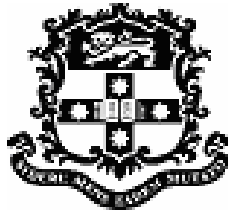




Poultry Research Foundation

**ANNUAL REPORT
2005**



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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University of Sydney
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PRESIDENT'S REPORT

As I mentioned in my opening address at the 2006 Poultry Science Symposium, the poultry industry continues to face challenges which can only be met successfully if it is supported by strong research and teaching programs.

With the release of each new genotype from the breeding companies the productive potential of poultry continues to increase, requiring new standards of nutrition and management to ensure commercial success through the full achievement of that potential. We live in a more demanding era with regard to public awareness and intervention into welfare and environmental issues, which brings legislative change to the ways we manage birds. In such a climate the industry will continue to need appropriately trained nutritionists and veterinarians to manage poultry production enterprises effectively and will continue to need the support of applied research, with a clear commercial focus, which is underpinned by sound basic science.

With this in mind, it is clear that the Foundation is at least as relevant today as it ever was, and it is important that it continues to provide an effective forum for exchange of information and collaboration between the industry and the University. Therefore it is with great pleasure that I report, without fear of contradiction, that the Foundation has had another successful year, with all meetings well attended and much positive feedback from members.

Sincere thanks are due to Professor Tom Scott for his visionary leadership, dedication and sheer hard work in steering the Foundation so effectively. Thanks are also due to Jo-Ann Geist who has carried the burden of administering the Foundation with much enthusiasm and efficiency throughout the year.

The Australian Poultry Science Symposium is regarded by many as the flagship of the Foundation. The 2006 Symposium was in my view one of the very best for many years, from the point of view of attendance, program content, quality of speakers, catering and social program. Congratulations to Tom and Jo-Ann on the success of this event and on behalf of the Foundation, sincere thanks to them both for all the time and effort they put into organising it.

Since this is my last report as President, I take the opportunity to say thank you to Tom and Jo-Ann for making the job so easy and thanks to all members for the support I have received during the last six years. I wish all the very best to my successor and to all members for the continuing success of the Foundation.

Dr Ian Partridge

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 team has worked very hard to meet these challenges and we will continue to maintain these objectives as core priorities. 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.

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 2005 APSS, we gratefully acknowledge the invited speakers for their contributions and time, likewise for those presenting and attending the scientific sessions.

Key objectives I will continue to work towards will be in developing our capacity to conduct poultry research and provide opportunities for learning (undergraduate and postgraduate). Although there has been no direct intervention for repairs to the infrastructure of the layer and deep litter broiler sheds, we have continued to be promised that these issues will be dealt with. Significant changes have been made to upgrading of some of the equipment and working areas of the facilities, including installation of two 2200 egg capacity incubator / hatchers, mobile hammer mill, laboratory equipment, and stainless steel working tables. Future efforts need to be directed for obtaining support for: a) new growing and laying cages for use in the environmental control rooms, existing cages do not comply with the new industry codes; upgrading feed milling equipment to include steam pelleting and feed cooling/crumbling as well as to minimise labour and OH&S concerns. Your support and assistance in achieving our goals is essential and it is our intention to demonstrate the value of this contribution.

I look forward to continued interactions as well as building new ones. In particular, your support in developing professional training opportunities for undergraduates and postgraduates is needed. I hope these interactions are as rewarding for yourselves and the students as they continue to be for myself.

Respectfully,
Tom A. Scott

POULTRY RESEARCH FOUNDATION MEMBERS

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Bartter Enterprises
Inghams Enterprises Pty Ltd

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ADM Australia Pty. Ltd
BASF Australia Limited
DSM Nutritional Products Pty. Ltd
Ridley AgriProducts

Members

Adisseo Australia Pty. Ltd
Baiada Poultry Pty Ltd
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Associate Members

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POULTRY RESEARCH FOUNDATION COUNCIL

President Dr. Ian Partridge

Deputy President Mr. James Aspinall

Director Professor Tom Scott

Industry Members

ADM Australia Pty Ltd
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Mr. Peter J. Bartter / Dr. Tim Walker

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

DSM Nutritional Products Pty. Ltd
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The Chancellor

The Deputy Chancellor

The Pro-Vice-Chancellor

The Deans of Agriculture and Natural Resources, and Veterinary Science

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

The Professors of Animal 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

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)

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)

Mrs. A. Gupta

Postgraduate Students

Mohammad Al Jibali – MSc course work

Honours Students (conducted thesis projects in poultry)

This year four fourth year animal production students have conducted thesis projects under supervision of the Poultry Research Foundation, one other has used chickens as a model for calves.

