Melbourne
Establishing a validated methodology for assessing the aversiveness of dog training devices

Tiffani Howell, PhD candidate, AWSC, Monash University
The utility of minimally-invasive electroencephalography (EEG) in dog cognition research

Sally Haynes, PhD candidate, AWSC, The University of Melbourne
Relationships between human attitudes, human behaviour and the behaviour and welfare of dogs in animal shelters and veterinary clinics

Lauren Hemsworth, PhD candidate, AWSC, Monash University
The Welfare of Recreational Horses in Victoria

Lauren Edwards, Post-doctoral research fellow, AWSC, The University of Melbourne
The human-animal relationship in the caged egg industry

Joanna Engel, PhD candidate, AWSC, The University of Melbourne
The Importance of Space and Nest Boxes for Laying Hens in Cages

Cameron Ralph, PhD candidate, AWSC, The University of Melbourne
Are the dynamics of change in intracellular Glucocorticoids related to the dynamics of change in plasma Glucocorticoids?

Sonja Laine, PhD candidate, AWSC, The University of Melbourne
Animal preference tests: importance of design factors

Marcus Karlen, PhD candidate, AWSC, The University of Melbourne
Is aggression a contributing factor to sow lameness?

Bronwyn Stevens, PhD candidate, AWSC, The University of Melbourne
Effects of deprivation of a preferred resource, feed or social contact, on the biological functioning of pigs

April ‘10

Prof David Mellor, Animal Welfare Science and Bioethics Centre, Massey University, NZ
Pain and Slaughter PDF

February ‘10

Public seminar - Building better dogs: using what we've learned about genetic and experiential effects on dog behaviour to improve dog welfare PDF VIDEOS

Paul McGreevy, The University of Sydney
Breeding for quality of life

Mike Goddard, The University of Melbourne
Genetics of dog behaviour and breeding programs to improve canine welfare

Pauleen Bennett, AWSC, Monash University
Why behaviour is as important as conformation when selecting breeding dogs

Kate Schoeffel, Australian Association of Pet Dog Breeders
A model for an association of professional pet dog breeders

Mia Cobb, PhD student, AWSC, Monash University
The experience of young dogs transitioning from the home environment into a kennel facility

Tammie King, PhD student, AWSC, Monash University
Identifying ‘ideal’ companion dogs for Australia

Kate Mornement, PhD student, AWSC, Monash University
Community attitudes towards shelter dogs

Vanessa Rohlf, PhD student, AWSC, Monash University
What makes people responsible owners?

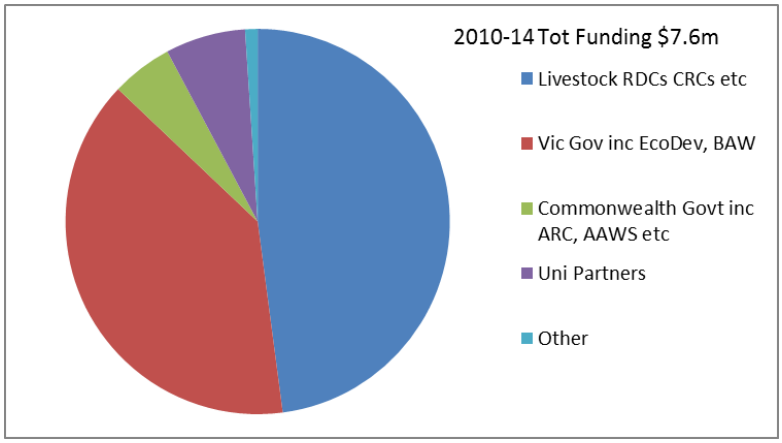
Lisa Tomkins, PhD student, Faculty of Veterinary Science, The University of Sydney
The sensory jump test: a measure of sensory laterality in dogs

APPENDIX III

A. AWSC Funding Breakdown 2010-14

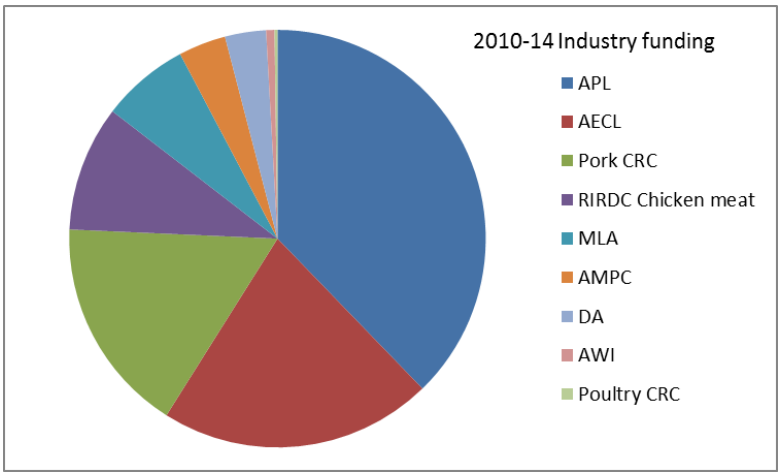
1. Total RD&E Funding 2010-14

Primary Industry Funders - Livestock RDCs CRCs etc	$3,628,487
Victorian Government - Department of Economic Development, Jobs, Transport	$2,964,559
Commonwealth Government - ARC, Department of Agriculture, AAWS	$389,592
University Partners – Melbourne, Monash, Ohio	$510,753
Other	$79,425
TOTAL	**$7,572,816**



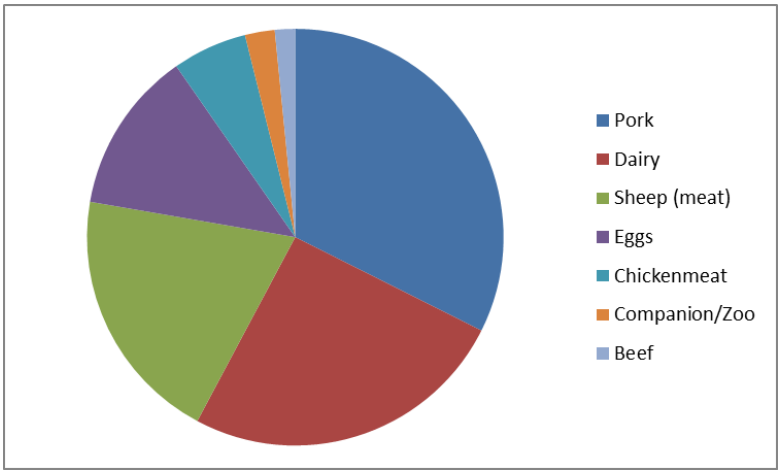
2. Industry RD&E funding 2010-14

APL	$1,367,405
AECL	$768,093
Pork CRC	$606,823
RIRDC Chicken meat	$353,036
MLA	$246,717
AMPC	$133,416
DA	$115,373
AWI	$23,416
Poultry CRC	$8,333
TOTAL	**$3,622,612**

