AUSTRALIAN EGG®
CORPORATION LIMITED

# 11th European Poultry Conference Bremen, Germany, September 6-10, 2002

**A Report presented for the Australian Egg Corporation Limited**

By

Juliet R. Roberts, School of Rural Science and Agriculture

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**Researcher Contact Details**

| | |
|---|---|
| Name: | Juliet R. Roberts |
| Address: | School of Rural Science and Agriculture,<br>University of New England, Armidale, NSW 2351 |
| Phone: | (02) 6773 2506 |
| Fax: | (02) 6773 3234 |
| Email: | jrobert2@metz.une.edu.au |

In submitting this report, the researcher has agreed to AECL publishing this material in its edited form.

AECL Contact Details
Australian Egg Corporation Limited
A.B.N: 6610 2859 585
Suite 502, Level 5
12-14 Ormonde Pde
HURSTVILLE NSW 2220
PO Box 569
HURSTVILLE NSW 1481

Phone: 02 9570 9222
Fax: 02 9570 9763
Email: irene@aeia.org
Website: http://www.aecl.org

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# SUMMARY

The 11th European Poultry Conference was attended by approximately 900 delegates. There were a number of Australians present including Dr. Bruce Sheldon, Dr. Bob Pym (and Sally and Georgie Pym), Dr. Andi Kocher, Mr. Dick Munt (and Von Munt). I gave a poster presentation entitled "Optimising infectious bronchitis vaccination of laying hens for maximum egg shell quality", which reported some of the findings of a research project funded by the RIRDC Egg Program. This presentation generated useful discussion. An extra copy of the proceedings (Hard Copy of the Abstracts published in the Archiv fur Geflugelkunde and a copy on CD-ROM of both Abstracts and Full Papers) was purchased and sent to the RIRDC Egg Program Manager, Dr. Irene Gorman, on my return from the conference. Specific topics of interest that were covered at the conference included housing systems for laying hens, genetically modified organisms as feedstuffs, development of vaccines against Salmonella and coccidia, alternatives to anti-biotic growth promotants, effects of enzymes on wheat, quality control and food safety, and novel products from eggs.

# ITINERARY

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|---|---|
| August 31 | Depart for Bremen via Sydney and Frankfurt |
| October 6-10 | Attendance at 11th European Poultry Conference |
| October 12 | Depart Bremen for Armidale via London and Sydney |

# TRAVEL REPORT

## Primary Purpose of the Travel

The primary purpose of the travel was to attend the 11th European Poultry Conference which was held in Bremen, Germany.

## Major Achievements/Findings of the Travel

I gave a poster presentation in Poster Session P5.2 "Egg Quality and Egg Processing" entitled "Optimising infectious bronchitis vaccination of laying hens for maximum egg shell quality", which reported some of the findings of a research project UNE 76A funded by the RIRDC Egg Program.

There were six Plenary lectures, 31 Sessions of Invited Symposium presentations, 8 sessions of contributed Oral Presentations and 31 sessions of contributed Poster Presentations. Because all except the Plenary Lectures were run as concurrent sessions, I was able to attend only some of the presentations. I took notes at all of the presentations that I attended and will include the content of these notes in my report, below. Additional information is available in the Published Abstracts and Full Papers. Full Papers are available only for the invited presentations (the Plenary Lectures and the Symposia).

The Opening Session began with an address by Dr. Dietmar Flock who was the Chairman of the Conference. Dr. Flock stressed the importance of communication with the general public. A representative of the German Parliament (Green Party) who had just returned from the meeting on rural development in Johannesburg, spoke of the anticipated enlargement of the European Union, BSE, animal welfare, the environmental impact of production and food safety. He also emphasised that consumers (at least in the EU) do not want GMO products and that major chains such as McDonald's and Burger King will not use such products. Dr. Franz Fischler spoke of the risk that production will move to other countries because of the rising costs of production in the EU.

The **first Plenary Lecture** was given by **Dr. H. Klemm** of the EU Commission who spoke about the competitiveness of European poultry production. Dr. Klemm outlined that the major concerns of the EU's 375 to 377 million members are product quality and animal welfare. The banning of cages in some countries in Europe (e.g. in 2007 for Germany) and the EU Directive of 2012 raise issues of competitiveness at the global level and the threat of importation of product. Dr. Klemm indicated that more support was needed in the EU for alternative methods of egg production (e.g. free range production in France is currently about 10% of production).