1. Fiona Sparke, “Novel delivery systems for poultry health products”. This work was associated with research supported by the Australian Poultry CRC. The project was done in collaboration with PerOs Technologies a Canadian Biotechnology Company; Fiona spent six weeks in Quebec at Laval University doing a component of her research work. Fiona also received a Poultry CRC honours scholarship. (Supervisors: Muir, Scott)
2. Kylie Knight, “Preliminary development of a diagnostic tool for determining true fertility in chicken eggs”. The project was supported by Baiada Poultry Pty Ltd who provided hatchery participation in collection of 2000 “infertile” eggs from two egg storage treatments. (Supervisor: Scott)
3. Cameron Tomkinson, “Use of pre-germination of grains and oilseeds to improve feed value and gut development in broiler chickens”. The student conducted two 21 day broiler trials to evaluate a total of 14 dietary treatments. Cameron received an Australian Poultry CRC honours scholarship for his project. Cameron will also receive the Poultry Research Foundation Prize (\$700) for obtaining the highest mark in the

Poultry Production course (89%) and demonstrating a significant commitment to the poultry industry (thesis project). (Supervisors: Selle and Scott)

4. Tim Dawson, “Effect of calcium source, size and solubility on egg quality”.
(Supervisor: Scott)
5. Quintin Lau, “Identification of gastrointestinal biological activities in colostrum”.
(Supervisor: Wynn; Dairy project using chicken embryos and chicks)

External Appointments

Professor Scott was asked to become an advisor to the Premium Grains for Livestock Program

Professor Scott is on the Poultry CRC Education committee, responsible for reviewing applications for postgraduate and honours scholarships; and for development of CRC education program.

AECL – Egg quality program director

Degrees Awarded

None

Doctor of Philosophy

None

Master of Agriculture

None

Conference Attendance

Australian Poultry Science Symposium 2005, including presentations by Drs. J. Downing, P.H. Selle, W. Muir and Professor T.A. Scott

3rd International Poultry Broiler Nutritionists Conference, Auckland, New Zealand. Two presentations by T.A. Scott

Feedworks Coolum Meeting. Presentations by P.H. Selle and T.A. Scott

Recent Advances in Animal Nutrition in Australia. Presentation by T.A. Scott.

Acknowledgments & Awards

AUSTRALIAN POULTRY SCIENCE SYMPOSIUM - 2005

The 17th annual, combined scientific meeting of the Poultry Research Foundation and the World's Poultry Science Association (Australian Branch) was held on February 7-9, 2005. A total of 140 participated in the 2005 APSS. A total of 12 invited presentations and 60 contributed presentations were heard at the meeting. Invited speakers and presentation titles, include:

Professor John Taylor University of Pretoria	Non-starch polysaccharides, proteins and starch: Form, function and feed – Highlight on sorghum. Five simple “in-field” methods for measuring sorghum end-use quality.
Dr. Henk Enting Schothorst Feed Research	Starch digestion rate affects broiler performance. Effect of low density feeds on performance of broiler breeders and their offspring.
Dr. John Black Premium Grains for Livestock Programme	The energy value of cereal grains, particularly wheat and sorghum, for poultry.
Professor Mike Forbes University of Leeds, UK	Wet feeding of young chicks. Why did the chicken choose the food?
Dr. Roger Lentle Massey University, NZ	The macrobiophysics of digestion: Implications for the poultry industry.
Professor Tom Scott, University of Sydney	The impact of pelleting and enzyme supplementation on feed value of twenty five Canadian wheat samples
Professor Bob Pym University of Queensland	Genetic aspects of food intake and food utilisation efficiency for growth in chickens
Professor Julie Roberts University of New England	Egg Nutrition for health promotion: Highlights from the symposium in Banff, Canada
Dr. Jane Dixon Australian National University	The social life of the Australian chicken
Mr. Paul Meggison Aust-Asia Business Solutions	Changes in the Asian livestock industries: Implications for Australian producers and the feed industry
Dr. Andrew Turner Andrew Turner Consulting	An update on avian influenza
Professor Peter Coloe RMIT University	The changing nature of food borne pathogens – a bird's eye view of how these may impact on food safety

