Poultry Research Foundation

ANNUAL REPORT
2009

THE UNIVERSITY OF
SYDNEY

CONTENTS

OBJECTIVES OF THE FOUNDATION

The objectives of the Poultry Research Foundation are to advise the Senate of the University of Sydney and the Vice-Chancellor on matters associated with poultry research, education and scholarship within the University of Sydney and to provide an interface between the Australian poultry and allied industries and the University.

In doing so, the Foundation shall increase the resources of the University by way of membership to the Foundation and utilising benefits given by members in provision of services and other non-financial contributions.

AIMS OF THE FOUNDATION

1. To provide an interface between the poultry and allied industries in Australia and the University of Sydney.
2. To undertake research of relevance to these industries.
3. To assist in the training of scientific and technical personnel to service the private and public sectors of these industries.
4. To act in an industrial liaison capacity.

PRIORITIES 2009

1. Develop links between the University of Sydney and the Poultry CRC
    a. Research projects
    b. Educational programs
    c. Postgraduate scholarships
2. Develop research projects lead by the Chair of Poultry Science
3. Complete infrastructure maintenance of the Poultry Unit
4. Promote postgraduate opportunities within the Poultry Research Foundation
5. Organise the 2009 Australian Poultry Science Symposium

Management of the Foundation is vested in a Council which comprises the President, Deputy President, Director, Faculty of Veterinary Science Dean and DVC (External Relations) along with elected Industry Members from the categories of Governor, Company member and Member, and Honorary Governors and Ex Officio Members.

The administrative office and Research Unit are based at Camden.

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University of Sydney
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Camden, NSW
2570

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Peter Groves, Director
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Email: peter.groves@sydney.edu.au

PRESIDENT'S REPORT

Our Poultry Research Foundation has again provided a strong, relevant and positive interface between our Australian Poultry Industry and the Veterinary Science department of Sydney University.

With this in mind, it is with great pleasure I report we have been successful in recruiting Dr Aaron Cowieson for the position of full time Director for our Poultry Research Foundation with his recent appointment to the position of Associate Professor within the Faculty of Veterinary Science. Aaron will commence his appointment on June 1st 2010. Aaron is a leading world expert in poultry nutrition and will give leadership, expertise and impetus to the leading role of the PRF within the Australian Poultry Industry. Dr Aaron Cowieson's appointment reflects the commencement of an exciting new era for our PRF.

Currently the role of Director has been undertaken by the professional and highly effective leadership of Dr Peter Groves. For the last 18 months Peter has worked effectively and selflessly, providing guidance based on years of experience, common sense, great intellect and a strong research direction. Peter has done an excellent job producing 2 excellent symposia and a framework of new research projects. Thank-you Peter, we are indeed in your debt.

The successful achievement of Aaron's appointment can be directly credited to two outstanding people - Associate Professor/ ProDean David Emery and Dr Peter Selle.
For the last 12 months David has been tenaciously working to achieve three critically important milestones, necessary for the best research and associated outcomes during Aaron's tenure. Firstly David, working with Sydney University Sydnovate has been successful in rationalizing and clarifying Intellectual Property and Publishing Rights. Secondly, David has worked tirelessly to produce a successful business case for Sydney University to join the Australian Poultry CRC. And finally David with great care and sensitivity undertook the last minute negotiations associated with Aarons appointment.
In respect to Dr Peter Selle, Peter has worked energetically and with great enthusiasm to achieve the appointment of Aaron through almost daily personal communications and the successful organization of the meet and greet week in January. I know Aaron is looking forward to working with Peter. To both David and Peter, we sincerely say thank-you.

On behalf of the Foundation I wish to acknowledge the invaluable support from RIRDC Chicken Meat Programme and AECL, towards the PRF in general and also more significantly the financial support for the position of Director.

Once again, our most recent Symposium last month has been heralded a great success by our industry leaders some even calling it the best ever. The high quality of topics presented, all with great intellectual rigor and coupled to a team of top international and local speakers was a recipe for success. The more technical nature and less commercial emphasis within the conference was positively noted. I thank Peter Groves, Jo-Ann Geist, Peter Selle, our sponsors and the organizing committee for such a great conference.