**Symposium S1.5 Egg Production** addressed a number of issues. The first speaker, **Dr. Albers** of the Netherlands, spoke on the topic "Breeding strategies for layers in view of new technologies". Dr. Albers pointed out that there are now fewer breeder companies (only 4) but more products which raised the importance of the need to reduce in-breeding. He mentioned the BLUP computer database, as well as the importance of information such as the chicken gene mapping process. Dr. Albers suggested that the information held in the data bases of the individual companies should be combined with that in the public data bases to provide information that can be used in breeding selection programes (feather colour, behaviour, resistance, functional and nutritional components of eggs). **Dr. Kjaer** of Denmark continued the theme of selection when he spoke on the topic "Recording of feather pecking and selection against feather pecking". Dr. Kjaer evaluated the use of direct and indirect recording of feather pecking and separated this behaviour into self pecking (considered rare in chickens), allo pecking (pecking of other birds), aggressive versus non-agresssive pecking and the different targets of pecking (beak, toe, skin, feathers – gentle, severe, stereotypic). He hypothesised that gentle and severe feather pecking have different motivational and neurobiological backgrounds. In order to test this hypothesis, haloperidol (which blocks dopamine receptors in the brain) was

injected into pairs of birds (Isa Brown and White Leghorn). He concluded that a reduction in dopamine activity reduced the level of feather pecking (both severe and gentle) but did not change the number of aggressive pecks. In addition, there appeared to be line differences in the level of feather pecking with the brown egg shell strains indulging in more pecking that the White Leghorns. Experiments were conducted to determine the heritability of these behavioural traits and a divergence between high and low pecking was achieved after two generations. The composition of the groups of birds affected the nature of the interactions. By the third generation, it was found that the low feather pecking (LFP) birds showed significantly less pecking than the high feather pecking (HFP) lines. By the fourth generation, the control (unselected) line pecked more than the HFP birds which, in turn pecked more than the LFP line. Measurements of tonic immobility and heart rate showed that the HFP birds had a "more active" coping style than the LFP birds and serotonin levels were found to be higher in the HFP birds. Dopamine and serotonin are of interest because they are neurotransmitters in the central nervous system of birds (and humans) and their levels affect behaviour. **Dr. Middlekoop** of the Netherlands presented a paper entitled "Influence of genotype environment interaction on embryonic mortality and sex ratio". He spoke of the difficulty of maintaining a uniform temperature in the large commercial incubators, with differences of 4-5°C being found. Air velocity interacts with temperature in influencing embryonic mortality and numbers of culled chicks. There are breed differences in both broilers and layers in the effects of temperature, and layers (particularly female layers) can be more susceptible. Low temperature during early incubation is especially likely to increase mortalities. Dr. Middlekoop concluded that a temperature deviation of as little as 1.5°F can result in an increase in embryonic mortality and an increase in second grade chicks. **Dr. Preisinger** of Lohmann, Germany spoke on "Commercial layer breeding with special focus on alternative housing" and commented that selection of birds raised in cages can lead to genetic lines that are unsuitable for alternative housing systems. Below is a table that is on page 2 of the full paper (see the CD-ROM):

**Table 1:** Mortality during laying period in different housing systems

| Housing System | Germany | | Denmark |
|---|---|---|---|
| | Range, % | Average % | Average % |
| Cage | 4.8-12.6 | 8.8 | 6.2 |
| Floor management | 3.0-13.8 | 10.6 | 8.7 |
| Aviary System | 4.2-31.8 | 16.9 | - |
| Free Range | 15.1-50.1 | 36.9 | 9.1 |
| Organic Free Range | 15.4-50.0 | 34.2 | 20.3 |

Flock size between 5,000 and 43,000 hens
Germany field study (2000) and Danish Poultry Association (2001)

As can be seen from this table, the lowest mortality was from cage systems. However, it appears that it is possible to achieve similar mortalities in floor management systems whereas mortality is consistently higher for free range operations. Strain differences were found for mortality, egg number, egg weight and feed conversion ratio and these were different for cage versus floor. Birds in floor systems had similar or lower egg weight, ate more feed, laid fewer eggs and had higher mortality. The interactions of genotype and environment were influenced by factors such as organic farming, light intensity, feed quality, feed structure, floor quality, group size, stocking density and air quality. Inability to beak trim in some countries and the inability to use certain feed ingredients also affect performance. Dr. Preisinger also stressed that the test environment needs to resemble the production environment. The general breeding target is for maximum saleable eggs (hen housed), minimum feed cost, low losses, good stress resistance, good parent stock performance, metabolic stability, strong plumage, docile behaviour, performance related feed intake (as opposed to indirect selection for higher body weight). As far as cannibalism is concerned, there is considerable variation between families of birds within a strain and there are differences within lines. However, it is possible that environment has a greater influence than genetics on cannabilistic behaviours.