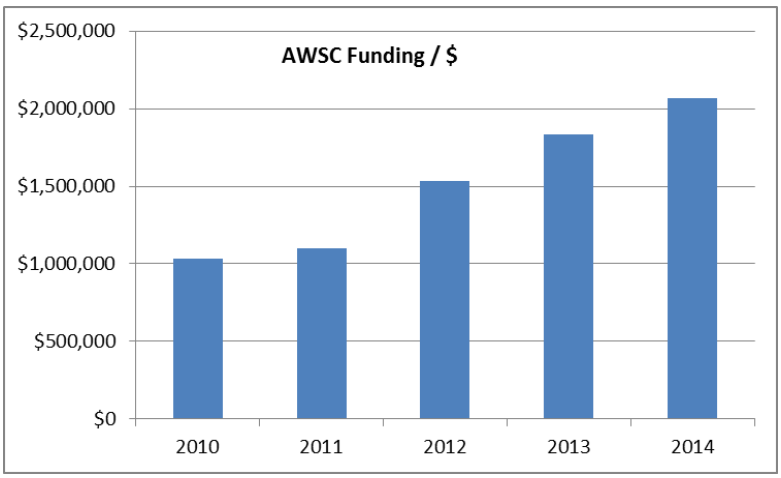


3. Sector RD&E Funding 2010-14

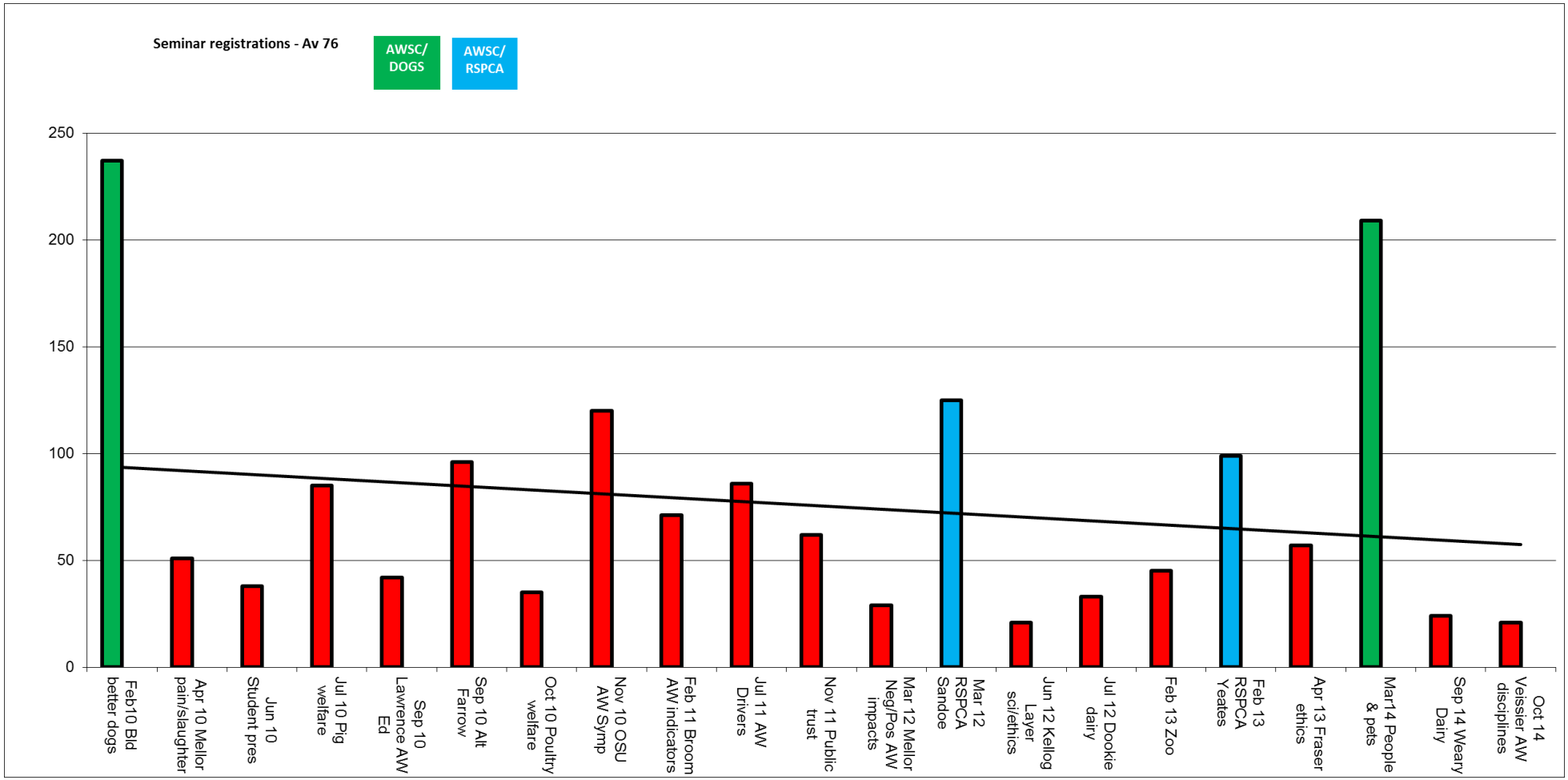
Pork	$1,974,228
Dairy	$1,547,549
Sheep (meat)	$1,214,281
Eggs	$768,093
Chickenmeat	$353,036
Companion/Zoo	$140,844
Beef	$95,952



4. AWSC RD&E Funding by year 2010-14



B. AWSC Seminar Attendance



Appendix 5b

Supplementary information for 2015 Review of AWSC

AWSC History

The Animal Welfare Centre (AWC) was established in March 1997 as a collaborative venture between the, then newly formed, Department of Natural Resources and Environment (NRE), the University of Melbourne and Monash University. The Centre's role was to concentrate the research and academic resources of the three partner organisations, and to improve the welfare of farm, companion, laboratory and captive animals. In so doing, the AWC aimed to improve the sustainability of animal production agriculture through ethical husbandry practices. An additional aim was to enhance the quality of life for both animals and people through better understanding of the relationships between animals and society.

At its inception, the Centre had a secondary goal, for the first five years, which was to establish a solid research capability on which to build national leadership in the field of animal welfare Research, Development and Extension (RD&E).

Following the 2002 review of the Centre's activities, the Centre changed its name to the Animal Welfare Science Centre (AWSC) to reflect the Centre's key activity of using science to improve animal welfare.

In 2006 the position of Executive Officer was filled to facilitate within-partner communication and to raise the profile of the Centre both domestically and internationally.

In 2009 a long-standing collaborative arrangement with the Department of Animal Science at The Ohio State University (OSU) was formalized by the admission of the Department of Animal Science and the College of Veterinary Medicine at OSU as full partners in the Centre.

In 2012, Monash University withdrew from the Centre following the moves of Tilbrook to SARDI, Bennett to La Trobe and Coleman to UoM.

Under a new AWSC Agreement, The University of Adelaide and SARDI will join the Centre in 2015.

Operation / Funding

Under the previous AWSC agreement, partners contributed both cash and in-kind towards the operation of the AWSC. Cash contributions provided for the employment of an Executive Officer at 1.0FTE and the services of the Director at 0.2FTE. Cash contributions also provided for an operating budget which was used for promotional activities (website, seminars, banners etc)

The new agreement which will admit SARDI and the University of Adelaide as partners in the AWSC has structured the AWSC into Victorian and South Australian 'nodes'. Each 'node' will contribute to the AWSC as a whole through in-kind contributions which remain within each 'node'. The position of Executive Officer will be split as an in-kind contribution of 0.5FTE in each 'node and the positions of Director and Deputy Director will similarly be split into a 0.1FTE in-kind contribution from each 'node'.

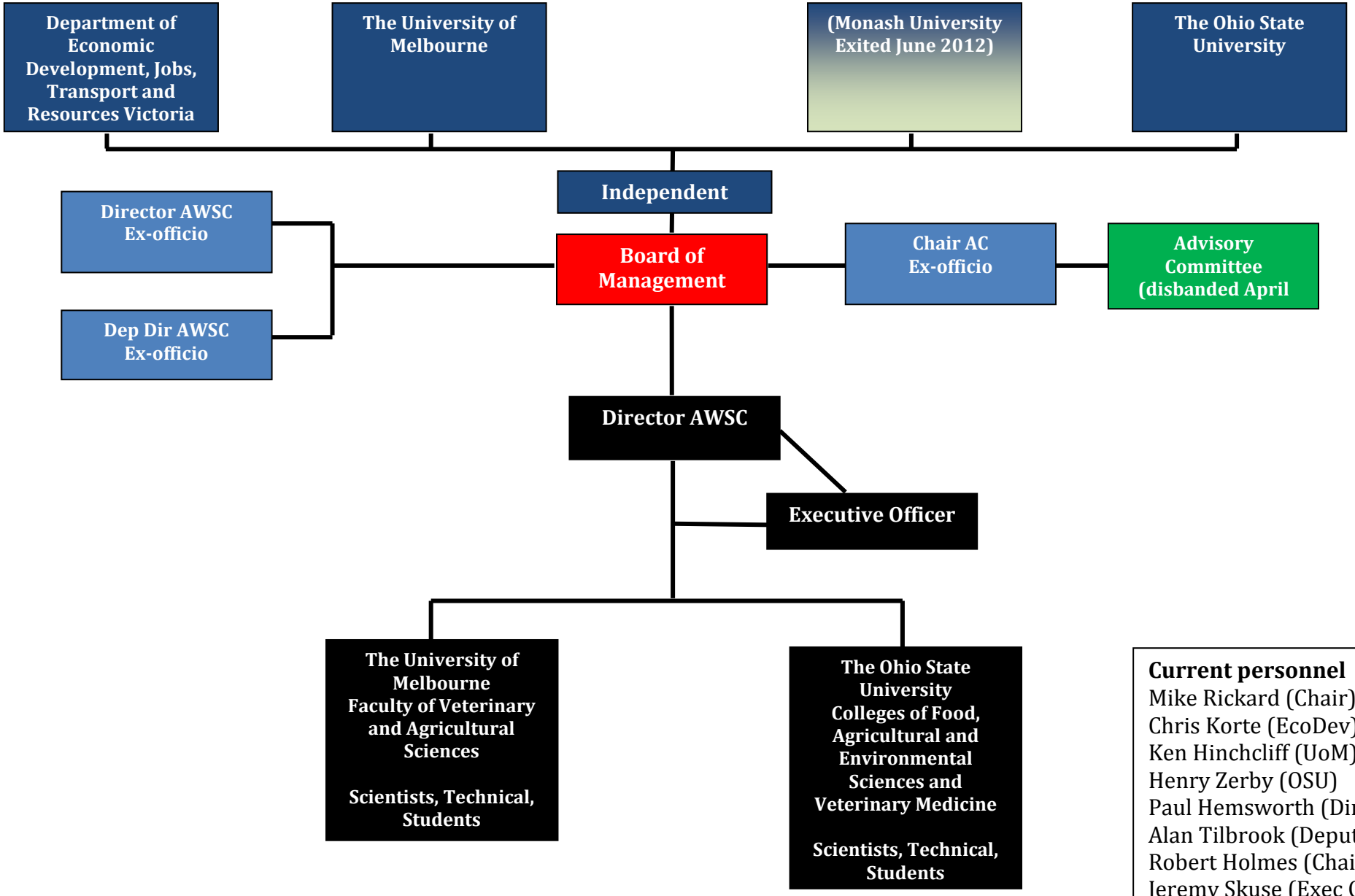
Social media

The AWSC Facebook page has attracted 1125 ‘likes’, (an increase of 12% over the period 2013-2014) with over 60% of likes originating from overseas, (15% Asia, 14% N. America, 13% S. America, 13% Europe).

