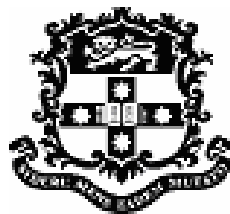




Poultry Research Foundation

**ANNUAL REPORT
2006**



UNIVERSITY OF SYDNEY

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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 within the University of Sydney and to provide an interface between the Australian poultry and allied industries and the university.

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 2006

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 Layer and Deep Litter Sheds
4. Promote postgraduate opportunities within the Poultry Research Foundation
5. Organise the 2006 Australian Poultry Science Symposium

Management of the Foundation is vested in a Council comprising the President, Deputy President and Director, Industry Members in 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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PRESIDENT'S REPORT

The last year has seen unexpected change with the resignation of Professor Tom Scott as Director. Our sincere thanks go to Tom for his visionary leadership, dedication and sheer hard work in steering the Foundation so effectively over the last 3 1/2 years.

Tom has through scientific rigor, diplomacy and great charm bonded the commercial poultry industry and the Foundation laying down a rock solid foundation upon which to grow.

I am delighted to report that Dr Peter Groves has accepted a caretaker role as Director of the Poultry Research Foundation while a permanent replacement for Tom is sought over the coming year. Peter is well known to all of us for his great knowledge and experience of our industry coupled to his ability to successfully work with both Commercial and Academic Facets the Poultry Industry. In his new role Peter will be actively working to generate a longer term research strategy and programme geared directly to industry needs.

The 2007 symposium was a great success with many participants commenting it was the best for many years. This was largely due to the fantastic efforts of Bob Pym, Jo-Ann Geist and Tom Scott. Bob Pym undertook the heavy burden of editing papers. Tom organized the principal guest speakers and Symposium themes and Jo-Ann beautifully organized the administrative and social sides of the occasion. Thank-you Bob, Tom and Jo-Ann.

I also wish to sincerely thank Professor Chis Maxwell for his dedicated support to the Foundation during these unsettling times. Chis, as always, is the quiet backbone of our Foundation. Chis, effectively and smoothly keeps our wheels on track. Thank-you Chis

On behalf of the Foundation I wish to thank RIRDC Chicken Meat Programme and the Australian Egg Corporation (AECL) for their financial support over the years. Your support has been critically important to the Poultry Foundation because it funded that part of the salary of our Director, which covered his time with the Poultry Research Foundation and its associated industry commitments such as our Poultry Science Symposium. At the same time, The University of Sydney co-funded that part of the Directors role which was involved directly with University undergraduate teaching and University department administration. To-date this has been a unique position whereby both the Poultry Industry and Sydney University have funded the one position but under the understanding that the position itself had two distinct roles, one to serve our Australian Poultry Industry, the other to serve the University

Indeed funding for the position of Director of our Foundation and its associated research will need to be resolved in 2007. I seek all your help on this issue. However with the solid guidance and direction from Peter Groves, coupled to your support I genuinely believe our future is very bright indeed. The bond between our Foundation and the Australian Poultry Industry will strengthen, in other words our "Raison d' Etre" will be achieved. 2008 will be our 50th Anniversary. Something indeed to be celebrated!

DIRECTOR'S REPORT

The role of the Director of the Poultry Research Foundation and Chair in Poultry Science is an industry and University supported position, with the objectives of the position being defined as to:

- Develop a program that focuses on poultry nutrition and digestive physiology;
- Identify and facilitate collaborations between industry and scientists;
- Serve as the primary contact person for industry regarding research conducted by the poultry group;
- Play a major role in organising the Australian Poultry Science Symposium, and;
- Foster strong linkages between the undergraduate program and the poultry industry.

I feel that the poultry group has worked very hard to meet these challenges and we will continue to maintain these objectives as core priorities for future development. Therefore I gratefully acknowledge the poultry research and support staff for their dedication and hard work. Included in this acknowledgment are a variety of university support staff that provides overall support in administration and teaching. Added to this list are contributions from two new postgraduates (Elisabeth Ovelgonne and Mohamed Sayed) and three undergrad honours thesis students.