Sponsorship of the Symposium (2005) was kindly supplied by:

Speaker Sponsors	Australian Egg Corporation Ltd RIRDC Chicken Meat Program
Gold Sponsors	ADM Australia Pty Ltd Alltech Biotechnology Pty Ltd Degussa Australia Pty Ltd DSM Nutritional Products Pty Ltd
Silver Sponsors	Biomim Australia
Bronze Sponsors	Adisseo Australia Pty Limited Brisbane Export Corporation Danisco Animal Nutrition Elanco Animal Health Novus International Pty Ltd OziBioPharm Baiada Poultry Pty Ltd Pace Farm Pty. Ltd
Other Sponsors	Australian Poultry CRC

Australian Poultry Science Symposium - 2006

The 2006 Australian Poultry Science Symposium will be held on February 20 – 22nd. The main themes of the Symposium will be:

1. Physical Effects of Feed Processing on Digestion and Performance
 - a. Dr. David Creswell – Creswell Nutrition.
 - b. Dr. Manfred Peisker – ADM Specialty Ingredients
 - c. Dr. Ian Buick – Operations Management Services Ltd
 - d. Dr. Marcus Kenny – Aviagen Limited
2. Optimising Egg and Chick Quality
 - a. Dr. Deana Jones – USDA Agricultural Research Service
 - b. Dr. Peter Lewis – University of KwaZulu-Natal
 - c. Dr. Marleen Boerjan – Pas Reform Hatchery Technologies Netherlands
 - d. Dr. Robert Renema – University of Alberta Canada
 - e. Dr. Peter Surai – Scottish Agricultural College
 - f. Dr. Jose-Maria Hernandez – DSM Nutritional Products Limited
3. Hot Topics
 - a. Tamsyn Crowley – CSIRO Livestock Industries
 - b. Dr. Andrew Ball – DSM Nutritional Products (UK) Ltd
 - c. Dr. David Chapman – University of Arkansas
 - d. Dr Colin Whitehead – Roslin Institute

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:

1. RIRDC Chicken Meat: US-134A “Early dietary and management intervention on broiler breast meat yield.” Project Objectives: Feeding and management strategies to facilitate early nutrition of broiler chicks to maximise uniform production of breast meat yield and market age and weight.
2. RIRDC Chicken Meat: US-137A “Variability in performance and physiology of broilers fed wheat- and sorghum-based diets.” Project Objectives: Define what characteristics are critical to determining / predicting the feeding value of wheat and sorghum grains; with an emphasis on wheat; Provide an approach that will contribute to a more complete understanding of feeding value for these cereal grains, including the impact on gut physiology/microbiology
3. Australian Poultry CRC: “Oral delivery system for poultry health products.” Project objectives: The project was supported to develop a preliminary investigation of using OralJect™, a vaccine diet carrier, developed by PerOs Technologies (Canada) for use in delivery of health products to aquaculture. The carrier has been successfully applied, patented and commercially marketed for use of delivery of vaccines to aquaculture. Combinations of ingredients routinely used in diet formulations are combined to temporarily suspend digestion (raise pH and inactivate proteases) to facilitate adequate delivery of intact antigens (alternatively this may be enzymes, cytokines, probiotic cultures, etc). The diet also contains other dietary components that facilitate intact proteins activating both mucosal and long-term serum antibody response or alternatively binding to the intestinal epithelium and generating serum antibody responses directly. Initial studies have demonstrated some palatability problems with existing carrier formulations and less alternation in gizzard digesta pH than was expected. A series of alternative ingredients tested in combination with antigens is planned for January.
4. 4th Year Animal and Veterinary Bioscience Honours Student Projects:
 - a. Fiona Sparke, “Novel delivery systems for poultry health products”.
 - b. Kylie Knight, “Preliminary development of a diagnostic tool for determining true fertility in chicken eggs”.
 - c. Cameron Tomkinson, “Use of pre-germination of grains and oilseeds to improve feed value and gut development in broiler chickens”.
 - d. Tim Dawson, “Effect of calcium source, size and solubility on egg quality”.
5. Industry funded projects
 - a. Egg quality variability of individual hens (Baiada Poultry and Pace Farm)
 - b. BegaNP, evaluation of “Selvita” a processed fish product as a nutraceutical
 - c. NSI Dental, evaluation of whey by-products and nutraceuticals for broiler health
 - d. Preliminary study to evaluate Salmate as a feed additive for broiler breeders. Feedworks and Baiada Poultry Pty Limited.
 - e. AME – Weston Feeds (Kim Huang)