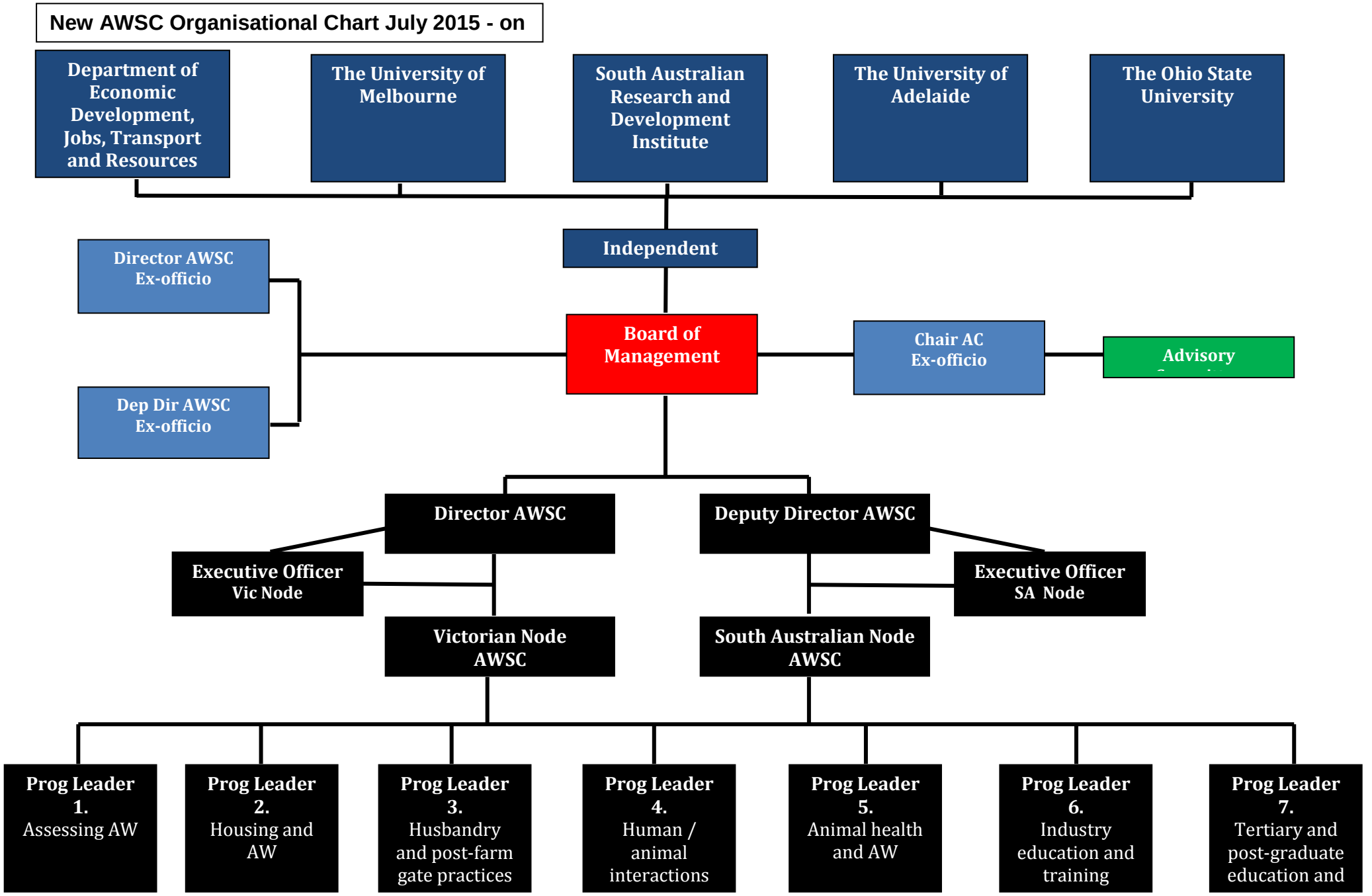
The AWSC website attracts around 8,000 sessions (45% from overseas) per annum, with 30% of sessions initiated by returning visitors.

The AWSC Vimeo site used to host video presentations of AWSC seminars has attracted 31,681 ‘loads’ in the period 2010-2014 with 87% of loads originating from overseas, (5% Asia, 63% N. America, 1% S. America, 13% Europe)

Previous / Current Organisational Chart



Current personnel
Mike Rickard (Chair)
Chris Korte (EcoDev)
Ken Hinchcliff (UoM)
Henry Zerby (OSU)
Paul Hemsworth (Director)
Alan Tilbrook (Deputy Director
Robert Holmes (Chair AC)
Jeremy Skuse (Exec Officer)


New AWSC Organisational Chart July 2015 - on
Department of Economic Development, Jobs, Transport and Resources
The University of Melbourne
South Australian Research and Development Institute
The University of Adelaide
The Ohio State University
Independent
Director AWSC Ex-officio
Dep Dir AWSC Ex-officio
Board of Management
Chair AC Ex-officio
Advisory
Director AWSC
Deputy Director AWSC
Executive Officer Vic Node
Executive Officer SA Node
Victorian Node AWSC
South Australian Node AWSC
Prog Leader 1. Assessing AW
Prog Leader 2. Housing and AW
Prog Leader 3. Husbandry and post-farm gate practices
Prog Leader 4. Human / animal interactions
Prog Leader 5. Animal health and AW
Prog Leader 6. Industry education and training
Prog Leader 7. Tertiary and post-graduate education and

Facilities

1. **The University of Melbourne Faculty of Veterinary and Agricultural Sciences at Werribee**

   Facilities include dog colony, animal holding paddocks and yards, elevated sheep housing, poultry housing, surgery facilities, basic storage facilities, and teaching laboratories and classrooms.

2. **The University of Melbourne Faculty of Veterinary and Agricultural Sciences at Parkville**

   Animal house with the capacity to hold sheep and pigs (individually and in groups), chickens and small rodents, limited storage facilities.

3. **The University of Melbourne Faculty of Veterinary and Agricultural Sciences at Dookie**

   Facilities include research dairy farm (robotic milking, target herd size 180 cows), pig grower accommodation, broad acre grazing research farm, beef feedlot and sheep yards and shearing shed, single and group sheep research facilities, and teaching laboratories and classrooms.

4. **AWSC Specialist Equipment Capability at the University of Melbourne, Parkville**

   a. **Video recording equipment**

      The AWSC regularly utilises a range of infrared CCTV cameras and digital video recording units that allow for recording on farm, both under cover and exposed to the elements, and in research environments.

   b. **Behaviour analysis software**

      Specialist software developed by the Noldus technology company in the Netherlands is designed for use in animal behaviour and welfare research. The AWSC has a mid-range capability in available software and hardware, including two licenses for the Observer base program, 2 Mobile Observers and the Video-Pro system, in which the video record is time-locked to a computer for more efficient and accurate read-out of video data. These technologies are highly valuable for animal welfare research as they are designed to assist the quantification of behaviour either by direct observation or via video (either normal speed or time-lapse recording).

   c. **Heart rate monitors**

      Approximately 10 heart rate monitors are available for use in AWSC research. They have the capacity to fit animals as small as sheep and upwards.

   d. **Proximity loggers**

      These loggers are used to study social behaviour in pigs and sheep.

   e. **ICE tags**

      These tags are used to study activity levels and lying behaviour in sheep and cattle

5. **DEDJTR Facilities at Hamilton**

   AWSC has access to specialist new multi-purpose animal housing, handling and feeding research facilities for sheep on the site at Hamilton. The facility includes new covered sheep yards and handling facilities.

6. **DEDJTR Facilities at Ellinbank**

   AWSC has access to a 217 hectare dairy research farm. There is also modern infrastructure including greenhouse chambers, a dairy, and a feeding complex.

7. AWSC Research lab at the University of Melbourne, Parkville

This lab is maintained to conduct specialist assays for oxytocin research and to train students in conducting cortisol and corticosterone assays.

8. **School of Physics at the University of Melbourne, Parkville**

The AWSC has close collaborative links with scientists in the fields of telemetry, remote sensing, video image analysis.

9. On-farm research on commercial facilities

The AWSC has built strong relationships which allow research on commercial farming operations

- **a.** Pork industry research is carried out in collaboration with Rivalea Australia and Berrybank Farms
- **b.** Research in the egg industry is carried out on commercial layer farms in Victoria, including Kinross Farms.

10. The Ohio State University, Columbus

The Department of Animal Sciences has recently expanded the laboratory capabilities to include additional video image analysis software (Noldus, Observer XT) to assist with continuous and scan sampling procedures.

A Pressure Algometer is available to be used in field and laboratory settings to assess lameness, primarily in swine.

Euthanex® Ag Pro, Zephyr-E, Cash Special (penetrating and non-penetrating) euthanasia training tools are used extensively in multi-species education and hands-on demonstration activities.

Herds of Beef, Dairy, and Swine and flocks of poultry and sheep are maintained in research settings that allow both intensive and extensive research on welfare and behaviour.

11. The Ohio State University, Wooster

Herds of Beef (4 locations) and Dairy (2 locations) and flocks of poultry (turkey, broiler and layer) and sheep are available for use in welfare and behaviour research.

Video capture equipment is available for collection of images and software available for interpretation and recording outcomes.