Through 2009 we are indebted to the dedicated support from Professor Leo Jeffcott for all aspects of our Poultry Research Foundation. Leo has retired now as Dean of the Faculty of Veterinary Science; however we are most fortunate to have Roseanne Taylor as our new

Dean. Roseanne gave an excellent opening address at our recent symposium, outlining the wonderful History of our Veterinary Science Faculty over the last 100 years.

I wish to officially acknowledge our PRF professional team – alongside Dr Peter Groves, we have Dr Jeff Dowling, Dr Peter Selle, Dr Wendy Muir and new member Dr. Greg Cronin, who together provide an "A" team of excellent, teaching, and research contributions. We gratefully acknowledge the long term efforts of Mrs Joy Gill and Mrs Melinda Hayter who undertake the daily poultry husbandry duties with our birds, in all weathers, at all hours.

On behalf of all of us, I wish to thank Jo-Ann Geist who with great enthusiasm, great efficiency and wonderfully good grace, administers the everyday functions of our foundation. Thank-you Jo for your tremendous efforts.

In summary, 2009 has been a successful year. It has been a year of consolidation and preparation for the next chapter of our PRF. With our continued generous spirit of co-operation coupled to hard work and good grace we face a wonderfully exciting new era for OUR Poultry Research Foundation.

Linda Browning
March 2010

DIRECTOR'S REPORT

The 2009 Australian Poultry Science Symposium attracted its usual high level of interest and provided valuable information and a wonderful forum for interaction between industry attendees. The overriding themes were of "climate change and industry sustainability" and "incubation and chick quality". We had valuable input from six invited speakers related to these topics. The quality of the invited and local speakers and from our own local and young researchers again made this Australia's premier poultry science event and its international acclaim continues.

Dr Greg Cronin joined the faculty in mid 2008 and has begun to work within the Foundation's areas through 2009. We welcome Greg and look forward to the major contributions he will make in the areas of animal welfare and behaviour.

The acquirement of steam pelleting capabilities for the Foundation feed mill has been a major project during 2009 and is approaching fruition. This will have an immediate impact through one research project under Dr Peter Selle and will provide an incredible resource for us and the industry in coming years. Most of the hard work in achieving this outcome has been due to Dr Jeff Downing and we offer our appreciation for his diligent activity in monitoring the progress of the mill's installation.

A vote of thanks must go to the keen members of our Research Advisory Group. Their inputs and advice in identifying appropriate and valuable research projects suited to our staff and facilities has resulted in successful grant applications through RIRDC, AECL and the Poultry CRC during 2009.

Planning for the 2010 Australian Poultry Science Symposium occupied us heavily for much of the year, with an ambitious program and the invitation of seven high quality overseas and two local speakers. Many thanks are owed to the depth of input from the Organising Committee and of course to the tireless and inspired activity of our Administrative Assistant, Jo-Ann Geist, without whom we could not mount anything like the quality event that these symposiums prove to be.

This will be my last report as Director of the Foundation as Dr Aaron Cowieson will take up this position in June 2010. Aaron will be a great asset to the Foundation and to the University and we look forward to welcoming him into the role. My contributions to the Foundation since 2007 could not have been of value without the enthusiastic help from Foundation members, the President Linda Browning, the researchers and staff of the Poultry Unit and the fantastic administrative and guiding assistance from Mrs Jo-Ann Geist. I offer my deep gratitude to for their support and encouragement throughout the last three years. It has been a great honour to serve in this role, initially as Acting Director and later as Director, and I trust that the contributions I've been able to make have helped the Foundation to meet its objectives and to strengthen its position in providing an interface between the industries and the University of Sydney in research provision and in training of future technical personnel. I wish the Foundation success in the future and will continue my best efforts to support and contribute as best I can. Thank you all for the opportunity to have taken a part in its history.