The **second Plenary Lecture** was given by **Dr. Tixier-Boichard** of France on the topic "Interface between genetics and physiology: current approaches and prospects". Dr. Tixier-Boichard pointed out that molecular biology has enhanced our understanding of genetics and physiology and gave the examples of the sex-linked dwarfism gene in chickens, the pygmy mutation in mice and resistance to Marek's disease in chickens. Sex-linked dwarfism in chickens is due to three molecular defects of the growth hormone receptor gene. The presenter outlined the way in which the genes affecting these conditions were identified.

**Symposium S2.5 Housing Systems for Layers** contained four papers. The third one, by Rauch, is not contained in the proceedings. The first presentation, by **Dr. Drakely** of the U.K., was entitled "Production efficiency of laying hens at four stocking densities in furnished cages of two heights". From 2012, most egg producers in the EU will be required to house hens only in furnished, modified cages or in non-cage systems. Therefore, there is considerable interest in optimising production in furnished cages. Dr. Drakely reported on a study which investigated different stocking densities (609 $cm^2$/bird for 10 bird groups, 677 $cm^2$ for 9 bird groups, 762 $cm^2$ for 8 bird groups, 870 $cm^2$ for 7 bird groups and 609 $cm^2$ for 7 bird groups) and cage heights (45 cm or 38 cm at rear). This study used Isa Brown and Babcock B380 birds. There were no effects of cage height or stocking density on rate of lay, mortality, egg weight, behaviour, tonic immobility, heterophil/lymphocyte ratios and only minor effects on body weight. However, the Babcock birds were less fearful than the Isa Browns and the top tier birds were more fearful than the lower tiers. A second study used Babcock B380 birds, all beak trimmed, on a commercial farm, housed in one of the following cage systems: Conventional cages, Patchett furnished, Valli furnished, Big Dutchman Eurovent, Big Dutchman Aviplus. In these systems, the cage height at the rear was either 45 cm or 38 cm, the stocking densities either 600 $cm^2$ per bird or 750 $cm^2$ per bird, feed space varied from 12 cm to 17 cm per bird and the colony sizes varied from 8 to 24. There was no effect of cage height and the stocking density had only a small effect on rate of lay and feed conversion. The second presentation in this Symposium was by **Dr. Tauson** of Sweden "Experiences from various furnished cage models in Sweden". The use of conventional cages in Sweden was banned as of 1999. Interest in furnished cages arose from observations during a compulsory national evaluation of floor systems (mainly aviaries) during 1990 to 1996. This evaluation found that alternative floor systems showed unpredictable results in relation to health, mortality and production and offered an inferior working environment for staff. The Swedish Animal Welfare Ordinance from 1988 was modified in 1997 to allow only furnished cages with nests, perches and litter from 1999. Dr. Tauson discussed some furnished cages including the Victorsson furnished 8 hen "comfort cage" (modified from the Edinburgh furnished cage), and the Big Dutchman Aviplus. Problems that arose in the furnished cages included coccidiosis caused by non-optimal position of perches, bumblefoot which was improved by changing the perch design, comb wounds which were worst in the bigger colonies, problem of birds staying in the nest at night, cracked eggs (more common with short curtain than long curtain on nest box). Some management factors to consider include opening the nest boxes 5 hours after lights on to discourage sitting in the nest box, running of manure belts at least twice weekly, using sunrise-sundown lighting to allow birds to find the perches at night, using sawdust rather than sand for litter. The conclusions reached were that the best furnished cages were competitive with conventional cages in relation to health traits and were better than floor systems but that the furnished cages increase production cost. **Dr. Rauch** of Germany reported on a study which is being conducted from 2000 to 2003 on 6 farms in the north, west, east and middle of Germany using 4 cage manufacturers, 3 strains of bird, from 2600 to 15000 hens per farm, from 8 to 24 hens per cage, rearing either in deep litter or cage, with or without beak trimming, with or without moult, and from 3 to 4 tiers of cages. Behavioural observations were conducted 4 times over 2 successive days and the following recorded: plumage of the neck, punctiform deviation of the comb, scabbed ball of the foot, deviant breast bone (on palpation). There was a large variation in the degree of deviation of the breast bone in both the white (Tetra) and brown (Lohmann) birds. The length of the claws was influenced by the type of abrasive and was generally longer in the white birds. The production costs in the cages was cheaper than alternative systems. **Dr. Oester** from Switzerland presented "Non-cage housing systems in Switzerland". In 1976 research commenced on aviaries and get-away cages in Switzerland. Research on get-away cages ceased and, in 1981, the Swiss Animal Welfare Legislation came into force. This required: authorisation