We also gratefully acknowledge the membership support of the Poultry Research Foundation, this support provides administrative assistance, and Jo-Ann Geist in this position is much appreciated by all members of the poultry group. We also recognise the research support of RIRDC, Australian Poultry CRC, and AECL. We hope that stronger collaboration can be developed with these funding bodies as well as directly with industry. Likewise, we are fortunate to receive approximately one third of the cost of hosting the Australian Poultry Science Support from industry sponsorship. With respect to the 2006 APSS, we gratefully acknowledge the invited speakers for their contributions and time, likewise for those presenting and attending the scientific sessions.

In 2006 we have seen completion of repairs and upgrades to the infrastructure of the Poultry Research Unit, including the addition of added heating units to the brick bioassay building, correction of roof defects to the layer and broiler sheds, and the addition of wireless communication with the research facilities. There are still other considerations to be made with respect to upgrading layer cages for the environmental control rooms and increasing the applications for feed processing.

At the end of 2006 I officially resigned from the University and as Director of the Poultry Research Foundation. This was a very difficult decision, and was based on a number of circumstances related to long-term support for my position and the chance to pursue new opportunities. There are significant challenges ahead for the Poultry Research Foundation to deliver learning experiences for a much larger student base and maintain its service to the members of the foundation as outlined above. I deeply wish to thank the members of the Foundation for their support and their extension of good wishes for my future.

Respectfully,
Tom A. Scott

POULTRY RESEARCH FOUNDATION MEMBERS

Governors

Bartter Enterprises

Inghams Enterprises Pty Ltd

Members

Baiada Poultry Pty Ltd

BASF Australia Ltd

Danisco Animal Nutrition

Degussa Australia Pty Ltd

Elanco Animal Health

Novus Nutrition Pty Ltd

Phibro Animal Health

Weston Animal Nutrition

Company Members

ADM Australia Pty Ltd

DSM Nutritional Products Pty Ltd

Novartis Animal Health

Ridley AgriProducts

Associate Members

Adisseo Australia Pty. Ltd

Biomin Australia Pty. Ltd

Cordina Chicken Farms Pty Ltd

Kemin (Aust) Pty Ltd

OziBioPharm

The Egg Basket (Sales) Pty. Ltd

POULTRY RESEARCH FOUNDATION COUNCIL

President	Ms. Linda Browning
Deputy President	Ms. Judith O’Keeffe
Director	Professor Tom Scott
Administrative Assistant	Mrs. JoAnn Geist

Industry Members

ADM Australia Pty Ltd
Mr. John McLeish

Baiada Poultry Pty. Limited
Mr. Greg Hargreave/Dr. Peter Groves

Batter Enterprises
Mr. Peter J. Bartter / Dr. Tim Walker

BASF Australia Ltd
Mr. Chris Roach / Dr. Peter H. Selle

Danisco Animal Nutrition
Mr. Roy Frederick/Dr. David Cadogan

Degussa Australia
Mr. Markus Moser

DSM Nutritional Products Pty. Ltd
Ms. Linda Browning

Elanco Animal Health
Mr. Jim Aspinall

Inghams Enterprises Pty Ltd
Dr. Ron MacAlpine

Novus International Pty Ltd
Mr. David Watson

Novartis Animal Health
Mr. Nick Malikides

Phibro Animal Health
Mr. Peter Doyle

Ridley Agriproducts
Ms. Judith O’Keeffe

Weston Animal Nutrition
Mr. Todd Middlebrook

Ex Officio Members

The Chancellor

The Vice Chancellor

Executive Dean – Faculties of Science

The Deans of Agriculture and Natural Resources, and Veterinary Science

The Pro-Dean and Associate Dean for Research, Faculty of Veterinary Science

The Director of the Foundation

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

Honorary Governors

Emeritus Professor E. Frank Annison

Dr. Balkar S. Bains

Dr. Derick Balnave

Professor Wayne Bryden

Mr. John Darling

Mr. Ern Newton

STAFF AND STUDENTS

Academic Staff

Professor T.A. Scott, BScAg (Saskatchewan), MSc (McGill), PhD (Sydney)

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

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

Dr. P. Groves BVSc. (Sydney) MACVSc. (Epidemiology) PhD (Sydney)

Honorary Research Fellows

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

Support Staff

Mrs. R.J. Gill

Mrs. M.E. Hayter

Mr. S.J. Wilkinson, B.Sc.Agr., MScVSc. (Sydney)

Mrs. J. Geist (Administrative Assistant)

Postgraduate Students

Mr. Mohamed Sayed

Mrs. Elizabeth Ovelgonne

Honours Students (conducted thesis projects in poultry)

This year three fourth year animal production students have conducted thesis projects under supervision of the Poultry Research Foundation.