Research Capability

Discipline	Scientist Capability
Applied Ethology	P. Hemsworth, Jongman, Doyle, L. Hemsworth, Rault, Verdon, Pairis-Garcia, Proudfoot
Biometrics	Coleman, Butler
Immunology	
Neurophysiology	
Neuroendocrinology	
Psychology (Animal behaviour)	Coleman, Rohlf
Psychology (Human attitudes and education / training)	Coleman, Rohlf, Skuse, Moeller, Pairis-Garcia
Sociology	
Stress physiology	Rault,
Veterinary Science	Fisher, Cakebread, Campbell, Coombe, Pairis-Garcia
Ethics	

Animal Welfare Research Capabilities of SARDI / Uni Adelaide

Facilities

1. Roseworthy Poultry unit has the capacity to undertake research (layers and broilers) in free-range and barn conditions, in both physiology and behaviour. These facilities are complemented with laboratory facilities that allow for endocrine, histological and molecular measures.
2. Roseworthy Research Piggery and on-farm research linked with Sunpork West commercial operations. Facilities allows for intensive physiological and behavioural research and large-scale on-farm research, coupled with an array of laboratory measurements.
3. Large scale sheep research is conducted at the Turretfield, Struan and Minippa sites. The Turretfield Research Centre has state-of-the-art sheep handling facilities (incorporating electronic identification systems), well-equipped laboratories, versatile pen configurations and behavioural facilities.
4. The Struan Research Centre has facilities that allow extensive experiments with beef cattle and intensive sampling experiments.
5. The School of Animal and Veterinary Sciences at Roseworthy has recently established the Companion Animal Health Centre which has excellent facilities for the conduct of research and teaching in companion animals, particularly cats and dogs.

Research Capability

Discipline	**Scientist Capability**
Applied Ethology	Van Wettere, Plush, Drake, Burnard, Hocking Edwards
Biometrics	
Immunology	Hein
Neurophysiology	Ralph, Tilbrook
Neuroendocrinology	Tilbrook
Psychology (Animal behaviour)	
Psychology (Human attitudes and education / training)	Hazel, Burnard
Sociology	Umberger, Ankeny, Bray
Stress physiology	Ralph, Tilbrook
Veterinary Science	Chousalkar, Hazel, Kirkwood
Ethics	

AWSC Teaching activities

UoM Undergraduate

- Animals in Society 1: Introduction
- Animals and Society 2: Humans & Animals
- Animal Welfare and Ethics
- Applied Animal Behaviour
- Companion Animal Biology

Uom Post-graduate

- Animal Welfare
- Behaviour of Farm & Companion Animals

Past post-graduate students – what did they do/where are they now?

Adele Arnold (PhD, Melbourne)	AgResearch NZ; Animal Welfare Officer, Dairy NZ
Rachael Gallaugher (Bindloss) (Masters, Melbourne)	Practice Manager at Greencross Vets
Rachel Bloomfield (Masters, Melbourne)	Operations Manager/ dog trainer - pet care & dog training company
Naomi Botheras (PhD, Melbourne)	Animal Welfare extension specialist, OSU
Kate Breuer (PhD, Monash)	Animal Welfare Policy Officer, RSPCA Vic
Puja Busch (Masters Ohio)	Veterinary student at UC Davis, USA
Mia Cobb (PhD, Monash)	PhD student, Monash Uni – Enrichment effects on kennelled working dogs; Tutor, La Trobe Uni
Sara Crawford (PhD, Ohio)	Beef and Pork Raw Material Vendor Specialist at OSI Industries, USA
Jo Coombe (PhD, Melbourne)	Post Doc research fellow, UoM
Peter Cransberg (Masters, Melbourne)	Poultry consultant
Anoma Dilrukshi (PhD, Melbourne)	Post Grad Teaching student, UoM
Fleur Dwyer (D.Psych, Monash)	Medical student at Uni Qld
Lauren Edwards (PhD, Melbourne)	Lecturer at Unitec NZ
Trista Harvey (Masters, Melbourne)	Exhibit Attendant, Woodland Park Zoo, WA, USA
Lauren Hemsworth (PhD, Monash)	Post Doc research fellow, UoM
Tiffani Howell (PhD, Monash)	Casual research assistant, La Trobe Uni: Tutor, Monash Univ
Renee Huggard (Masters, Melbourne)	Veterinary student, Charles Sturt Uni
Marcus Karlen (Masters, Melbourne)	Equine trainer, Vic
Keven Kerswell (PhD, Melbourne)	Casual research assistant, UoM

Tammie King (PhD Monash)	Senior Behavioural Research Scientist, Waltham Centre for Pet Nutrition, UK
Amanda Ellery (Kobelt) (PhD, Melbourne)	Key Project Development Manager, EcoDev, Vic
Sonja Laine (PhD, Melbourne)	Seeing Eye Dogs Australia
Mariko Lauber (PhD, Melbourne)	Senior Project Officer, EcoDev, Vic
Jacqui Ley (PhD, Monash)	Veterinarian, Animal Behaviour Consultations
Linda Marston (PhD, Monash)	Assessor and trainer, GOTAFE ; Lecturer, La Trobe Uni
Andrew McLean (PhD, Melbourne)	Consultant, Australian Equine Behaviour Center
Kate Mornement (PhD, Monash)	PhD student, Monash Uni – Canine behaviour; Director, Pets Behaving Badly
Naomi Friede (Pearson) (Masters, Melbourne)	Policy and Legislation Officer, EcoDev, Vic
Jessica Pempek (Masters, Ohio)	PhD student, OSU – Dairy calf welfare
Bree Pierce (PhD, Monash)	Clinical trials manager with a pharmaceutical company
Candice Powell (Masters, Melbourne)	Seeing Eye Dogs Australia
Cameron Ralph, PhD, Melbourne	Research Scientist, SARDI
Vanessa Rohlf (PhD, Monash)	Casual research assistant, UoM
Sabine Roussel (PhD, Melbourne)	Lecturer, INA P-G, Paris, France
Rebecca Morrison (Sargent) (PhD, Melbourne)	Animal Welfare research scientist, Rivalea Australia
Sally Sherwen (PhD, Melbourne)	Animal Welfare Specialist, Zoos Vic
Ken Smith (Masters, Ohio)	Auditor of farm facilities in US for US certification organisation
Anne Turner (PhD, Monash)	Senior lecturer, Deakin Uni
Neva Gladman (Van de Kuyt) (Masters, Melbourne)	Project Officer, EcoDev, Vic
Megan Verdon (PhD Melbourne)	Casual research assistant, UoM
Catherine Webb (Masters, Melbourne)	Director, Southern Cross Dog Training

Scientific performance of AWSC

Sci Output from AWSC Website

	2010	2011	2012	2013	2014	Tot
Books		1				**1**
Book chapters	2	1		2		**5**
Refereed jnl	18	22	12	20	12	**84**
Refereeed conf	15	26	10	11	19	**81**

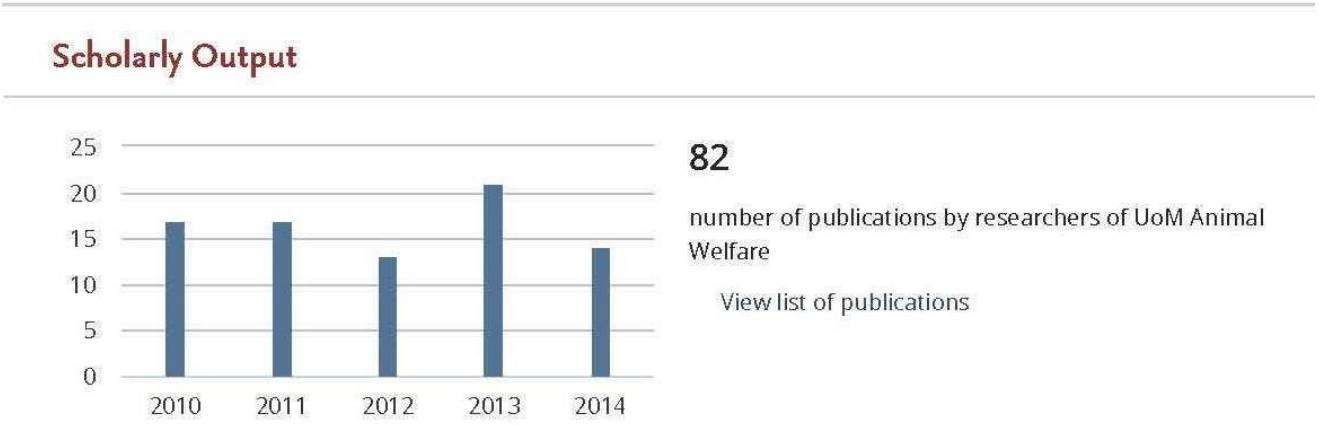
- The above table includes all publications from all AWSC scientists over the period 2010 - 2014.

The data on the following pages were sourced on 30th April 2015 from Scopus data up to 30 Mar 2015 and include output only from core AWSC Scientists. R. Doyle was not included as her AWSC publications are from 2015.