procedure, 5 lux of light for a maximum of 16 hours, 5 hens per nest or a m2/100 hens, slatted floor or perches (14 cm per hen), 800 cm2/hen, no litter prescriptions. In 1988, negative decisions were made about furnished cages and, in 1993, a negative decision was made about the use of slatted floor Pennsylvania systems. The main reasons for these decisions were nervousness of birds, feather picking and cannibalism. As of 1994, there were 2 systems remaining: deep litter and aviaries. There has been a trend towards the provision of a wintergarden and free range systems. The Swiss producer price has decreased since 1991-1992 but the consumer price is high at 60c/egg (imported eggs are cheaper). Direct payments are made to producers of the order of 2.8 Swiss francs per hen per year for the presence of wintergarden or for free range. Mortality varies with the strain of bird being lowest in hybrids. Mortality was found to be lowest in floor systems with a wintergarden, highest in free range, with indoor (aviary?) systems intermediate.

The **Short Communications (Offered Contributions) Nutrition I** contained 5 presentations (Dr. Lopez, presentation oc1.3.3, did not attend the conference). **Dr. Patel** of India spoke on "The comparative effect of feeding direct-fed microbial and antibiotic on egg production, feed efficiency, livability and economics of layer birds in hot climate". He reported on a study that compared the effects of adding the antibiotic Tylosin or the direct-fed microbial (DFM) Protexin to laying hens. Dr. Patel concluded that DFM improve performance. **Dr. Abdellatif** of Egypt presented "Effect of phytase on laying performance of layers fed corn-soybean meal diet during the late stage of egg production post molt". The control diet contained 0.37% non-phytate phosphorus and the experimental diet 0.29% non-phytate phosphorus with added phytase (Ronozyme PCT). Birds were 82 weeks old at the beginning of the experiment. The birds receiving the experimental diet had higher production, higher egg weight at 86 and 94 weeks, higher shell weight at 86 and 90 weeks, higher shell thickness at 86, 88 and 92 weeks, and higher weight and ash content in the tibia. Mortality and plasma calcium, phosphorus and alkaline phosphatase were not different. A question was asked about the levels of inclusion of non-phytate phosphorus (i.e. whether or not the control was appropriate). **Dr. D'Alfonso** of the U.K. presented "Global corn quality variance", reporting on the composition of 93 commercial corn samples from 14 countries. He measured *in vitro* factors as well as animal performance. Diets were prepared containing 58% corn and 36% soya bean meal. There were significant differences among the corn samples (with some notable outliers, mostly from Asia). In general, as the percentage starch increased, the percentages of oil and protein decreased. 68% of the variance could be explained by differences in starch and 89% by differences in moisture levels. North American samples had lower starch and the more amylose present, the more resistant the starch was to digestion. The author offered the opinion that factors adversely affecting starch digestability may also adversely affect protein digestability. All diets were mash but the authors will be investigating pelleted diets. **Dr. Zohravi** from Iran showed a very large number of graphs very quickly so it was difficult to grasp the detail of her presentation. Her overall finding was that limestone was better than oystershell for performance, the retention of calcium and phosphorus and for bone strength. Best results were obtained when the birds were fed 85% of the NRC recommendation for calcium. During question time, the author conceded that there were differences between the two calcium sources with respect to the calcium to phosphorus ratio, the solubility of the limestone was unknown (it was mining waste of 37% calcium) and the oystershell (22-23% calcium) was mixed with other components such as sand. The last paper of this session was "Evaluation of the suitability of Bt176-maize as a GM feed in poultry nutrition" by **Dr. Aeschbacher** of Switzerland. On world markets, 46% of soy and 7% of maize products are transgenic. There are public concerns about GM feeds because of allergens, antibiotic resistance and threats to biodiversity. The GMO containing diet resulted in equal bird performance and no transgenic fragments were detected in the meat.