Peter Groves

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Mr. Ern Newton

Invitees

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A representative, NSW Agriculture
The President, World's Poultry Science Association (Australian Branch)
The Program Manager, RIRDC Chicken Meat Program
The Program Manager, Australian Egg Corporation Ltd
A representative, Australian Egg Industry Association
The Executive Director, Australian Poultry Industry Association

POULTRY RESEARCH FOUNDATION COUNCIL

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Professor Rosanne Taylor / Assoc. Prof. David Emery

POULTRY UNIT STAFF AND STUDENTS

Academic Staff

Dr. P. Groves BVSc. (Sydney) MACVSc. (Epidemiology) PhD (Sydney)
Director Poultry Research Foundation

Dr. W.I. Muir, B.Sc.Agr., PhD (Sydney), GradDipEd(UNE)

Dr. J.A. Downing, WDA (Wagga Agr. Col.), B.Sc., PhD (Macquarie)

Dr G.M. Cronin, BAgrSc (Melb), MAgrSc (Melb), PhD (Wageningen NL), Grad. Cert. Educ. Stud. (Higher Educ.)

Honorary Research Fellows

Dr. P.H. Selle, B.V.Sc, PhD (Sydney)

Faculty Support Staff

Mrs. R.J. Gill
Mrs. M.E. Hayter

Foundation Staff

Mrs. J. Geist (Administrative Assistant)

Postgraduate Students

Mr. Mohamed Sayed

Honours Students (conducted thesis projects in poultry)

There was only one fourth year animal production student to conduct a thesis project under supervision of the Poultry Research Foundation.

Miss Jayde Ichsan (Supervisor: Downing)
"The effect of strain and protein content of the finisher diet on performance and carcass composition of growing ducks during the summer".

External Appointments

Peter Groves:

Vice President – Australian Veterinary Poultry Association
Adjunct Senior Lecturer, Charles Stuart University – Department Agriculture & Veterinary Sciences
Adjunct Senior Lecturer, James Cook University – Veterinary Science
Member: RIRDC Chicken Meat Advisory Committee
Member: Newcastle Disease Technical Working Group
Member: National Avian Influenza Vaccination Expert (NAÏVE) group

Jeff Downing:

Pork CRC Sow Productivity Advisory Committee

Degrees Awarded

-

Doctor of Philosophy

-

Master of Agriculture

-

Conference Attendance

Australian Poultry Science Symposium – Sydney February 2009 attended by Drs. Peter Groves, Wendy Muir, Peter Selle, Jeff Downing and Greg Cronin. Presentations were given by Dr. Jeff Downing, Dr. Wendy Muir, Dr. Peter Selle, Dr. Greg Cronin.

Molecular biology workshop. Epidemiology Chapter of the Australian College of Veterinary Scientists. Gold Coast, June 2009. Dr. Peter Groves

Science Week. Scientific meeting of the Australian College of Veterinary Scientists. Gold Coast, July, 2009. Dr. Peter Groves

Australasian Pig Science Association Bi-Annual meeting Cairns November 2009 – Dr. Jeff Downing

International Society for Applied Ethology, Cairns July 2009 – Dr. Greg Cronin

4th Global Vaccine Congress, October 2009 in Singapore – Dr. Wendy Muir, this also included a presentation

Acknowledgments & Awards

Poultry Award Winner 2009 - Jayde Ichsan

Monetary support is given to the Veterinary Science Postgraduate Conference annually.

AUSTRALIAN POUTLRY SCIENCE SYMPOISUM 2009

The 20th Annual Australian Poultry Science Symposium was held 9th -11th February 2009. The Poultry Research Foundation in conjunction with the World's Poultry Science Association (Australian Branch) organised this combined meeting which presented valuable information under the theme of Poultry – Surviving Climate Change. We had four internationally acclaimed speakers and two local authorities who presented their recent research outcomes and concepts for sustainable agriculture to a crowd of approximately 160 attendees. In total, there were 58 contributed and invited speaker papers presented.
The Australasian Veterinary Poultry Association was also a valuable part of the conference overlapping the final day of APPS with their two day scientific meeting.