Dr. Wendy Muir:

Dr Muir is 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.
Work at the University of Sydney involves assessment and enumeration of IgA antibody producing plasma cells present in tissue samples, with a particular focus on tissues of the mucosal surfaces.
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 is focussed on establishing an ELISA system to identify an effective immune response to the *Mycoplasma gallisepticum* ts-11 vaccine. ts-11 specific ELISA's are being established for each of the antibody isotypes IgM, IgG and IgA. Both serum and samples taken from mucosal washings of birds vaccinated with the ts-11 vaccine are being evaluated in the optimised ELISA.
3. Working in collaboration with Professor Tom Scott on the “Oral delivery system for poultry health products.”

Dr. Peter Selle:

Evaluation of potassium diformate (Formi®)

The fourth of a series of potassium diformate feeding studies in broilers was completed. Potassium diformate, an ‘acidifier’, is a chemical complex which dissociates into formic acid and potassium formate in the gut and it is probable that the dissociation kinetics impact on the efficacy of potassium diformate.

Anecdotally, acidifiers are more effective in diets with low acid binding capacities (ABC). Recently, Lawlor *et al.* (2005)¹ published ABC values for the common feed ingredients and the ABC of the experimental diets used in the four studies have been retrospectively estimated on the basis of this data. In the one study in which potassium diformate generated positive responses in growth performance and nutrient utilisation the mean ABC were relatively low (481 meq/kg at pH 3). In contrast, in the other three studies in which potassium diformate did not generate positive responses, the average ABC was higher (676 meq/kg). Thus this empirical evidence supports the concept that acidifiers are more effective in diets of low ABC and this may be a contributing factor to the inconsistent responses to acidifying agents observed in pigs and poultry.

The dietary electrolyte balances (DEB) of the experimental diets were also retrospectively estimated [DEB (meq/kg) = Na⁺ + K⁺ - Cl⁻]. Here, positive responses to potassium diformate were associated with relatively high mean DEB (297 meq/kg) and the lack of responses were associated with lower average ABC (247 meq/kg). If

this apparent relationship is valid it would suggest that DEB may influence the dissociation kinetics of potassium diformate.

Presently, potassium diformate is being evaluated in the Necrotic Enteritis challenge model at the University of New England study in association with Dr Lene Mikkelsen. The challenge study will be completed in April, 2006.

Evaluation of exogenous phytase

A paper was presented at APSS 2005² which suggests that the positive influence of exogenous phytase on ileal digestibility of amino acids may, at least in part, be involved with acid-base homeostasis and/or Na⁺-dependent intestinal uptake of amino acids. Two recent studies in Scotland and New Zealand have demonstrated that phytate increases (and phytase decreases) the secretion of Na⁺ into the gut lumen in both atypical and conventional broiler diets. While the mechanisms responsible for this phytate-induced shift of Na⁺ into the gut lumen are not clear, the implications may be important for the intestinal uptake of glucose and certain amino acids.

A review of the impact of phytate and phytase on ileal digestibility of amino acids in broilers³ was submitted to *Journal of Poultry Science* and it will be published in April, 2006. One aspect that is considered is the selection of dietary markers in phytase amino acid digestibility assays. It would appear that responses in amino acid digestibility following phytase supplementation are more pronounced when either acid insoluble ash or titanium oxide are used as markers in comparison to chromic oxide. The majority of assays have used chromic oxide and there is the possibility that this has led to amino acid digestibility responses being reported where phytase has had little or no impact but these results may be misleading. Generally, phytase increases feed intakes and gut transit rates, which could have a confounding effect in chromic oxide assays, as chromic oxide may be more closely associated with the aqueous phase of digesta. Also, it is possible that the release of phytate-bound phosphorus, calcium (and other minerals) by phytase interferes with chromic oxide analytical procedures.