The **third Plenary Lecture** was delivered by **Dr. Chesson** of the U.K. on "Transgenic plants in poultry nutrition". Bt maize has better control of insect infestation and better secondary control of mycotoxins. Dr. Chesson discussed the fate of ingested DNA which is rapidly degraded and leaches into the gut lumen as the feed matrix is disrupted. It can be detected in the gut many hours after feeding. Amplifiable DNA can be detected in the intestinal contents, spleen and liver and can cross the placenta and appear in the foetus and newborn animal. When plant chloroplast DNA was injected intramuscularly, there was a progressive elimination of the DNA. However, fragments of the

chloroplast DNA were found in muscle, liver, spleen and kidneys of broilers and layers but not on litter or in eggs (although the author believes that this is only a matter of time). No transgenic DNA has been detected in birds fed transgenic maize or soybean meal. However, as the sensitivity of the detection method increases, transgenes will be detected in animal tissues. Dr. Chesson is on the opinion that recombinant DNA has much to offer the poultry industry. However, before transgenic material can be introduced into the food chain it must be demonstrated as safe for birds and consumers. There is no evidence at present that consumers in northern Europe see any benefit in GM technology.

The **Symposium S3.4 Vaccination** contained 4 papers. The first paper by **Dr. Schijns** from the Netherlands was titled "Vaccine adjuvants: concepts and applications". Vaccines can be divided into replicating, attenuated pathogens, non-replicating (whole inactivated or subunit) antigens. Non-replicating antigens are usually administered along with an adjuvant (immunopotentiator) which mimics the non-self signal which is necessary to stimulate the immune system. The mode of action of adjuvants is still not completely understood and chickens may be different from mammals. Current adjuvants are mineral oil based and it would be better to move from mineral oil to biodegradable oil or no oil at all. Another approach is to use host-derived adjuvants such as sequences of chicken genome. Inactivated vaccines are usually applied by intramuscular injection and there has been little success with mucosal administration of inactivated vaccines. **Dr. Vermeulen**, also from the Netherlands, gave a paper "Cell-mediated immunity utilised to select protective antigens of *Eimeria tenella* in chickens". Cell mediated immunity is essential for development of protection against *Eimeria* in chickens. The live vaccines that are available for coccidiosis are the potentially virulent Coccivac and Immunocox, the attenuated Paracox and Livacox and the naturally low-virulent Nobilis COC-ATM. Inactivated, subunit vaccines are in development. The research approach adopted by the authors was to isolate immune cells (CD4 and CD8 T-cells) that were circulating in the blood of chickens following a primary infection and select sporozoite antigens that could be the target of the protective immune response. These fractions were then used to vaccinate birds. **Dr. Barrow** from the U.K. presented "The use of vaccines in poultry against Salmonella". In attempting to find an effective vaccine or vaccines against Salmonella, it was found that injection of killed bacteria intramuscularly provided little protection. The administration of killed bacteria in feed or the use of live attenuated bacteria gave some protection but it didn't last long. The phage strain was found to offer better protection. What is required of a suitable vaccine is strong and long-lasting protection, avirulence for chickens and humans, protection against different serotypes, ease of administration (ideally orally), ease of differentiation from field strains, compatability with other control measures. In the author's opinion, live vaccines are the way forward. There appear to be advantages of vaccinating the dams as well as the progeny.

Instead of attending the last paper in Symposium S3.4, I attended the last paper in the **Symposium S3.3 Behaviour** which was delivered by **Dr. B. Jones** of the U.K. Dr. Jones reported on a study conducted with strains of Japanese Quail that had been selected for levels of plasma corticosterone in response to brief mechanical restraint. These birds were used as a model for the factors affecting fear and stress in broilers and layers. The LS birds had low levels of corticosterone following restraint whereas the HS birds had high levels. The LS quail showed shorter periods of tonic immobility, more struggling during restraint, more activity in a novel arena, faster emergence into an exposed area, less avoidance of novel objects and people, greater sociability, accelerated puberty (larger cloacal gland size in the males at 42 days; lower age at first egg in the females), better bone strength, less deviation from bilateral symmetry. There were quite a few questions at the end of this presentation with some questioning the usefulness of the quail model.

**Symposium S4.2 Feed Additives** started with a presentation by **Dr. Whitehead** of the U.K. on "Influence of vitamins and minerals on bone formation and quality". Dr. Whitehead indicated that a deficiency of the B vitamins and several minerals can result in chondrodystrophy whereas a deficiency of vitamin D, calcium and phosphorus causes rickets. The causes of tibial dyschondroplasia (TD) are unknown but can be prevented by Vitamin D metabolites. Increasing the levels of Vitamin D above the NRC recommendation for broilers has been shown to be beneficial. The best preventative measure