Invited speakers were:

Professor Nick Costa – Murdoch University - W.A
Dr. Owen Cameron – Land and Water Australia - ACT

Dr. Robert A. Swick – Linden Nutrtition – Singapore
Professor Peter Cheeke – Oregon State University – USA
Dr. Gaylene Fasenko – University of Alberta – Canada
Dr. Ron Meijerhof – HatchTech – The Netherlands

Sponsorship of the APSS 2009 was kindly supported by:

Invited Speaker Sponsors	AECL Egg Program
	American Soybean Association
	HatchTech
	Poultry Research Foundation
	RIRDC Chicken Meat Program
Gold Sponsors	DSM Nutritional Products Pty Ltd
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	Elanco Animal Health
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	Guangzhou Wisdom Bio-Technology Pty. Ltd
	JEFO Australia
	Phibro Animal Health
Alternative Sponsors	Australian Poultry CRC
	Auspac Ingredients/Trouw Nutrition/Nutreco Pty. Ltd
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	Kemira
	Taylor and Francis Group

FOUNDATION RESEARCH IN REVIEW

The Poultry Research Unit has been very active in both the broiler and layer research fields for more than 50 years here at Camden. Some major contributions to research and industry during this time have been in the areas of:

1. **Amino Acid Digestibility Studies (RIRDC)**
2. **Modulation of lean tissue deposition by dietary fatty acids (RIRDC; ARC)**
3. **Development of a non-invasive test for stress in laying hens (RIRDC)**
4. **Mucosal immunity in chickens (RIRDC)**
5. **Nutritional and toxicological evaluation of transgenic plants (CSIRO Division of Plant Industry)**
6. **Application of feed enzymes (Industry)**
7. **Mycotoxins in poultry feeds (ADAB)**
8. **Egg Shell Quality (RIRDC)**
9. **Amino acid balance for heat stressed broilers (Industry)**
10. **Nutritional requirements of recently imported layer stock (RIRDC)**

We will continue to serve the needs of research, industry and teaching over years to come.

CURRENT RESEARCH PROJECTS

Dr. Peter Groves:

Dr Peter Groves began work on the following research projects in 2009:

1. AECL Project No: 1US091 "*Salmonella* control in commercial layer flocks". This two year project looks at approaches to reduction in intestinal colonisation of layer chickens by *Salmonella* with the use of a live and an inactivated vaccine in various combinations. Two flocks, one floor reared and the other reared in cages were established and birds are challenged at various ages to determine vaccine efficiency and duration of immunity. There were some initial difficulties with the salmonella challenge model as layer breeds appeared to be very resistant to artificial infection. This has been overcome and some of the earlier age work is being repeated.

2. Poultry CRC Project No. 09-24 "Effects of incubation differences on broiler chicken skeletal integrity". This was a short term scoping study for the CRC working with Dr. Wendy Muir. It evolved from a field observation of differences in chick leg strength following a variation in incubation conditions. The approach was to try to recreate this observed difference compared to an "ideal" incubation profile. Differences involved temperature and humidity variations in early incubation. The two incubators at the poultry unit were set up so that one would run close to ideal conditions (control) and the other mimicked the field condition thought involved in the skeletal problem. Despite poor control of the humidity in the control incubator we were able to demonstrate significant differences in day old bone ash and serum calcium levels, 14

day tibial growth plate width and bone ash. The experiment is to be repeated to confirm the outcomes and to use a more subjective assessment of bird mobility. If we can show repeatable results, the work should lead to a major project in future in this important area of broiler chicken welfare.

3. Spotty Liver Syndrome in free range and barn layer chickens. We conducted an unfunded field survey by mail of a large proportion of the free range and layer flocks in New South Wales and Victoria. This is the first time an epidemiological study has been done on this syndrome, which is one of the most troublesome for this class of bird. Response to the survey was good. The causative organism is unknown and the syndrome has defied experimental reproduction by other workers to date. Although this was a limited survey, we were able to provide data to dispel some misconceptions about the syndrome and to show a significant association with flock size (larger flocks being more at risk). We hypothesise that this relates to restrictions in the availability of "real" effective feed space for birds approaching peak lay (and hence peak feed consumption) where birds are at their hungriest, under the added stress of hot weather conditions. This work needs more precise follow up studies but does provide an indication that we may be able to prevent the problem without the use of antibiotic treatment.

Dr. Wendy Muir:

During 2009 Dr Muir has been involved with the following research

1. Meat and Livestock Australia project A.COP.0047: *Strategies to identify and develop bioactive peptides in meat and bone meal (MBM):*
   Screening for peptides in several samples of meat and bone meal has been completed. An *in-ovo* delivery system for assessment of bioactive peptides has also been established throughout 2009. Future work involves an assessment of bioactivity of MBM-derived peptides following their *in-ovo* delivery.