1. Shelly Burnett (Supervisors: Wilkinson, Scott) **“Very early dietary intervention effects on post hatch broiler chick performance and development”**
2. Gillian Hay, (Supervisor: Scott) **“A project to establish efficient, bird and environmentally friendly commercial duck production in Australia”**
3. David Ford, “CRC Scholarship (Supervisor: Scott) **“Utilising chicken litter derived microalgae in broiler diets”**
4. Three students have signed up for research project in poultry at present; this number may change by the time term starts in March 2007.

External Appointments

1. Australian Poultry CRC Education Committee
2. Assist in editing "Best Practices for the Conduct of Animal Studies to Evaluate Crops Genetically Modified for Output Traits". The publication is prepared by the ILSI International Food Biotechnology Committee

Degrees Awarded

Higher degrees were awarded to the following postgraduate students of the Poultry Research Unit during 2006.

Doctor of Philosophy

None

Master of Agriculture

None

Conference Attendance

Australian Poultry Science Symposium 2006, including presentations by P.H. Selle, S. Wilkinson and T.A. Scott

Acknowledgments & Awards

AUSTRALIAN POULTRY SCIENCE SYMPOSIUM - 2006

The 18th annual, combined scientific meeting of the Poultry Research Foundation and the World's Poultry Science Association (Australian Branch) was held on February 20-22nd, 2006. A total of 152 participated in the 2006 APSS. A total of fourteen invited presentations and 44 contributed presentations were heard at the meeting. Invited speakers and presentation titles, include:

Dr. Deana Jones, USDA Agricultural Research Services	Conserving and Monitoring Shell Egg Quality The Impact of Shell Egg Processing on Food Safety
Dr. Peter Lewis University of KwaZulu- Natal	Lighting growing Pullets – get it wrong at your peril. Lighting for Growth and Feed Conversion Efficiency.
Dr. Robert Renema University of Alberta	Identifying Broiler Breeder Management – Nutrition interactions to Optimise Chick Production. Role of Broiler Breeder Genetics on Breeder Chick Quality and sensitivity to Overfeeding.
Dr. David Creswell Creswell Nutrition	High Pelleting Temperatures Reduce Broiler Performance
Dr. Manfred Peisker ADM Specialty Ingredients	Feed Processing – Impacts on Nutritive Value and Hygienic Status in Broiler Feeds..
Dr. Ian Buick Operations Management Services Ltd	Trends and Technologies for Feed Milling
Dr. Marcus Kenny Aviagen Limited	Optimising Broiler Performance – The Role of Physical Feed Quality Optimum Broiler Feeds; The Aviagen Protein Calculator Incubation for Uniformity
Dr. Marleen Boerjan Pas Reform Hatchery Technologies Netherlands	
Dr. Peter Surai Scottish Agricultural College	Selenium in Poultry Nutrition: from Improvement of Reproductive Performance to Functional Food
Dr. Jose-Maria Hernandez DSM Nutritional Products Limited	European Consumer Perspectives on Egg Quality
Tasmyn Crowley CSIRO Livestock Industries	Mircoarrays: Chipping away at the Mysteries of Chicken Genomics
Dr. Andrew Ball DSM Nutritional Products (UK) Ltd	Chicken Production in Europe – Where do we go from here
Dr. David Chapman University of Arkansas	Guidelines for the development and registration of Anticoccidial Vaccines for Poultry
Dr. Colin Whitehead Roslin Institute	A Comparison of Genetic, Nutritional and Environmental effects on Bone Characteristics and Osteoporosis in Laying Hens

Sponsorship of the Symposium (2006) was kindly supplied by:

Speakers Sponsors	ADM Australia Pty. Limited Australian Egg Corporation Ltd Alltech Biotechnology Pty. Limited Aviagen DSM Nutritional Products Pty. Limited PasReform RIRDC Chicken Meat Program
Gold Sponsors	Alltech Biotechnology Pty Ltd Degussa Australia Pty Ltd DSM Nutritional Products Pty Ltd
Silver Sponsors	Nil
Bronze Sponsors	Adisseo Australia Pty Limited Australian Poultry CRC Brisbane Export Corporation Biomim Australia Danisco Animal Nutrition Elanco Animal Health
Other Sponsors	OziBioPharm

Australian Poultry Science Symposium - 2007

The 2007 Australian Poultry Science Symposium will be held on February 12 - 14th in conjunction with AVPA. The main themes of the Symposium will be:

1. Combating the Effects of Heat Stress
 - a. Professor S. Yahav, ARO the Volcani Center, Israel
 - b. Dr. P. Cronje, Cronje Consulting and Editing, Australia
 - c. Dr. Carlyle Bennett, Manitoba Agriculture, Food and Rural Initiatives
2. Bone and Eggshell Formation and Problems in Broilers and Layers
 - a. Dr. Mark Pines, Volcani Center, Israel
 - b. Professor Colin Whitehead, Roslin Institute, UK
3. Hot Topics - Extension
 - a. Dr. Stephen Collett, University of Georgia, USA

FOUNDATION RESEARCH IN REVIEW

For some 40 years the Poultry Research Unit at Camden has been very active in both broiler and layer research. Some major achievements during the last decade are listed below. This is a very succinct summary with research findings and industry outcomes listed for each major research area. Organisations that appear in brackets e.g. RIRDC indicate the major source of funding for the research area.

1. Amino Acid Digestibility Studies (RIRDC)

Research Findings

- i) Development of an assay model for the determination of endogenous amino acid losses under a continuous feeding regimen using guanidinated proteins.
- ii) Comparison of excreta and ileal-based assays to measure amino acid digestibility; the results showed that ileal digesta analysis is more appropriate.
- iii) Development of an ileal digestibility assay for routine determination of amino acid digestibility.
- iv) Compilation of a database of the apparent ileal amino acid digestibilities of feedstuffs.
- v) Development of a method for tryptophan analysis and compilation of ileal tryptophan digestibility of feedstuffs.
- vi) Evaluation of feed enzymes on digestible amino acid supply.
- vii) Application of digestible amino acids to feed formulation.

Industry Outcomes

- Publication of a database: “Digestible Amino Acids in Poultry Feedstuffs” (RIRDC)
- Favourable cost/benefit analyses of industry outcomes (RIRDC)
- Standardized Ileal Digestibility of Amino Acids in Poultry - International Compilation (Industry)
- Reference data for development of *in vitro* test methodology (Industry)
- Feature article in Feedstuffs (July 3, 2000) “Digestible amino acid values more appropriate than total amino acids”.

2. Modulation of lean tissue deposition by dietary fatty acids (RIRDC; ARC)

Research Findings

- i) Demonstration that dietary inclusion of n-3 and n-6 fatty acids can reduce carcass fatness.
- ii) Demonstration that dietary inclusion of n-3 and n-6 fatty acids can improve feed conversion efficiency.

Industry Outcomes

- Recommendations for inclusion of fatty acids that will optimise growth and feed conversion efficiency.
- Enriched meat and eggs as functional foods (Smart Food Centre, University of Wollongong).

3. Development of a non-invasive test for stress in laying hens (RIRDC)

Research Findings

- i) The relationship between corticosterone and catecholamines in egg albumen was established.
- ii) Corticosterone and not catecholamine concentrations in egg albumen reflect stress in hens.

Industry Outcome

- Egg albumin concentrations of corticosterone could provide a non-invasive measure of stress in hens.

4. Mucosal immunity in chickens (RIRDC)

Research Findings

- i) Identification of the site of precursors of IgA producing cells.
- ii) Identification of cytokines involved in regulating secretory IgA.
- iii) Investigation of *in ovo* vaccinations.
- iv) Investigation of the potential for nutrients to modulate the immune response in chickens.