against osteoporosus appears to be provision of particulate calcium. **Dr. Simon** of Germany delivered the next paper on "Probiotics and Prebiotics". Probiotics are defined as viable microorganisms used as feed additives whereas Prebiotics are non-digestible carbohydrates in feed that selectively stimulate growth and metabolic activity of a limited number of intestinal bacteria thought to be beneficial to the host. There are a number of Probiotics authorised for use in the EU, some consisting of one strain of organism and other consisting of more than one strain. The effectiveness of probiotics is variable. During the questions at the end of the presentation, the comment was made that it is important to publish or report negative findings. The paper by **Dr. Brufau** from Spain was "Exogenous enzymes in poultry feeding. Recent Developments". Since 1993, enzymes have been considered as additives in the EU and 60 products have been approved although only one (3-phytase) has permanent authorisation. Dr. Brufau discussed enzyme use in relation to different grain types and commented that enzymes do not always work on wheat. Apparent metabolisable energy (AME) is not related to viscosity with wheat whereas the genetic origin of wheat cultivars was not related to AME but was related to viscosity. Dr. Brufau mentioned that the presence of enzyme inhibitors (e.g. xylanase inhibitors) may influence the efficacy of enzymes in wheat. Enzymes ($\alpha$-galactosidase, proteases) increase feed efficiency with maize-soybean diets. The role of enzymes in modulating intestinal microflora, especially in relation to the ban on antibiotic growth promotants was discussed.

The final paper in **Symposium S4.1 Adaptation** was delivered by **Dr. Dragon** of Germany on "Adaptation of red cell function to hypoxia". This paper outlined the roles of noradrenaline and adenosine in modulating the gas transport properties of the red cells of the chick embryo for different stages of incubation.

**Short Communications Poultry Health 2** began with a paper by **Dr. Hess** of Austria "Avian pneumovirus: virus excretion in vaccinated and non-vaccinated laying birds under experimental conditions". Avian pneumovirus causes a drop in egg production in turkeys and respiratory signs and egg drop in ducks. In chickens, virus shedding has been reported to occur up to 3, 5, 14 days and 3 weeks, in different studies. Dr. Hess reported on an experiment where there was intravenous challenge of unvaccinated birds and those vaccinated with Nobilis RTCV1194. (15 birds per group). Clinical signs were seen only in the unvaccinated birds. Live virus was excreted for 5 to 7 days postchallenge in the unvaccinated birds but there was no live virus excretion in the vaccinated birds. **Dr. Franken** of Germany spoke on "Humoral antibody response of five chicken breeds after vaccinations against Newcastle disease, infectious bronchitis, infectious bursal disease and avian encephalomyelitis". Germany has required vaccination against Newcastle Disease and fowl plaque since 1994. Dr. Franken reported on a study in which Australorps, Bielefelder, New Hampshire, and Rhode Island Red birds were compared with Lohmann brown hybrids. There were differences among breeds with other breeds being better antibody responders than the Lohmann birds although the Lohmanns reponded better to IBD. The New Hampshire birds were found to need booster vaccinations. I was particularly interested in the data for infectious bronchitis (IB) antibody responses. IB vaccination occurred in water at 2, 8, 15, 29, 42 and 54 weeks and blood samples were taken at 3, 21, 28, 36, 45, 54, 62 and 72 weeks of age. The haemagglutination titres for IB increased to 3 weeks and then continued to increase up to 36 weeks after which they remained constant. **Dr. Cotter** of the U.S.A. reported on "Modulation of serum and yolk antibody levels in commercial hens fed mannanoligosaccharide". Hy-Line W36 birds were used to test the effect of feeding Bio-Mos to birds that had been immunised with either sheep red blood cells (SRBS) or bovine serum albumin (BSA). The immune response, as measured by antibodies to SRBS and BSA, was enhanced in birds receiving the Bio-Mos.

The **Oral Contributions Session SC Egg Quality and Egg Processing** contained a paper by **Dr. Surai** of the U.K. "Designer egg production: prospects and limitations". Dr. Surai discussed the types of designer eggs that are available including eggs enriched with omega 3 fatty acids (LA and DHA), iodine, vitamin E, lutein, and selenium.

**Plenary Lecture PL5** was delivered by **Dr. Wesjohann** of Germany "Safety and quality concepts: the WIESENHOF brand". Dr. Wesjohann outlined the processes adopted by his company which

adheres to a standard considerably higher than the legal requirement. Feed used contains no animal protein, antibiotic growth promotants, or genetically modified soya. Checking for GMO occurs all along the chain. Soy bean is obtained from Brazil but processing occurs in Germany. Feed is free from Salmonella. Chickens are maintained on deep litter of natural materials and there are also free range and organic chickens. Dr. Wesjohann emphasised that the important thing is what the consumer wants.