2. An Australian Poultry CRC strategic research project No. 09-24 investigating the "*Effects of incubation differences on broiler chicken skeletal integrity*" with senior investigator Dr Peter Groves.
   Dr Groves has outlined the main findings of this work in his report.

3. "*Salmonella control in commercial layer flocks*" (AECL Project No: 1US091) with senior investigator Dr Groves is also outlined under his report.

Dr Muir is predominantly involved with the assessment of the mucosal antibody responses at pre-determined times following vaccination. Initial mucosal samples and their preparation for analysis have been completed.

Dr. Jeff Downing:

Dr Jeff Downing is continuing work on the following research projects

1. RIRDC Chicken Meat. Project No: US152A 'Physiological and nutritional approaches to alleviate heat stress in broiler chickens.'
   In previous studies it was found that supplying oral hydration (glucose plus electrolyte salts) plus betaine to broilers during periods of high temperature improved their performance.

   In 2009 as part of this project two studies were undertaken to investigate:
   The significance of including the energy source (glucose) in the oral hydration treatment was evaluated. In this study Cobb male broilers were provided with tap water, Tap water + betaine (500mg/L), Tap water + glucose, Tap water + glucose + betaine (500mg/L), Electrolyte solution, Electrolyte solution + glucose, Electrolyte solution + glucose + betaine (500mg/L) and Electrolyte solution + glucose + betaine (500mg/L) + ammonium chloride. The key finding was that the glucose provided no advantage and that the improvement in performance was due to the electrolytes and betaine.

   The role that dietary electrolyte balance (DEB) had on performance of broilers under high temperature. Birds were fed basal diets with a DEB of 180 or 220 and also fed these diets with electrolyte and betaine supplements in water or extra electrolytes in the feed while maintaining the electrolyte balance at 180 or 220. Providing the electrolytes in feed improved performance under high temperature as did the extra electrolyte in water.

2. RIRDC New Animal Industries- Project No: US150A. Efficient, environment and bird friendly duck Production.
   In this project the final experiment was completed. A three phase feeding program was evaluated where a finisher diet was introduced in weeks 5 and 6 of the production program. Finisher diets differing in protein content were fed and it was found that ducks could be fed 16-17% protein in the finisher phase without affecting performance. This is lower than is presently being fed in the two phase commercial feeding program. The final report is being prepared for this project.

3. A project funded by AECL was initiated in May 2009. In this project the corticosterone concentration in egg albumen is being determined as a non-invasive measure of stress in hens maintained in different housing systems. Flocks are being samples at 10 week intervals throughout a full production cycle. Samples are being taken from 3 individual flocks (total 9) being housed in conventional cages, barn and free range production systems.

4. Work continues with funding from the Pork CRC on the induction of oestrus during lactation in sows. This work will form a major component of the Pork CRC rebid effort.

Dr. Peter Selle:

Dr Selle continued his involvement in the RIRDC Chicken-meat project considering nutritive value of sorghum in broilers. This culminated in the publication of a review entitled 'Implications of sorghum in broiler chicken nutrition' in Animal Feed Science and Technology.

The inconsistent performance of broilers offered sorghum-based diets is of concern to the chicken-meat industry. Variations in both concentration and digestibility of amino acids appear to be prime causal factors. The storage protein, kafirin, is unique to sorghum and may comprise more than 50% of total protein but kafirin is deficient in lysine is a relatively poor source of digestible amino acids. It seems likely that as protein levels of sorghum increase so too does kafirin as a proportion of total protein so that amino acid digestibility and lysine concentrations decline. Also kafirin is associated with harder grain textures and higher starch gelatinisation temperatures. Kafirin, as a proportion of sorghum protein, is probably critical to variations in concentration and digestibility of amino acids.

Sorghum is highly vulnerable to 'moist-heat' because it induces disulphide cross-linkages, particularly in the β- and γ-kafirin protein fractions, which limits both protein and energy utilisation. In sorghum endosperm, starch granules are intimately associated with protein bodies (kafirin) and the protein matrix (glutelin) and moist heat-induced disulphide cross-linkages in protein depress amino acid availability and starch digestibility. Therefore, a critical issue is whether or not steam-pelleting sorghum-based broiler diets at ~90°C constitutes sufficient 'moist-heat' to compromise protein and starch digestibility.