The following data include all publications (articles and reviews) from 2010-2014 inclusive only for the following core AWSC Scientists:

- G.J. Coleman
- A.D. Fisher
- P.H. Hemsworth
- E.C. Jongman
- J-L. Rault
- A.J. Tilbrook

Publications



Journals in which AWSC published 2010-2014

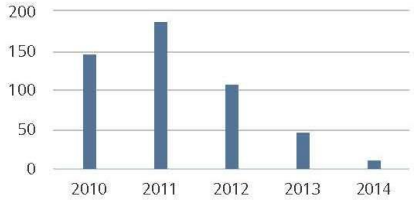
Journal	Publications	Citations	Authors	Citations/Pub	SJR	5yr IF
Applied Animal Behaviour Science	15	120	5	8	0.826	2.06
Animal Production Science	8	7	4	0.9	0.627	1.23
Anthrozoos	6	23	2	3.8	0.474	1.42
Australian Veterinary Journal	4	9	4	2.3	0.622	1.06
Journal of Animal Science	4	35	4	8.8	1.164	2.64
Animal Welfare	4	5	4	1.3	0.621	1.67
Animals	4	4	3	1	0.362	-
Behavioural Processes	3	31	2	10.3	0.793	1.63
Journal of Applied Animal Welfare Science	3	21	2	7	0.28	1.1
OIE Revue Scientifique et Technique	2	1	3	0.5	0.421	1.13
Veterinary Journal	2	6	2	3	1.005	2.66
Stress	2	33	1	16.5	1.315	3.45
Physiology and Behavior	2	48	2	24	1.483	3.34
Biology of Reproduction	1	3	1	3	1.754	4.14
Australian and New Zealand Journal of	1	3	1	3	1.739	3.1
BMC Psychiatry	1	5	1	5	1.134	2.9
Journal of Neuroendocrinology	1	5	1	5	1.417	3.48
Journal of Proteome Research	1	8	1	8	2.006	5.22
Neuropsychologia	1	24	1	24	2.424	4.37
Journal of Veterinary Medical Education	1	1	1	1	0.271	0.56
Psychoneuroendocrinology	1	15	1	15	2.603	5.93
Reproduction in Domestic Animals	1	0	1	0	0.656	1.82
Ethology	1	0	1	0	0.903	1.04
International Journal of	1	9	1	9	2.15	5.09
Hypertension	1	31	1	31	3.702	6.98
Diabetes	1	19	1	19	4.749	8.61
Diabetes, Obesity and Metabolism	1	14	1	14	2.387	4.42
Endocrinology	1	5	1	5	2.478	4.83
Hormones and Behavior	1	1	2	1	2.064	4.01
Journal of Clinical Endocrinology and	1	9	1	9	3.169	6.3
Journal of Dairy Science	1	1	2	1	1.373	3.01
Journal of Dairy Research	1	0	2	0	0.615	1.51
Small Ruminant Research	1	0	1	0	0.654	1.55
Encyclopedia of Stress	1	3	1	3	-	-
Encyclopedia of Neuroscience	1	0	1	0	-	-
Human-Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensively	1	0	1	0	-	-

n.b.

***SJR**. "**S**CImago **J**ournal **R**ank" is an alternative (c.f. **IF – Impact Factor**, Web of Science), prestige metric, whose methodology is similar to that of Google PageRank. It weights the value of a citation depending on the field, quality and reputation of the journal that the citation comes from, so that "all citations are not equal". SJR also takes differences in the behavior of academics in different disciplines into account, and can be used to compare journals in different fields. The average SJR value for all journals in Scopus is 1.000*

Citations (more recent publications will always have a lower citation count)

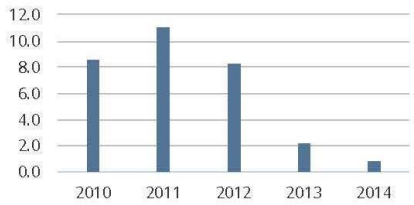
Citation Count



499

number of citations received by publications of UoM Animal Welfare

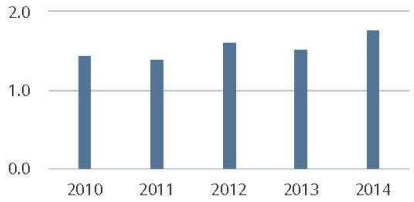
Citations per Publication



6.1

average number of citations per publication of UoM Animal Welfare

Field-Weighted Citation Impact



1.54

Field-Weighted Citation Impact of UoM Animal Welfare

n.b.

Field-Weighted Citation Impact in SciVal indicates how the number of citations received by an entity's publications compares with the average number of citations received by all other similar publications in the data universe: how do the citations received by this entity's publications compare with the world average?

- *A Field-Weighted Citation Impact of 1.00 indicates that the entity's publications have been cited exactlyas would be expected based on the global average for similar publications; the Field-Weighted Citation Impact of "World", or the entire Scopus database, is 1.00*
- *A Field-Weighted Citation Impact of more than 1.00 indicates that the entity's publications have been cited more than would be expected based on the global average for similar publications; for example, 2.11 means 111% more cited than world average*
- *A Field-Weighted Citation Impact of less than 1.00 indicates that the entity's publications have been cited less than would be expected based on the global average for similar publications; for example, 0.87 means 13% less cited than world average*

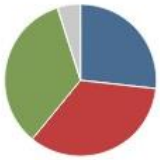
Researchers

Name	Publications	Citations	Citations per Publication	Field-Weighted Citation Impact	h-index		
Hemsworth, Paul Hamilton	22	45	2	0.91	26		
Fisher, Andrew D.	19	167	8.8	1.7	18		
Tilbrook, Alan J.	19	171	9	1.51	28		
Coleman, Grahame John	18	68	3.8	1.4	20		
Rault, Jean Loup	12	72	6	2.51	5		
Jongman, Ellen Caroline	5	6	1.2	1.18	3		

Collaboration

Collaboration

Publications of UoM Animal Welfare, by amount of international, national and institutional collaboration



Metric		Publications	Citations
International collaboration	26.8%	22	165
Only national collaboration	34.2%	28	165
Only institutional collaboration	34.2%	28	132
Single authorship (no collaboration)	4.9%	4	37

Benchmarking

Scientific performance of the AWSC (core scientists as above) for the period 2010-2014 has been benchmarked against the performance of core scientists at comparable institutions world-wide.

The data on the following pages were sourced on 30th April 2015 from Scopus data up to 30 Mar 2015 and include output from core scientists at each institution.

The following data include all publications (articles and reviews) from 2010-2014 inclusive.

1. CSIRO – Animal Health & Welfare
http://www.csiro.au/en/Research/AF/Areas/Animal-Science/Animal-Health-Welfare

Core scientists

1. I. G. Colditz
2. C. Lee
3. D. M. Ferguson
4. A. Small

2. Massey University – Animal Welfare & Bioethics Centre
http://www.massey.ac.nz/massey/learning/departments/centres-research/animal-welfare-science-and-bioethics-centre/animal-welfare-science-and-bioethics-centre_home.cfm

Core scientists

1. N.J. Beausoleil
2. C.B. Johnson
3. D.J Mellor
4. K.J. Stafford

3. Scotland's Rural College – Animal Behaviour & Welfare
http://www.sruc.ac.uk/info/120243/animal_behaviour_and_welfare

Core scientists

1. E.M. Baxter
2. C.M. Dwyer
3. A.B. Lawrence
4. K.M.D. Rutherford
5. S.P. Turner
6. F. Wemelsfelder

4. University of British Columbia – Animal Welfare Program
http://awp.landfood.ubc.ca/

Core scientists

1. D. Fraser
2. M.A.G. von Keyserlingk
3. D.M. Weary

Scholarly output (articles and reviews)

	2010	2011	2012	2013	2014	Overall	Av/group
UBC	17	18	18	24	24	101	20.2
CSIRO	9	10	7	5	15	46	9.2
Massey	17	10	9	11	14	61	12.2
SRUC	11	22	21	16	15	85	17
AWSC	14	17	13	20	13	77	15.4