**Symposium S5.2 Egg Quality and Egg Processing** consisted of three presentations. The first of these was by **Dr. Hammershoj** from Denmark "Egg functional properties". Dr. Hammershoj spoke in detail about the desirable functional properties of egg components and how these are achieved. Yolks are employed for their properties of emulsification and gelation whereas albumen is used for gelation and foaming properties. These properties are affected by a range of factors. Emulsification of egg yolk is affected by hen age, storage temperature, freezing, pasteurisation. The gelation of egg albumen is affected by hen age, storage temperature, pasteurisation time, whereas foaming is affected by pH, shell egg storage. **Dr. Peter Hunton** spoke on "On-farm food safety for egg producers". In Canada, egg production operations are not integrated. There are 400 independent producers and about 7 million hens. Dr. Hunton reported the quality assurance procedures introduced by the Ontario Egg Producers and the HACCP programs covering testing for Salmonella, biosecurity, pest control, facility hygiene, and egg storage. If a positive test for Salmonella occurs, the remaining eggs are pasteurised, the spent hens are specially processed and the next batch of pullets receives killed *Salmonella enteritidis* vaccine. There is repeated monthly testing of the new flock for a period of 6 months. **Dr. Gautron** gave an excellent overview of the work which has been completed on the egg shell matrix proteins in his address "Identification of eggshell matrix proteins. Application to eggshell quality". The organic matrix of the eggshell represents 3.5% whereas the calcite portion is 95% but the organic matrix controls the calcification process. Studies have included growing of calcite crystals *in vitro*, with and without the presence of uterine fluid components. The composition of the uterine fluid is different at different stages of shell formation. The proteins found in egg albumen and also in the egg shell matrix (including the shell membranes) include ovalbumin, lysozyme, ovotransferrin. The bone protein osteopontin is also found in egg shells. Proteins which are found only in the shell are ovocleidin-17, ovocleidin-116 and ovocalyxin-32. The proteoglycans mammillan (keratan sulphate), ovoglycan (dermatan sulphate) are unique to the egg shell. A current EU project Eggdefence is investigating relationships between the organic matrix of the shell and egg shell quality.

The **sixth Plenary Lecture PL6** was presented by **Dr. Van Horne** of the Netherlands on the topic "Production cost development of broilermeat". This paper compared the cost of production of broilers in the EU. The differences were small but the U.K. had the highest production costs and Germany the highest processing costs. Major issues facing the EU broiler industry are animal welfare (density), food safety, the environment and costs of production. Major issues facing the egg industry are animal welfare (density, debeaking), food safety, the environment and costs.

**Symposium S6.2** covered **Novel Food and Products**. **Dr. Nau** listed all the potentially useful features of egg components. Egg yolk contains substances that have antioxidant activity (phosvitin), antigenic activity (immunoglobulins – alternative to mammalian antibody production), cryoprotective activity (low density lipoproteins – can be used for freezing mammalian sperm). Egg albumen contains substances that are antibacterial and antiviral (lysozyme, ovotransferrin, cystatin, ovomucin), have immunomodulation and activation properties (lysozyme, cystatin), specific binding activity (avidin). The paper delivered by Dr. Reimerdes on "Egg proteins in food matrices" is not in the proceedings. **Dr. Reimerdes** outlined the functional properties of egg components and covered similar material to that delivered by Dr. Hammershoj and Dr. Nau. **Dr. Kopec** from Poland spoke on "An attempt to industrial process of simultaneous isolation of lysozyme and cystatin from egg white". Lysozyme is extracted first, followed by cystatin.

## Benefits/Significance to Person Funded and her Work

Attendance at the conference allowed me to present my research findings and benefit from questions and comments from other researchers. It also allowed me to renew contacts with other researchers such as Dr. Yves Nys of France who is the main international researchers in the field of egg shell quality. Being at the conference also enabled me to make new contacts.

## Benefits/Significance to the Rural Industry

My attendance at the Conference allows the research which is being supported in Australia by the RIRDC Egg Program to be made known to the international scientific and industry communities. It also allows the results of research being conducted overseas to be made available to the Australian Egg Industry.