Consequently, Peter Selle has received funding from RIRDC Chicken-meat to investigate the effects of steam-pelleting temperatures and grain particle size/texture on the performance of broilers offered sorghum-based diets. Feeding studies will commence as soon as the new steam-pellet press is installed and commissioned. In the interim, a mini-survey of sorghum 'hardness', and its possible relationship to protein content, is being completed.

Dr. Greg Cronin:

Conducted a behaviour study on the interaction by two-day-old ducks with two water provision devices in the pen (nipple drinker and bell waterer). The observations were conducted within the constraints of a larger experiment on the growth of ducks by Dr. Jeff Downing.

RESEARCH COLLABORATION AND INDUSTRY SERVICES

Peter's collaboration with Professor Ravi Ravindran and Dr Aaron Cowieson continued in 2009. This culminated in the publications of a 'phytase and/or xylanase' feeding study and reviews of (i) calcium interactions with phytate and phytase and (ii) the impact of phyate and phytase on endogenous nitrogen losses (see communications).
In 2009, Peter Selle presented a lecture "Sorghum protein and Subtilisin protease" at a Feedworks nutrition workshop held at Brighton-Le-Sands. The likelihood is that the inclusion of endogenous proteases in sorghum-based broiler diets with the capacity to degrade kafirin would be beneficial for both protein and starch utilisation.
The outcomes of a 2008 R&D project with Danisco Animal Nutrition have been published in International Journal of Poultry Science.
Towards the end of 2009, a contract R&D project for AB Vista was commenced.

Dr. Peter Groves undertook a project review for the Australian Poultry CRC, August 2009.

Dr. Greg Cronin had a collaborative AECL funded research project with the University of Melbourne (Professor Paul Hemsworth) on "The welfare of laying hens in cages. Project UM-65, completed Sept. 2009. He currently has another collaborative project again with Professor Paul Hemsworth, University of Melbourne funded by AECL on "The importance of rearing environment, space and nests for laying hens in cages". Project commenced 2009/10 for completion 2011/12.

COMMUNICATIONS

Publications:

Barnett JL., Tauson R., **Downing J.A,** Janardhana., V., Lowenthal, J.W., Butler, K.L. and **G.M. Cronin.** (2009) The effects of a perch, dust bath, and nest box, either alone or in combination as used in furnished cages, on the welfare of laying hens. Poultry Science, 88; 456-470.

Cadogan DJ, **Selle PH**, Partridge GG, Ravindran V (2009) Supplementation of wheat-based diets with xylanase and phytase, individually and in combination. *Proceedings, Australian Poultry Science Symposium* **20**, 40-43.

Cronin GM, Borg SS, Barnett JL (2009) The effects of group size on the proportion of nest box eggs laid by hens in cages. Proceedings, Australian Poultry Science Symposium **20**: 149-152.

Cronin GM, Borg SS, Barnett JL (2009) The effects of group size on nest-box use by Hy-Line Brown hens in furnished cages. Proceedings of the 43rd International Society for Applied Ethology Congress, Cairns July 6-10, 2009, p. 36.

Cronin GM, Hemsworth PH (2009) Final Report to the Australian Egg Corporation Limited for Project UM-65: The welfare of laying hens in cages. 96 pp.

Cowieson AJ, Bedford MR, **Selle PH**, Ravindran V (2009) Phytate and microbial phytase: implications for endogenous nitrogen looses and nutrient availability. *World's Poultry Science Journal* **65**, 1401-418.

Downing, J.A. and Bryden. W.L. **(2009)** The effects of housing laying hens as groups in conventional cages on plasma and egg albumen corticosterone concentrations. Australian Poultry Science Symposium, 20, 157-160.

Downing, J.A. Broek, D., Smits, R.J. and Giles, L.R. **(2009)** Induction of oestrus during lactation results in normal mating and farrowing performance. Manipulating Pig Production. Australasian Pig Science Association, XII, p144.

Engel J, Hemsworth PH, Widowski T, Tilbrook AJ, **Cronin GM** (2009) Importance of space and nests for laying hens in cages and further evaluation of welfare methodology. Australian Poultry CRC Ideas Exchange 2009.