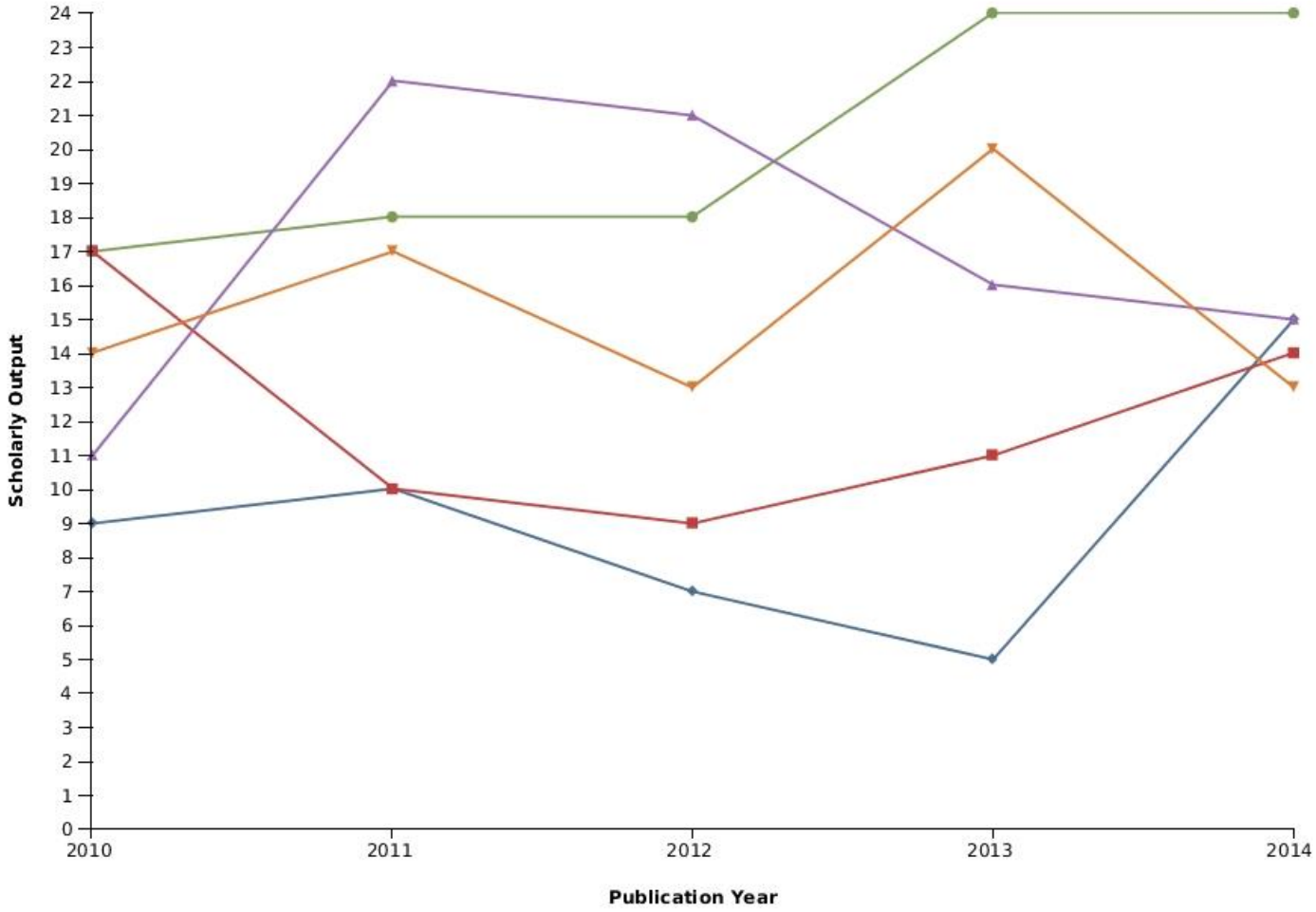


Chart Legend

- British Columbia Animal Welfare [Group of Researchers]
- CSIRO Animal Welfare [Group of Researchers]
- Massey Animal Welfare [Group of Researchers]
- SRUC Animal Welfare [Group of Researchers]
- UoM Animal Welfare [Group of Researchers]

Scholarly output by journal (top 7/group)

AWSC

Journal	Publications	Citations	Authors	Citations/Pub	SJR	5yr IF
Applied Animal Behaviour Science	15	120	5	8	0.826	2.06
Animal Production Science	8	7	4	0.9	0.627	1.23
Anthrozoos	6	23	2	3.8	0.474	1.42
Australian Veterinary Journal	4	9	4	2.3	0.622	1.06
Journal of Animal Science	4	35	4	8.8	1.164	2.64
Animal Welfare	4	5	4	1.3	0.621	1.67
Animals	4	4	3	1	0.362	-

UBC

Journal	Publications	Citations	Authors	Citations/Pub	SJR	5yr IF
Journal of Dairy Science	51	497	2	9.7	1.373	3.01
Applied Animal Behaviour Science	7	22	2	3.1	0.826	2.06
Animal Welfare	5	37	1	7.4	0.621	1.67
Livestock Science	5	32	3	6.4	0.715	1.49
PLoS One	5	14	2	2.8	1.724	4.24
Journal of Agricultural and Environmental Ethics	4	5	3	1.3	0.468	1.34
Journal of Animal Science	4	12	2	3	1.164	2.64

CSIRO

Journal	Publications	Citations	Authors	Citations/Pub	SJR	5yr IF
Applied Animal Behaviour Science	11	81	4	7.4	0.826	2.06
Animal Production Science	7	20	2	2.9	0.627	1.23
Australian Veterinary Journal	5	17	3	3.4	0.622	1.06
Psychoneuroendocrinology	2	18	1	9	2.603	5.93
Research in Veterinary Science	2	3	1	1.5	0.645	1.72
Meat Science	2	41	1	20.5	1.522	3.04
Physiology and Behavior	2	41	2	20.5	1.483	3.34

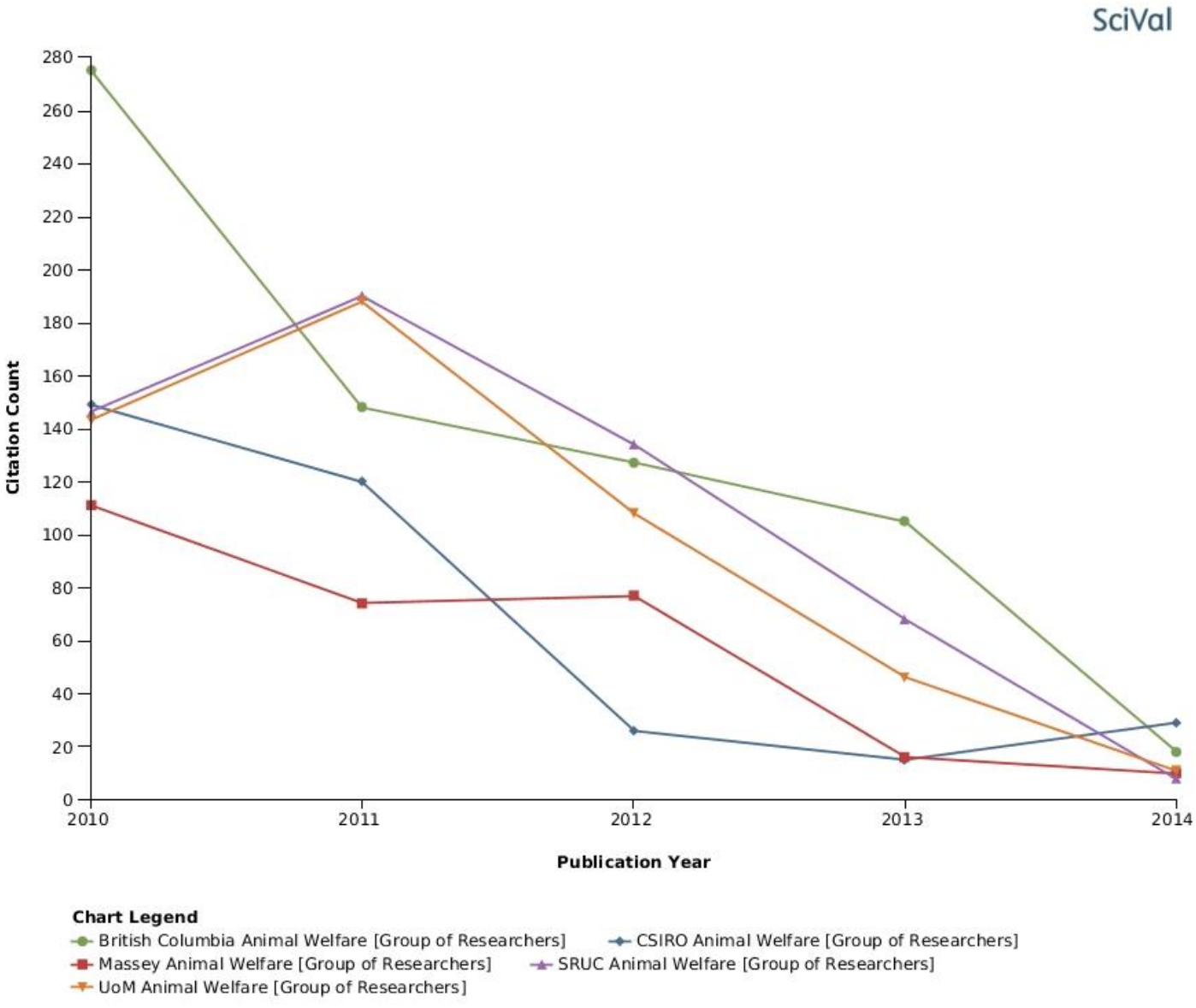
Massey

Journal	Publications	Citations	Authors	Citations/Pub	SJR	5yr IF
Applied Animal Behaviour Science	12	36	4	3	0.826	2.06
New Zealand Veterinary Journal	9	70	4	7.8	0.612	1.35
Veterinary Anaesthesia and Analgesia	7	10	3	1.4	1.078	1.63
Animal Production Science	5	26	1	5.2	0.627	1.23
OIE Revue Scientifique et Technique	4	2	2	0.5	0.421	1.13
Veterinary Journal	4	18	2	4.5	1.005	2.66
Veterinary Record	2	7	1	3.5	0.466	1.64

SRUC

Journal	Publications	Citations	Authors	Citations/Pub	SJR	5yr IF
Applied Animal Behaviour Science	24	159	6	6.6	0.826	2.06
Animal Welfare	12	108	6	9	0.621	1.67
Journal of Animal Science	11	64	6	5.8	1.164	2.64
Animal (*new Jnl, since 2013)	7	74	5	10.6	1.065	1.78*
Veterinary Journal	4	2	2	0.5	1.005	2.66
Physiology and Behavior	4	22	3	5.5	1.483	3.34
Journal of Dairy Science	4	11	3	2.8	1.373	3.01

Citation count (more recent publications will always have a lower citation count)



Citations per publication (more recent publications will always have a lower citation count)

	Av. Citations per Publication					
	2010	**2011**	**2012**	**2013**	**2014**	**Overall**
British Columbia Animal Welfare	16.2	8.2	7.1	4.4	0.8	6.7
CSIRO Animal Welfare	16.6	12	3.7	3	1.9	7.4
Massey Animal Welfare	6.5	7.4	8.6	1.5	0.7	4.7
SRUC Animal Welfare	13.3	8.6	6.4	4.3	0.5	6.4
UoM Animal Welfare	10.2	11.1	8.3	2.3	0.8	6.4

Field-weighted citation impact

	Field-Weighted Citation Impact					
	2010	**2011**	**2012**	**2013**	**2014**	**Overall**
British Columbia Animal Welfare	1.88	1.12	1.79	2.08	1.31	1.64
CSIRO Animal Welfare	1.81	1.61	1.25	1.96	4.18	2.47
Massey Animal Welfare	1	1.77	3.38	0.99	1.93	1.69
SRUC Animal Welfare	1.49	1.78	2.02	2.67	1.22	1.87
UoM Animal Welfare	1.33	1.41	1.61	1.6	1.9	1.56