Prior to its inclusion in experimental diets in phytase feeding studies, wheat may be 'pre-pelleted' separately to eliminate intrinsic phytase activity; which, in theory, could compromise responses to exogenous phytase. However, empirical evidence suggests that this may not be the case as positive responses to phytase feed enzymes have been reported in wheat-based, mash diets with intact intrinsic phytase activity.

Consequently, broilers were offered wheat-based diets in which the wheat was either unprocessed ('raw') or had been separately steam-pelleted (~90°), without and with 750 FTU/kg exogenous phytase. Phytase increased N retention in raw wheat diets (0.550 to 0.574) but depressed N retention in diets containing steam-pelleted wheat (0.587 to 0.579) and, moreover, the treatment interaction was significant (P < 0.01). Similar interactive trends were observed for AME (P < 0.15) and weight gain (P < 0.20). There is evidence from experiments with extruded wheat, that heat-treatment reduces the solubility of phytate and protein. Thus the prior, separate steam-pelleting of wheat may render phytate less susceptible to hydrolysis by exogenous phytase and less likely to complex with nutrients in the gut. It is not known if the responses observed in this study would apply to conventionally steam-pelleted wheat-based broiler diets.

- ¹Lawlor PG, Lynch PB, Caffrey PJ, O'Reilly JO, O'Connell MK (2005) Measurements of the acid-binding capacity of ingredients used in pig diets. *Irish Veterinary Journal* **58**, 447-452
- ²Selle PH, Ravindran V, Ravindran G, Bryden WL (2005) Amino acid digestibility and growth performance interactions to phytase and lysine supplementation of lysine-deficient broiler diets. *Proceedings, Australian Poultry Science Symposium* **17**, 234-237.
- ³Selle PH, Ravindran V, Bryden WL, Scott TA (2006) Influence of dietary phytate and exogenous phytase on amino acid digestibility of poultry; A review. *Journal of Poultry Science* **43**, 89-103.

Dephytinisation project

A series of *in vitro* experiments were completed to investigate the elimination of phytate ('dephytinisation') from sorghum and soyabean meal individually by adding and mixing exogenous phytase into a slurry of the feedstuff. The dephytinisation procedure is greatly facilitated by the addition of citric acid. The pH of the slurry is reduced by citric acid from approximately 6.5 to 5.5, which is more conducive to exogenous phytase activity. However, it is believed that the chelating capacity of citric acid is more important and that citric acids strips Mg^{2+} , Ca^{2+} , etc from mineral-phytate complexes rendering phytate more susceptible to enzymatic hydrolysis.

In association with Dr Rob Caldwell (Faculty of Agriculture, Food and Natural Resources) an HPLC method to determine phytate has been developed. This method is more accurate, appropriate and versatile than classic methods of analysing phytate, which are based on the 'ferric chloride-precipitation' principle.

RESEARCH COLLABORATION AND INDUSTRY SERVICES

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

1. Egg quality variability of individual hens (Baiada Poultry and Pace Farm)
2. BegaNP, evaluation of “Selvita” a processed fish product as a nutraceutical
3. NSI Dental, evaluation of whey by-products and nutraceuticals for broiler health
4. Preliminary study to evaluate Salmate as a feed additive for broiler breeders.
Feedworks and Baiada Poultry Pty Limited.

Dr. Wendy Muir is involved with two collaborative projects supported by the Australian Poultry CRC

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

Dr. Peter Selle is involved with two collaborative projects:

1. In association with BASF Animal Nutrition, potassium diformate was evaluated as a possible alternative to antibiotic growth promotants (AGP).
2. Also, in association with BASF Animal Nutrition, the impact of (Natuphos®) phytase on energy utilisation in broilers was investigated, as was the combined inclusion of phytase with potassium diformate in broiler diets.

COMMUNICATIONS

Publications:

- Barnett, J.L. Cronin, G.M., Tauson, R., **Downing, J.A.**, Janardhana, V., Lowenthal, J.W. and Butler, K.L. 2005. The effects of a perch, dust bath and nest box in furnished cages on the welfare of laying hens. 7th European Symposium on Poultry Welfare, Lublin Poland. Animal Science Papers and Reports, 23, Suppl 1, 111-119.
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