Grupen, C.G., Wilkinson, S.J., **Downing, J.A**. and Newman, R.E. **(2009)** Effects of dietary fatty caids on the secretion of metabolic hormones and ovarian properties in prepubertal gilts. Manipulating Pig Production, XII, p142.

Laine SM, **Cronin GM**, Petherick JC, Hemsworth PH (2009) Does the quantity of reward in a Y-maze preference test affect hen choice and motivation? Proc. Australian Poultry Science Symposium, 20: 153-156.

Mikkelsen LL, Vidanarachchi JK, Olnood CG, Bao YM, **Selle PH**, Choct M (2009) Effect of potassium diformate on growth performance and gut microbiota in broiler chickens challenged with necrotic enteritis. *British Poultry Science* **50**, 66-75.

Muir, W.I., Vandenberg, G. And Scott, T.A (2009). Application of a vaccine carrier diet designed for the oral delivery of antigen. Australian Poultry Science Symposium,**20,** 90.

Muir, W.I., Vandenberg, G. And Scott, T.A (2009). A delivery vehicle for oral vaccination of poultry. 4th Global Vaccine Congress

Newman, R. E., Yeung, K.R., Grupen, C.G., Thompson, P.C., **Downing, J.A.** broek, D. and Wilkinson, S.J (2009) Dietary n-6 and n-3 polyunsaturated fatty acids (PUFA) have differential effect on gilt litter characteristics. Manipulating Pig Production, XII, p44.

Pavic, A., **Groves, P.J**. and Cox, J.M. 2010. Utilization of a novel autologous killed tri-vaccine (serogroups B[Typhimurium], C [Mbandaka] and E [Orion]) for *Salmonella* control in commercial poultry breeders. *Avian Pathology***39**(1): 31-39.

Pavic, A., **Groves, P.J**., Bailey, G. and Cox, J.M. In press. A validated miniaturized MPN method, based on ISO6579:2002, for the enumeration of *Salmonella* from poultry matrices. *J. of Applied Microbiology.* doi:10.1111/j.1365-2672.2009.04649.x

Sayed, M.M. and **Downing, J.A.** (2009) The effects of water replacement by glucose-electrolyte fluids with or without betaine supplementation on performance, acid-base balance and water retention of heat stressed broiler chickens. Poultry Science (submitted)

Sayed. M. and **Downing, J.A.** (2009) Does antioxidant supplementation beneficially affect redox homeostatis and performance in broiler chickens exposed to short term heat stress. Australian Poultry Science Symposium, 20, 61-64.

Sayed. M. and **Downing, J.A.** (2009) Effects of a six-hour-thermal conditioning on performance and thermal tolerance acquisition in two broiler strains. Australian Poultry Science Symposium, 20, 57-60.

Selle PH, Cowieson AJ, Ravindran V (2009) Consequences of calcium interactions with phytate and phytase for poultry and pigs. *Livestock Science* **124**, 126-141.

Selle PH, Germaine K, Middlebrook T (2009) Water holding capacity of wheat may be indicative of voluntary feed intake in broiler chicks. *Proceedings, Australian Poultry Science Symposium* **20**, 125-128.

Selle PH, Partridge GG, Ravindran V (2009) Beneficial effects of xylanase and/or phytase inclusions on ileal amino acid digestibility energy utilisation mineral retention and growth performance in wheat-based broiler diets. *Animal Feed Science and Technology* **153**, 303-313.

Wilkinson, S.J., **Downing, J.A**., Thomson, P.C. and Newman, R.E. (2009) Eggect of fatty acid source on performance and carcase composition of finisher pigs Manipulating Pig Production, XII, p44.

Wilkinson, S.J., Buttermer, W., **Downing, J.A**., Thomson, P.C. and Newman, R.E. (2009) The effects of fatty acid subtype on performance and respiratory exchange ratio in gilt progeny. Manipulating Pig Production, XII, p30.

Invited presentations:

Groves, P.J. 2009. ILT in Sydney – lessons we should learn. *Proceedings of the Australasian Veterinary Poultry Association,* 12 February 2009. University of Sydney.

Groves, P.J. ,2009. Spotty Liver Syndrome survey results. NSW Poultry Health Liaison Group, 2 October, 2009. EMAI, Menangle.