% International collaboration

	International collaboration (%)					
Entity	2010	2011	2012	2013	2014	Overall
British Columbia Animal Welfare	41.2	33.3	33.3	33.3	45.8	37.6
CSIRO Animal Welfare	44.4	50.0	42.9	40.0	60.0	50.0
Massey Animal Welfare	17.6	20.0	33.3	45.5	42.9	31.1
SRUC Animal Welfare	45.5	31.8	33.3	56.3	60.0	43.5
UoM Animal Welfare	28.6	23.5	15.4	30.0	38.5	27.3

% National collaboration

	National collaboration (%)					
Entity	2010	2011	2012	2013	2014	Overall
British Columbia Animal Welfare	29.4	16.7	22.2	25.0	4.2	18.8
CSIRO Animal Welfare	11.1	30.0	14.3	40.0	13.3	19.6
Massey Animal Welfare	17.6	10.0	0.0	9.1	14.3	11.5
SRUC Animal Welfare	9.1	36.4	42.9	18.8	6.7	25.9
UoM Animal Welfare	14.3	41.2	61.5	35.0	23.1	35.1

% Within institute collaboration

Institutional collaboration (%)

Entity	2010	2011	2012	2013	2014	Overall
British Columbia Animal Welfare	23.5	50.0	38.9	41.7	45.8	40.6
CSIRO Animal Welfare	44.4	20.0	42.9	20.0	20.0	28.3
Massey Animal Welfare	58.8	70.0	55.6	45.5	35.7	52.5
SRUC Animal Welfare	45.5	27.3	23.8	25.0	33.3	29.4
UoM Animal Welfare	50.0	29.4	15.4	35.0	38.5	33.8

% Single authorship

Single authorship (%)

Entity	2010	2011	2012	2013	2014	Overall
British Columbia Animal Welfare	5.9	0.0	5.6	0.0	4.2	3.0
CSIRO Animal Welfare	0.0	0.0	0.0	0.0	6.7	2.2
Massey Animal Welfare	5.9	0.0	11.1	0.0	7.1	4.9
SRUC Animal Welfare	0.0	4.5	0.0	0.0	0.0	1.2
UoM Animal Welfare	7.1	5.9	7.7	0.0	0.0	3.9

Collaborating institutions

AWSC

Top collaborating Institutions

by number of publications co-authored with UoM Animal Welfare

	Institution	Co-authored publications	Citations received for co-authored publications	Co-authors
1.	University of Melbourne	46	180	37
2.	Monash University	34	241	28
3.	CSIRO	10	152	14
4.	Purdue University	7	65	7
5.	University of Adelaide	5	15	4
6.	University of New England NSW	5	118	3
7.	University of Sydney	5	3	3
8.	Baker Heart Research Institute	5	78	14
9.	INRA Institut National de La Recherche Agronomique	5	124	4
10.	La Trobe University	4	13	1

UBC

Top collaborating Institutions

by number of publications co-authored with British Columbia Animal Welfare

	Institution	Co-authored publications	Citations received for co-authored publications	Co-authors
1.	University of British Columbia	106	675	55
2.	University of Guelph	15	94	11
3.	AgriFood Canada	13	137	6
4.	Freie Universitat Berlin	7	109	5
5.	University of California at Davis	6	46	3
6.	Aarhus University	5	32	6
7.	Universidad Austral de Chile	4	7	2
8.	University of Calgary	3	7	1
9.	University of Alaska Fairbanks	3	9	2
10.	Universidade Estadual de Londrina	3	7	4
14.	University of Melbourne	1	6	1

CSIRO

Top collaborating Institutions

by number of publications co-authored with CSIRO Animal Welfare

	Institution	Co-authored publications	Citations received for co-authored publications	Co-authors
1.	CSIRO	32	302	22
2.	University of New England NSW	10	211	13
3.	University of Melbourne	8	92	3
4.	INRA Institut National de La Recherche Agronomique	8	141	8
5.	University of Queensland	4	16	4
6.	Universite Francois Rabelais	4	21	3
7.	Murdoch University	3	42	6
8.	University of Western Australia	3	13	4
9.	Massey University	3	5	3
10.	University of Auckland	3	4	2

Massey

Top collaborating Institutions

by number of publications co-authored with Massey Animal Welfare

	Institution	Co-authored publications	Citations received for co-authored publications	Co-authors
1.	Massey University	69	290	61
2.	AgResearch	7	42	5
3.	UNITEC Institute of Technology	5	9	3
4.	University of Bristol	4	8	3
5.	University of Edinburgh	4	5	1
6.	Royal Veterinary College University of London	3	14	2
7.	University of Melbourne	2	6	3
8.	University of Queensland	2	5	1
9.	AgriFood Canada	2	33	1
10.	University of Guelph	2	6	2

SRUC

Top collaborating Institutions

by number of publications co-authored with SRUC Animal Welfare

	Institution	Co-authored publications	Citations received for co-authored publications	Co-authors
1.	Scottish Agricultural College	58	471	59
2.	University of Edinburgh	21	92	24
3.	Newcastle University	10	116	6
4.	Murdoch University	7	39	12
5.	University of Bristol	7	47	9
6.	University of Copenhagen	6	46	6
7.	Research Institute for the Biology of Farm Animals	5	58	4
8.	University of Western Australia	4	35	1
9.	Wageningen University and Research Center	4	18	6
10.	University of Prince Edward Island	3	23	1

Interpretation of results

The research output of the AWSC in the last 5 years is comparable to other similarly sized animal welfare groups internationally.

Compared to the AWSC, the other research groups have a higher number of full-time, senior researchers. As a result the number of research students and subsequent research output are likely to be higher for scientists that have been established at an FTE of 1.0 within a University for a long period of time (e.g. UBC), compared to some AWSC scientists (Rault, Jongman). It is projected that publications from these AWSC scientists will increase in the coming years following the graduation of their research students.

Compared to other groups, the reported international collaborations from the AWSC were low, whereas there was a relatively high percentage of national collaborations (which was a key objective in establishing the AWSC in 1997 – facilitate national collaborations). This likely reflects collaboration with previous centre partners (Monash University) and previous employers of AWSC scientists (Fisher). The seniority of researchers is likely to affect this as well. As the experience of some of the AWSC scientists increase in the coming years, their international profiles will also grow. This is projected to include co-supervisor and co-investigator roles for projects led by other institutions.

AWSC publishes in the same journals as the other groups, however the average impact factor of journals are lower than others. Publishing in higher ranking journals, when appropriate, would be of strategic benefit in the future, and has the potential to enhance citation rates and competitiveness for national research grants (e.g. ARC).

Citations were chosen as the metric to analyse the impact of generated publications. Overall, the papers produced by AWSC seem to have a similar level of impact to those from other research groups, indicating that the publications produced are being used by the scientific community, and are therefore meaningful.

Appendix 6 – Industry and other presentations 2010/11 – 2014/15

Industry and other presentations 2014/15

- Andrew Fisher attended the AVA Northern Victorian Branch meeting on 2nd of July in Bendigo. He gave a presentation on dairy calf health and welfare and presented results of Jongman feeding study. 20 Vets attended.
- Dan Weary (UBC Canada), Andrew Fisher (AWSC) and Ellen Jongman spoke at the AWSC dairy cow welfare seminar. Topics included cow comfort and lameness, farm size and animal welfare, understanding public views, welfare in new feeding systems and feeding and transport of bobby calves. 22 attendees from industry, animal welfare groups.
- Ellen Jongman presented AWSC current research in dairy at an AWSC – convened Dairy Welfare RD&E planning meeting on 1st December. 17 attendees (AWSC Scientists, DA, Veterinarians, DEPI, RSPCA, Consultants).
- Ellen Jongman, Rebecca Doyle and Paul Hemsworth presented AWSC current research in sheep welfare at an AWSC – convened Sheep Welfare RD&E planning meeting on 4th September. 18 attendees (AWSC Scientists, MLA, AWI, AMPC, Veterinarians, DEPI, RSPCA, Consultants).
- Hosted a delegation from National Taiwan Univ, National Chung Hsing Univ and National Chiayi Univ from Taiwan. Interested in collaboration in pig and poultry research. Extended an invitation for a Centre scientist to present a seminar in Taiwan in December. Rebecca Doyle conducted 3 seminars at 3 universities in early December to a mixed audience of over 250 scientists and industry representatives.
- Professor Hemsworth delivered an invited presentation, “The effects of human-ruminant interactions on animal welfare and productivity in the tropics” at the 16th Asian-Australasian Association of Animal Production Societies, Yogyakarta, Indonesia in November 2014
- Doyle – presented at LiveEX - ‘Quantifying welfare improvements in the live export industry’
- Paul Hemsworth, Jean-Loup Rault presented AWSC current research in pig welfare at an AWSC – convened Pig Welfare RD&E planning meeting on 16th September. 22 attendees (AWSC Scientists, APL, Pork CRC, Industry, Veterinarians, DEPI, RSPCA, Consultants).
- Coleman – Presentation at 4th National Primary Industries AW RD&E Forum on Oct 30, Sydney – “Development of a monitoring scheme to inform livestock animal welfare policy”.
- Skuse - Presentation at 4th National Primary Industries AW RD&E Forum on Oct 30, Sydney – “Development of an AW project register”.
- Skuse - Presentation at Vic Pig Fair, Apr 15, Bendigo, – “ProHand redevelopment – an update”.