## Recommendations to RIRDC and Industry Arising from the Report

The conference presented many aspects of interest to the egg industry. The developments in relation to housing systems are of interest. Although there has been no move to ban conventional cages in Australia (ARMCANZ), the pressure to increase the proportion of hens in alternative production systems may continue. Therefore, the breeding of genetic lines that are better suited to such housing systems is a development worthy of attention. In addition, the types of alternative housing system that are acceptable to the European consumers may become more common here in Australia. The main issues surrounding alternative housing systems, especially free range, are problems increased mortality resulting from aggression, disease problems and higher price of production. Overseas results suggest that production in floor systems such as the barn may be cost effective and with mortalities only slightly higher than in cages. There are no signs, to date, that furnished cage systems will be adopted in Australia.

The use of genetically modified organisms (GMO) in poultry feed is a current issue for the Australian poultry industry. Australian consumers appear divided in their willingness to accept GMO foods or products derived from GMO products. Genetically modified crops have the potential to increase profitability in Australia. However, consumer opinion cannot be ignored as it has a major influence on the buying patterns of supermarket chains.

New developments in vaccines against organisms such as *Salmonella* species and coccidia are of interest. Even though virulent forms of *Salmonella* are not an actual problem for the egg industry, monitoring will continue. Coccidial vaccines suitable for Australian conditions would decrease the need for use of chemicals in floor systems.

Australia is facing pressure to phase out antibiotic growth promotants. Therefore, developments in probiotics and prebiotics and the use of enzymes are relevant. An interesting paper discussed how feed enzymes do not always work in wheat diets, owing to the presence of enzyme inhibitors such as xylanase inhibitors. These findings are of interest in view of my own findings that adding commercial feed enzymes to wheat-based diets does not necessarily improve hen performance. They also agree with my finding that AME is not necessarily related to viscosity.

Quality control and food safety remain of primary concern in Europe as well as Australia. Developments in novel products from eggs are of interest in Australia as a means of increasing returns from eggs.

## Suggested Dissemination of Information in the Report

A copy of the proceedings of the conference was purchased and sent to the RIRDC Egg Program Manager who makes them available to members of the Australian Egg Industry. Selected portions of the Report could be summarised in the "Eggsaminer", "In an Eggshell" or other industry publications.

## Copy of Paper Presented

A copy of the Abstract and the Poster presented are attached to this Report.

**Optimising vaccination protocols for infectious bronchitis virus in laying hens for maximum egg and egg shell quality**

**J.R. Roberts, A. Sulaiman, W. Ball and M. Jolly**

In Australia, all laying hens are vaccinated against infectious bronchitis virus. A range of vaccination protocols is currently used in the industry, there are several vaccine strains, the route of administration varies and some revaccinate regularly whereas others do not. There remains some uncertainty about the optimum vaccination protocol for maintenance of egg internal quality and egg shell quality.

The effect of strain of vaccine, route of administration and regular revaccination during lay on production performance and egg and egg shell quality in 625 Isa Brown layers was investigated. The treatment groups were as follows: no vaccination, vaccination with VicS at day-old by eyedrop, coarse spray or in water, vaccination with A3 at day-old by eyedrop, coarse spray or in water, Birds were revaccinated at 4 weekswith the opposite vaccine strain to that used at day-old, via the same routes of administration as at day-old. At 14 weeks of age, all birds including the controls were vaccinated with VicS by eyedrop. Half the birds were vaccinated every 8 weeks during lay whereas the other half were not revaccinated beyond 14 weeks of age. Egg production, egg weights and the external appearance of the eggs were recorded daily. Faecal moisture was determined at 1 and 2 weeks following revaccination. Blood samples were taken from 5 birds per treatment group per shed 3 weeks following revaccination in Shed 1. Blood samples were analysed for haematocrit, plasma electrolytes and IB antibody titres. Every 4 weeks eggs from each treatment group were collected for detailed egg and egg shell quality measurements. At the end of the trial, all birds were exposed to T-strain IBV and egg quality, manure moisture and plasma electrolytes measured.

Egg production was very similar but was lower for the birds revaccinated regularly. Production was slightly reduced in revaccinated birds for 2-3 weeks following revaccination at 22 and 46 weeks of age. Egg shell breaking strength and percentage shell were significantly affected by the revaccination of birds. These findings suggest that the process of revaccination has some negative effects on production and egg shell quality. The results of exposure of birds to T-strain IBV suggest that regular revaccination is not necessary to protect birds against intercurrent infection. The results of the IB antibody titres available to 43 weeks of age are difficult to interpret. The control groups remained negative until after they were vaccinated at 14 weeks of age. However, there is no clear trend in relation to the other treatment groups. The effect of regular revaccination on IB antibody titres is also not clear.

The results suggest that there are no advantages of regular revaccination during the laying period and that there are deleterious effects on egg shell quality.

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