Industry Outcomes

- Facilitate improved mucosal immunity.
- Development of oral vaccines.

5. Nutritional and toxicological evaluation of transgenic plants (CSIRO Division of Plant Industry)

Research Findings

- i) Enrichment of lupins with sulphur containing amino acids.
- ii) Insect resistant field peas.

Industry Outcome

- Improved poultry feed sources.

6. Application of feed enzymes (Industry)

Research Findings

- i) Antinutritive effects of phytate with regard to energy and protein.
- ii) Enzyme combinations and improved nutrient utilization.

Industry Outcome

- Estimation of the value of feed enzymes in modifying feed formulations.

7. Mycotoxins in poultry feeds (ADAB)

Research Findings

- i) Contamination of corn by aflatoxin, zearalenone and fumonisins and effects on nutritive value.
- ii) Toxicology of ergot alkaloids in poultry.

Industry Outcome

- Improved understanding to reduce the risk posed by mycotoxin contamination of poultry feeds.

8. Egg Shell Quality (RIRDC)

Research Findings

- i) Defining conditions for beneficial responses to dietary sodium bicarbonate supplementation.
- ii) Influence of intermittent lighting at high temperatures.

Industry Outcome

- Defining conditions for improving egg shell quality

9. Amino acid balance for heat stressed broilers (Industry)

Research Findings

- i) Identification of need for increased dietary arginine:lysine ratio.
- ii) Interaction of dietary sodium bicarbonate with arginine:lysine ratio.
- iii) Influence of dietary arginine:lysine ratio on the relative efficacy of different methionine sources.

Industry Outcomes

- Identification that dietary amino acid balance varies with ambient temperature.
- Defining optimum dietary arginine:lysine ratios.

10. Nutritional requirements of recently imported layer stock (RIRDC)

Research Findings

- i) Lysine requirement of ISABrown layers.
- ii) Methionine requirement of ISABrown layers.

Industry Outcome

- Defining lysine and methionine requirements of ISABrown laying hens under Australian conditions.

CURRENT RESEARCH PROJECTS

Professor Tom Scott:

Professor Tom Scott has completed or in progress the following industry supported projects

1. RIRDC Chicken Meat Program - Variability in performance and physiology of broilers fed cereal-based diets.
 - a. This preliminary project is now complete and a final report submitted to the RIRDC Chicken Meat Committee.
 - b. Significant variation in feed intake was observed in the grain samples tested (n=45) in broiler chick bioassay diets with and without enzyme, and as expected had strong correlations with growth (positive) and FCR (negative), but no relationship with AME.
 - c. There were some interesting relationships between bioassay performance measures and physiological (immune response) and anatomical (gastrointestinal villi size); however, these parameters only predicted a moderate amount of the feed value variability.
 - d. Paper submitted to APSS 2007 (Scott and Muir)
2. RIRDC Chicken Meat Program - Early dietary and management intervention on broiler breast meat yield.
 - a. Seven inovo feeding trials have been completed that screened a number of variables, including: nutrients, delivery point; age of injection. One early feeding trial was just completed.
 - b. Ongoing development of tools for scoring response with regards to gut development and breast muscle cell numbers/size.
 - c. The project was terminated and a final report submitted to the RIRDC Chicken Meat Committee
3. Australian Poultry CRC – Oral delivery system for poultry health products working with Dr. Wendy Muir. See below for details
4. Monitoring of individual hen egg production and egg quality (shell and albumen).
 - a. A total of 420 ISA hens, fed a commercial diet, provided by Baiada Poultry Pty Limited and Pace Farm were monitored from 16 to 44 weeks of age.
 - i. On average (16-44 weeks), individual hen albumen quality varied from 62 to 99; and average dry shell percentage ranged from 6.7 to 12.0%. The consistency of egg quality for individual hens is high.
 - ii. Individual hens have been identified for histological assessment.
 - b. Conducted laboratory assessment of a large number of eggs generated for an AECL consumer survey
5. Efficient, environment and bird friendly commercial duck production
 - a. Project has been supported by RIRDC New Animal Industries
 - b. Three years to help Pepe's Pty Limited establish growth models and develop feeding and management strategies to optimise duck production.