Industry and other presentations 2013/14

- Hemsworth presented at the CHM Alliance meeting, QLD, August. He outlined Centre research on the effects of mixing gestating sows Rault - Presentation at MSLE research day July 25th 2013: “Animal welfare as a whole, oxytocin as an example”.
- Sherwen presented at the AAWS conference, Gold Coast, August 2013. She outlined the results of her research on the effects of visitors on zoo animals.
- Rault - Invited talk: “Recent advances in Poultry Welfare”, South Australian Poultry Industry Day, October 3rd, 2013, Roseworthy campus, Adelaide. To poultry producers. Abstract published in the Poultry Hub and Poultry Digest.
- Rault - Invited talk: “Assessment of factors influencing bird welfare in free-range production systems”, Australian Poultry Veterinarian Association Scientific Meeting, October 4th, 2013, Adelaide.
- Sherwen presented a summary of her research on the effects of visitors on zoo animals as part of the 3 Min thesis competition. It was the winner of the University of Melbourne competition and she participated in the Aus/NZ finals in Sydney later in October 2013.
- Fisher participated in Australian Animal Welfare Standards combined Sheep & Cattle Writing Group workshop, Canberra 30-31st October 2013.
- Coleman presented “Why does animal welfare matter” at the Australian Working Dog Conference held in Sydney 4-5th November 2013.
- Sherwen presented at Melbourne University Research Strategy Conference about Zoo Welfare on November 7th 2013.
- Hemsworth presented at Australian Farm Institutes’ 10th annual Australian Agriculture Roundtable Conference on 6th of November 2013 in Sydney. "The future of animal welfare policy in Australia and its implications for livestock industries: Does science provide a factual basis for rational decision-making?
- Rault, Hemsworth presented at the APL/Pork CRC ‘Successful Group Housing Systems for Dry Sows Workshops’ at Toowomba and Melbourne on April 2nd and 4th 2013.
- Jongman gave a presentation on ‘International developments in animal welfare assessment and how it may be applied in Australia’ to the Sheep CRC on April 16th in Sydney.
- Hemsworth presented at the Pan Pacific Pork Expo “Update on Current and Future Approaches to Gestation Sow Housing and Space Allowance” on the Gold Coast on the 21st and 22nd May 2014.
- Rault - Poultry Information Exchange 2014 invited talk: The implications of outdoor range use on hen welfare in free-range flocks. 27th May 2014, Gold Coast.
- Proudfoot and Pempek participated in the US National Dairy FARM Program's "Train the Trainer" workshop June 18th and 19th 2014.
- Rault - Presentation at the Poultry Health and Welfare Liaison Group-Victoria: “Update of current research projects on free range system“, 26th June 2014.

Industry presentations and invited presentations 2012/13

- Hemsworth, Coleman and Skuse trained NCDEA trainers in the delivery of ProHand Dairy Cows in September 2012
- Hemsworth, Fisher, Skuse and Coombe presented/attended the DA Lameness Forum in October 2012
- Hemsworth presentations on the “Lessons from Europe - R&D directions & potential commercial applications in Australia” at the Pork CRC and APL Group Housing Solutions Workshops in October 2012 in Toowoomba Queensland and Melbourne
- Rault presented at AECL Hen Welfare Legislator forum in October 2012
- Fisher, Coombe, Hetti Arachchige and Jongman presented/attended the Australasian Dairy Science Symposium in Melbourne in November 2012
- Skuse and L. Hemsworth presented on benchmarking pig welfare at the Pork CRC meeting at Tullamarine in November 2012
- Coleman presentation on the effects of stockperson behaviour on the behaviour of farm animals inn January 2013 at the Veterinary Research Institute, Oslo, Norway
- Coleman presentation on the effects of stockperson behaviour on the behaviour of farm animals inn January 2013 at the University of Life Sciences, Oslo, Norway
- Fisher presented on the AWSC’s welfare research at a CSIRO Animal Welfare Forum in Armidale in February 2013
- Skuse interviewed in March 2013 for AAWS ProHand video http://www.youtube.com/watch?v=y-5WMmrgZ0U
- Hemsworth presented on sow housing at the March 2013 meeting of the American Society of Animal Science Des Moines.
- Andrew Fisher presented on animal welfare to the Seymour Sheep and Wool Farmer Group in April 2013
- Hemsworth presentation on the “Results of recent research on lactation pens for piglets and mixing principles to reduce aggression in grouped sows” at the Pork CRC Sow Housing Advisory Group Meeting in April 2013 in Melbourne
- Fisher presented on animal welfare in free-ranging systems at the Australian Veterinary Association Annual Conference in Cairns in May 2013
- Fisher presented on animal welfare management to the Yeoman Society farmer group in May 2013
- Hemsworth presentation on the “The importance of rearing environment, space and nests for laying hens in cages” at the 18th AECL Industry Forum in May, 2013 on the Sunshine Coast, Queensland
- Coleman presentation entitled "Zoo Animal-Visitor Interactions: An Approach to Research" at the 2nd International Symposium on Zoo Animal Welfare in June 2013 at Brookfield Zoo Chicago
- Skuse and Coleman met/presented on ProHand at a meeting with representatives of OSU, Ohio Ag Tech Institute, Certified Angus Beef, Ohio Farm Bureau and Bob Evans LLC at Wooster, OH in June 2013

- Fisher attended the Boehringer Forum on Farm Animal Wellbeing in Bilbao, Spain in June
- Skuse presented at the Australian Pig Veterinarians conference in Melbourne in June 2013

Industry presentations and invited presentations 2011/12

- Coleman, G.J. (2012). The role of stockmanship and attitudes in animal-human interactions. Crane Seminar, 1st – 5th April, Swedish University of Agricultural Sciences, Uppsala, Sweden.
- Coleman, G.J. and Hemsworth, P.H. (2011). The attitudes and behaviour of stockpeople at Australian sheep and cattle abattoirs. HSA International Symposium: Recent advances in the welfare of livestock at slaughter.
- Hemsworth, P.H. (2012). Current and future animal welfare research. DPIV Meat and Wool Showcase, 8th May, The Mercure Melbourne Treasury Gardens, Melbourne.
- Fisher, A.D. (2012). Handling and Stress. Lowline beef society conference, 29th April, Coldstream.Hemsworth, P.H. (2012). Panel discussion, Victorian Farmers Federation conference, 20th April, Bendigo.
- Rault, J-L. (2012) "Australian laying hens' welfare - Past, present, future". AECL Hen welfare forum, April 2012, Sydney.
- Verdon, M. (2012). The science of sow housing. SA Pig Industry Day, 17th February, Roseworthy, South Australia.

Industry presentations 2010/11

- Botheras, N.A. Animal Welfare Issues in Ohio. Ask-the-Authorities broadcast interview at Farm Science Review, Ohio, September, 2010.
- Botheras, N.A. Animal Welfare Issues in Ohio. Seminar at Farm Science Review, Ohio, September, 2010.
- Botheras, N.A. Animal welfare and the dairy industry: Challenges and opportunities. Dairy Veterinary & Management Services annual client meeting, Goshen IN, December, 2010.
- Botheras, N.A. Animal Handling and Production Based Outcomes. Wisconsin Dairy & Beef Animal Husbandry Conference, Neillsville WI, March 2011.
- Botheras, N.A. Animal Behavior and Handling. Ohio Farm Bureau, Animal Agriculture 101 training program for animal control and humane officers, Ohio, April, May, 2011.
- Croney, C. Invited speaker, Animal welfare and the US Dairy Industries, Cornell Summer Dairy Institute, Ithaca, NY, 2010.
- Croney, C. Invited speaker, Methods of Assessing Animal Welfare, Ohio Livestock Care Standards Board Meeting, Reynoldsburg, OH, 2010.
- Croney, C. Invited speaker, Addressing Animal Welfare Issues: Lessons from Ohio, Tennessee Farm Bureau Federation Presidents Annual Meeting. Nashville, TN, 2010.

- Croney, C. Invited speaker, Ethics and politics, Animal Housing Issues Symposium. Ohio Veterinary Medical Association. Columbus, OH, 2010.
- Croney, C. Invited speaker, Addressing Animal Welfare in Ohio, Ohio Livestock Care Standards Board Listening Sessions. Dayton, OH, 2010.
- Croney, C. Invited speaker, Addressing Animal Welfare in Ohio, Ohio Livestock Care Standards Board Listening Sessions. Parkman, OH, 2010.
- Croney, C. Invited panellist, Animals, ethics and food, Food Chain Communications Roundtable, Philadelphia, PA, 2010.
- Croney, C. Invited speaker, Public perceptions and swine production, Ohio swine health symposium. Plain City, OH, 2010.
- Croney, C. Invited speaker, Understanding the issues underlying Issue 2, Killbuck Valley Dairy Producers Meeting. Wooster, OH.
- Hemsworth, P.H. Australian research on group housing of gestating sows. Presentation at Animal Welfare Science Centre Scientific Seminar, Pig Welfare, July 2010.
- Hemsworth, P.H. Space and group size effects on sow welfare. Presentation at the DAFWA “Pig Day Out” conference at Medina, WA, March 2011.
- Hemsworth, P.H. Sow housing options – meeting the challenge. Presentation at the DAFWA “Pig Day Out” conference at Medina, WA, March 2011.
- Hemsworth, P.H. Group housing of sows – meeting the challenge. Presentation at the Victorian Pig Fair, Bendigo, Victoria, June 2011.
- Jongman, E.C. Stockperson behaviour and its effect on lameness. Presentation at the DPI Dairy field day on 'lameness and laneways, Western District Victoria, September 2010.