Groves, P.J. 2009. Epidemiology of the NSW ILT outbreak. NSW Poultry Health Liaison Group, 2 October, 2009. EMAI, Menangle.

The University of Sydney

The Poultry Research Foundation

Balance Sheet

as at 31st December 2009

	2009 $	2008 $
ASSETS		
CURRENT ASSETS		
Funds Participating in University Pool Interest	178,879	180,452
Total Current Assets	**178,879**	**180,452**
TOTAL ASSETS	**178,879**	**180,452**
NET ASSETS	**178,879**	**180,452**
EQUITY		
Accumulated Funds	178,879	180,452
TOTAL EQUITY	**178,879**	**180,452**

Notes to Financial Statements:

1. The increase in Salaries is due to the commencement of the Foundation contribution to the Director position. As agreed with the Faculty, the Foundation is committed to $37,500 per annum. The additional $10,000 is due to increase in salary rates as per University increases and the use of additional casual labour to help with an increased workload.
2. The increase in both Symposium Income and Travel, Conference and Entertainment expenditure is due to the 2009 conference being held over three days whereas in 2008 it was held for one day.
3. The financial statements have been prepared on a modified accrual accounting basis.
4. All fixed assets expenses are expended in the year of purchase.
5. Employee entitlements for Long Service Leave are held centrally in the University's accounts.
6. The University (including the Foundations) is exempt from income tax.

I certify that the Income Statement and Balance Sheet of the Foundation have been prepared in accordance with the University's accounting practices and procedures. These Foundation accounts form part of The University of Sydney's financial reports which have been audited by the Auditor-General, New South Wales.

Peter Groves
Director
Poultry Research Foundation
16th March 2010

Greg Robinson
Finance Director
Faculties of Sciences, Engineering and Technology
16th March 2010

The University of Sydney

The Poultry Research Foundation

Income Statement

for the year ended 31st December 2009

	2009 $	2008 $
INCOME		
Business and Investment Income	25,276	18,816
Memberships and Subscriptions	55,020	51,680
Symposium Income	118,594	41,576
Other Income	14,286	13,217
Total Income	**213,176**	**125,289**
EXPENDITURE		
Salaries	117,060	69,141
Consumables	8,099	7,827
Equipment and Repairs / Maintenance	6,945	9,052
Services and Utilities	3,565	7,662
Travel, Conferences and Entertainment	68,565	18,078
Contributions to University areas	1,200	1,050
Other Expenses	9,315	24,432
Total Expenditure	**214,750**	**137,243**
SURPLUS / (DEFICIT)	**(1,573)**	**(11,953)**
Accumulated Funds as at 1st January	180,452	192,405
ACCUMULATED FUNDS AS AT 31ST DECEMBER	**178,879**	**180,452**

NOTES TO FINANCIAL STATEMENTS

As noted at the General Meeting of the Foundation in December, the foundation accounts had been steady over the past year, you will note though, on the preceding pages of the Income Statement and the Balance Sheet that we were over budget by $ 1,573.00 for year ending 31st December, 2009.

Despite the negative, overall it was a good result considering the expenses the Foundation incurred throughout 2009, with the ordering of the additional parts for the new Pellet Mill (that had been purchased the previous year), the costs associated in getting the new mill installed including transportation and electrical work and also the support that the Foundation pledged to the Faculty by way of support for the Poultry Research Foundation Directors position.

The PRF again supported the Faculty by means of a $ 500 donation to the Post Graduate Conference in November 2009 along with the Faculty Poultry Prize to the value of $700, which was presented to Miss Jayde Ichsan for her project on ducks.

You will note on the Income Statement that our memberships increased by $ 3340.00 due to the 2 new memberships being taken up by Alltech Biotechnology and International Animal Health and Business Income was up due to some contract work done by Dr. Peter Selle for industry members and of course Symposium Income was up due to a very successful APSS 2009.

The major increases in the expenditure section of the Financials is of course in Salaries due to the support of the Directors position and Travel, Conferences and Entertainment due to APSS 2009 being back to the normal full 3 day conference on Camperdown campus.

I would like to take this opportunity to thank the Foundation members for their continued support of this unit and its operations and with the new Pellet Mill in operation for 2010 hopefully we will be in the “black” for the next financial report.

Jo-Ann Geist