Dr. Wendy Muir:

Dr Muir is currently involved with collaborative research projects that have been funded by the Australian Poultry CRC. The projects are:

1. Application of genomic-based technology for the development of new health products involves collaboration with CSIRO AAHL Geelong, University of Melbourne, University of Sydney, University of New England and Bioproperties Pty Ltd.

No new work has been undertaken with this project at the Univeristy of Sydney in 2006.

2. Development of new generation mycoplasma based vaccines involves collaboration with University of Melbourne, CSIRO AAHL Geelong, University of Sydney and Bioproperties Pty Ltd.

Work at the University of Sydney has been focussed on establishing an ELISA system to identify an effective immune response to the Mycoplasma gallisepticum ts-11 (MG ts-11) vaccine. MG ts-11 specific ELISA's have been established for the antibody isotypes IgG and IgA. Some difficulties were encountered with the identification of a suitable standard reference serum for MG ts-11 IgA, but this was overcome following the hyperimmunisation of birds for MG ts-11 from which sera containing reasonable IgA antibody titres was retrieved. Serum, tracheal and nasal washing samples of birds vaccinated with the ts-11 vaccine in studies run during 2006, have been evaluated for anti- MG ts-11 IgG and IgA antibody titres.

3. Oral delivery system for poultry health products in conjunction with Professor Tom Scott.
 - a. PerOs Technologies sent a technical representative from Canada to oversee the administration of the carrier they have used to deliver vaccines via the diet to aquaculture.
 - b. A total of 37 treatments were used to compare the immune response of oral administration of three antigen types.
 - c. Laboratory assays have been completed and results are currently undergoing statistical analysis with a final report pending.

Dr. Jeff Downing:

Dr. Jeff Downing is continuing work on the following research projects:

1. In collaboration with Geoff Stewart at the University of Queensland the effects of the different housing systems (free range, barn, conventional cages and environmental controlled housing) on stress levels are being evaluated. The first collection of eggs was completed in late July and second collection is scheduled for later in the year.
2. In collaboration with John Barnett at Werribee the effects of various modifications to furnished layer cages on stress in hens is being evaluated. The first egg collection was completed in May and the second collection has just been finalised.

3. At Camden work has continued on aspects of heat stress and presently, studies are in progress examining the effect of bird age on the ability of hens to handle stress when housed in conventional cages.

Dr. Peter Selle:

Dr. Peter Selle is currently involved in the following projects:

1. Potassium diformate versus Necrotic Enteritis
The results of this study will be presented at the 2007 Australian Poultry Science Symposium and a paper [Effect of potassium diformate on growth performance and gut microbiota in broiler chickens with necrotic enteritis] has been submitted to *British Poultry Science*. In this paper the concept that it may be possible to influence dissociation kinetics and enhance efficacy of potassium diformate, via the manipulation of acid binding capacities and dietary electrolyte balances, is discussed.
2. Dephytinisation
This RIRDC-funded project is designed to define the anti-nutritive properties of phytate via the experimental use of dephytinised feed ingredients. It is possible to remove phytate from feed ingredients (sorghum, soyabean meal) by the hydrothermal application of microbial phytase. Essentially this involves mixing a 1:1 slurry of finely-ground feedstuff and water, containing phytase and citric acid, at 45°C for 2 hours followed by drying at 60-65°C for 48-72 hours. Placebo dephytinisation, or sham-treatment, is identical except that phytase and citric acid are not incorporated into the slurry.

It is critical that sham-treatment is innocuous. Sorghum was selected as the cereal grain because it is commonly included in Australian broiler diets and, unlike wheat, contains little intrinsic phytase activity. Sorghum-casein diets were offered to broilers in which the sorghum was (i) ground, (ii) sham-treated or (iii) dephytinised. From 7-21 days post-hatch, the growth performance of broilers offered sham-treated or dephytinised sorghum-based diets was similar but substantially inferior to the negative controls. As indicated in parentheses, weight gain (-27.1%), feed intake (-20.3%) and feed efficiency (-9.5%) were significantly ($P < 0.001$) inferior. There were no significant ($P > 0.20$) differences between treatments for apparent metabolisable energy. In contrast, nitrogen (N) retention of broilers offered sham-treated (0.574) or dephytinised (0.580) sorghum was significantly ($P < 0.02$) inferior to the controls (0.627). Quite clearly, sham-treatment of sorghum is not an innocuous procedure.

It is probable that the 'moist heat' of the dephytinisation procedure is damaging protein quality of sorghum. It has been demonstrated that cooking sorghum (boiling water bath for 20 minutes) reduces *in vitro* protein digestibility by 20.2% (0.641 versus 0.803); whereas, cooking slightly enhanced protein digestibility in maize (Hamaker *et al.*, 1986). It is likely that protein cross-linking in the β - and γ -kafirin proteins induced by moist-heat in sorghum is responsible for the reduced protein digestibility (Duodu *et al.*, 2003).

3. Phytase amino acid digestibility assay in weaner pigs

An APL-funded project to determine the impact of exogenous phytase on apparent ileal amino acid digestibilities in weaner pigs is nearing completion. In this study, ileal digesta samples were taken from anaesthetised pigs and hexatricontaine was used as the dietary marker. In the majority of phytase amino acid digestibility assays completed in pigs, cannulation techniques have been used to collect ileal digesta and chromic oxide has been used as the marker. It is relevant that more pronounced responses in amino acid digestibility to phytase have been recorded where ileal digesta samples have been taken from 'intact' (anaesthetised or slaughtered) pigs as opposed to cannulated animals. It is also relevant that in phytase amino acid digestibility assays in broilers more pronounced responses to phytase have been observed when markers other than chromic oxide have been used (eg. acid insoluble ash, titanium oxide).

RESEARCH COLLABORATION AND INDUSTRY SERVICES

Professor Tom Scott has completed contract research work with the following companies:

1. Ongoing association with Pace Farm and Baiada to monitor laying hens (four strains)
2. Assisted AECL in conducting a consumer survey of expectations for egg quality.
3. Conducted an evaluation of coccidiostats for Elanco Animal Nutrition

Dr Muir is involved with collaborative research projects that have been funded by the Australian Poultry CRC as specified above.

Dr. Peter Selle was involved with collaborative research projects as stated previously.

Dr, Jeff Downing is involved in collaboration work as stated above

COMMUNICATIONS

Publications:

- Afsharmanesh, M., **Scott T.A.** and Silversides, F.G (2006) A comparison of grinding processes and wet feeding of wheat-based diets on AME, production and gastrointestinal tract development of broiler chicks. *Can. J. Anim. Sci.* **86**: 255-261
- Selle, P.H.**, Ravindran, V., Bryden, W.L. and **Scott, T.A** (2006) Influence of dietary phytate and exogenous phytase on amino acid digestibility in poultry : A review. *The Journal of Poultry Science* **43**: 89-103
- Selle PH**, Ravindran V, Bryden WL, Scott T (2006). Influence of dietary phytate and exogenous phytase on amino acid digestibility in poultry: a review. *The Journal of Poultry Science* **43**, 89-103.
- Selle PH**, Creswell DC, Cadogan DJ, GG Partridge, Scott T (2006). Phytase supplementation of wheat-based broiler diets reduces dependence on meat-and-bone meal. *The Journal of Poultry Science* **43**, 330-338.
- Selle PH**, Ravindran V (2006). Microbial phytase in poultry nutrition. *Animal Feed Science and Technology* (in press).
- Selle PH**, Ravindran V, Ravindran G, Bryden WL (2006). The interaction between dietary lysine and microbial phytase on the performance and nutrient utilisation of broiler chickens. *Asian-Australasian Journal of Animal Sciences* (submitted for publication).
- Scaramuzzi, Rex. J., Campbell, Bruce. K., **Downing, Jeff.** V., Kendall, Nigel. P., Khalid, Muhammad, Muñoz-Gutiérrez, Minerva., Somchit, Anongnart. (2006) A review of the effects of supplementary nutrition in the ewe on the concentrations of reproductive and metabolic hormones and the mechanisms that regulate folliculogenesis and ovulation rate. *Reproduction Nutrition and Development*, 46, 339-354.
- De Graf, SP., Beilby, K., Osborn, D., **Downing, J.A.** and Maxwell, W.M.C. (2006) Embryo production from superovulated sheep inseminated with sex-sorted ram spermatozoa. *Theriogenology*, (in press)
- Wang, B., **Downing, J.A.**, Petocz, P., Brand-Miller, J. and WL Bryden (2006) Metabolic fate of intravenously administered N-Acetylneuraminic acid-6-14C in newborn piglets. *Asia Pacific Journal of Clinical Nutrition* (in Press)

Symposium 2006 Proceedings Volume 18:

1. **Tomkinson, C. and Scott T.A.** 2006 Use of pregermination of grains and oilseeds to improve the feed value and gut development in broiler chickens Pp 67-70
2. **Tomkinson, C. and Scott T.A.** 2006 Effects of extended pregermination and formic acid on feed wheat feed value to broiler chickens Pp 71-74
3. **Scott T.A** 2006 Feed value of wheat-, triticale-and sorghum-based diets supplemented with and without enzymes for broilers Pp 83-86
4. **Selle, P.H** 2006 Citric acid enhances enzymatic hydrolysis of phytate Pp 91
5. **Reynolds, Y.S. and Downing, J.A** 2006 Measure of fear and the response to stress in laying hens Pp 100
6. **Knight, K.L and Scott T.A** 2006 Preliminary development of a diagnostic tool for determining true fertility in chicken eggs Pp 149-152
7. **Wilkinson, S.J. and Scott T.A.** 2006 Preliminary results of *in ovo* strategies to increase breast meat yield in broiler chickens Pp 206-209
8. **Barnett, J.L., Cronin, G.M., Tauson, R., Downing, J.A., Vanardhana, V.J., Lowenthal, J.W. and Butler, K.L.** 2006 The effects of the items of furnished cages on laying hen welfare. Pp 18, 114-117.
9. **Reynolds, Y.S. and Downing J.A.** 2006 Measures of fear and the response to stress in laying hens. Pp 100.

Abstracts:

Scott, T.A. (2006). Variability in feed value of Australian wheat-, triticale- and sorghum-based diets supplemented with and without enzymes for broilers. Poultry Science Association 95th Annual Meeting, Edmonton, Alberta, July. Poultry Science 85 (Suppl 1), abstract 225.

Tomkinson, C.M. and Scott, T.A. (2006). Efficacy of germination time and use of a preservative (potassium di-formate) on feeding value of wheat for broilers. Poultry Science Association 95th Annual Meeting, Edmonton, Alberta, July. Poultry Science 85 (Suppl 1), abstract 234.

Knight, K.L. and Scott, T.A. (2006). Determining true fertility of clear eggs identified at 7 days incubation histologically. Poultry Science Association 95th Annual Meeting, Edmonton, Alberta, July. Poultry Science 85 (Suppl 1), abstract 254.

Ovelgonne, E., Muir, W.I. and Scott, T.A. (2006). Strategies to identify and develop nutraceutical peptides in meat and bone meal to enhance its feed value for poultry. Presentation to the Faculty Postgraduate Seminar, Camden, NSW, October.

Sayed, M., Downing, J.D. and Scott, T.A. (2006). Nutritional and epigenetic strategies to reduce the impact of heat stress on poultry production. Presentation to the Faculty Postgraduate Seminar, Camden, NSW, October.

Invited presentations:

Scott, T.A. (2006). Poultry research in Australia. WPSA Canada Branch – Edmonton, Alberta, July

Scott, T.A. (2006). Met with the staff and students of the poultry research program (H.L. Classen, Department Head) at the University of Saskatchewan. Saskatoon, Saskatchewan, July

Scott, T.A. (2006). The ultimate bioassay. Provimi Research and Technology Centre, meeting with Research and Development Managers, September, Brussels, Belgium

Scott, T.A. (2006). Nutritional methods to improve broiler breeder fertility and early chick growth: A review. Provimi Poultry Training, September, Lisbon, Portugal

Scott, T.A. (2006). Many challenges / opportunities for optimizing high-value poultry meat and egg product. Provimi Poultry Training, September, Lisbon, Portugal.

Selle, P.H. (2006) The variable 'protein effect' of phytate and phytase. Coolum Conference. Feedworks Pty Ltd.