CORNELL POULTRY POINTERS

Cornell Cooperative Extension

Vol. 52, No. 1, January 2002 Barb Smagner, Managing Editor

MARK YOUR CALENDARS FOR THE 2002 CORNELL POULTRY CONFERENCE

The 2002 Cornell Poultry Conference will be held June 19th at the Ramada Inn, Ithaca, NY. The pre-conference symposium entitled, "Managing modern layer strains for productivity and profitability - how a producer should decide strain selection." Strains included are: DeKalb White, Shaver White, Bovans, Hy-Line W98 and ISA White.

The Poultry Conference topics will include:
Bio-terrorism and the poultry industry, industry consolidation - what is the outlook for small farm egg operations? What do they need to do to survive the difficult cycles?

Animal welfare regulations in the European community: What are they, how did they come about, and what are the long-term implications?

What was learned when an egg processing plant burned and there were 200,000 hens on production.

Mycoplasma synoviae, avian influenza, virus-induced immunosuppression, nutritional problems on commercial pullet and egg laying farms.

Investigation on egg cholesterol.

Composing poultry manure at Adams' Egg Farm in NYS.

Pest management.

CONTENTS

EZRA CORNELL: AN EXCELLENT POULTRY BREEDER

Poultry breeding is an art and science used by man to guide evolution, as used for all species of domesticated animals, so that poultry could be better able to meet the needs, desires, or interests of humans.

Chickens were domesticated from the red jungle fowl (Gallus gallus) about 4,000 years ago in India. There is now evidence that domestication had also occurred 3,400± years earlier in China. The evidence found in China indicated that the domesticated birds were larger than those in the south. They gave origin to what is now known as the Asiatic Class of chickens, which includes the Brahmas, Cochins, and Langshans. Birds of this type produced brown-shell eggs and played a major role in the selective breeding used to create the American Class of chickens. Those of the Mediterranean Class (Leghorns, Anconas, Minorcas) are smaller in size and produced white-shell eggs. These are likely to have come from the domesticated population moved west from India.

In a publication, "The Leghorns", edited by J. H. Drevenstedt and published in 1911, obtained by me in the mid-20's while learning how to judge chickens in a 4-H club, there were two articles by Ezra Cornell. These dealt with "Breeding White Leghorns to Standard Requirements" and "Buff Color Breeding Problems". Nothing in the publication provided any evidence who or where Ezra Cornell was, except that he was likely in central New York.

Cornell University was founded in 1865 by an Ezra Cornell and in its Agricultural section Professor James E. Rice was the first College worker, in the USA, to present a course dedicated entirely to poultry (1891). He created the Department of Poultry Husbandry in 1907. A similar department had been established in Ontario in 1894, and Professor W. R. Graham took control in 1899.

This was before the science of Genetics (Mendelian) had become known. Gregor Mendel reported (1865) his observations, dealing with crosses of varieties of garden peas that differed in a variety of traits, to the Natural History Society of Brunn, Austria, a city now known as Bruno in the Czech Republic. These findings were not brought to public scientific knowledge until 1900. They were found and reported on by three European plant breeders (de Vries in Holland, von Tschermak in Austria, and Correns in Germany). Similar findings had already been made and recorded in chickens by W. Bateson in England, who was crossing fowls with different types of combs. His studies had started in 1898 but were not officially reported until given at the Royal Society of London Meeting in December 1901. Had the findings of Mendel not been reported upon at that time, the basis of heredity, as already established in animals (chickens), would likely have become known as Batesonian Genetics.

Thanks for help from the Kroch Library, it was found that the Ezra Cornell, who was breeding chickens for exhibition purposes, was a grandson of the founder of the University. He lived in Ithaca and had the "Valley View Farm" on the west-hill area, but died in 1902. Thus, essentially, all his work and accomplishments had been done before genetics became a science.

He was one of the first to graduate from Cornell University in Electrical Engineering (1887) and soon had a position in New York (City) where he was exposed to the severe blizzard of 1888 that led to a health problem. Thus, he returned to Ithaca and became involved with chickens. He was primarily interested in breeding fancy chickens, so that they would be recognized at Exhibition Poultry Shows as being the best to meet the specifications for the given breed and variety. These requirements were organized by The American Poultry Association, at a meeting in Buffalo (February 1873). This Association of people involved with breeding chickens for, or judging them at, Poultry Shows soon published the first "American Standard of Excellence" in 1874. Subsequently the revised editions were entitled "Standard of Perfection", dedicated to the improvement of purebred domestic fowl. Ezra was also the president of the Cornell Incubator Company.

A footnote, by the Editor, to the article on "Breeding White Leghorns" states: "The above article was written by the late Ezra Cornell for the first edition of "The Leghorns", and being of such instructive merit is reprinted in the present edition. As Mr. Cornell was one of the most careful, intelligent and conscientious breeders of White Leghorns of his day, the advice on the correct mating of Single Comb White Leghorns so clearly presented by him should prove not only interesting but valuable to all breeders of this popular variety".

For the American Class, the Plymouth Rock and Dominique breeds had been accepted by the American Poultry Association at its first meeting in 1874 as already developed in the USA. In 1883 another breed (Wyandotte, silver-laced) was accepted. Attempts had been made to develop another breed that could be competitive with the long existing Plymouth Rock, first exhibited at America's first poultry show, held at Boston, Massachusetts, 1849. Several different types of chickens had been involved, starting in the 1860's, in crosses that eventually gave rise to the type called "Wyandotte". Many breeders in New York State had made crosses that involved Buff Cochins, Brahmas,

Spangled Hamburgs, Sebright Bantams, and French Breda.

Different types of comb were present: rose ex Hamburgs, pea ex Brahmas, single ex Cochins as also were feathered shank and yellow skin ex Brahmas and Cochins vs white skin and black (blue) shanks ex Hamburgs. Thus a variety of differences were initially present and available for consideration by the breeders. The Wyandotte, as finally accepted, had to have rose comb, yellow skin, and no feathers nor pigment on the shanks or toes. It's name was proposed by F. A. Houdlette, from Massachusetts, because the new breed was created in the area of New York and Michigan originally controlled by the Wyandotte Indians.

The shape and size of the chicken is what the American Poultry Association uses to recognize a breed. Within a breed there can be many differences in plumage color or pattern. A variety is issued by the American Poultry Association to recognize a specific color or pattern. These are the traits used by the breeders to create true-breeding populations within a given breed that will be recognized as a variety.

The number of varieties per breed, that have been accepted by the American Poultry Association, varies from one (New Hampshires, Rhode Island Whites, Delawares) to many (7 Plymouth Rocks, 9 Wyandottes and Cochins, and 13 Old English Games). Breeders of bantam breeds have, often, more varieties: 12 Modern Games, 13 Cochins, and 19 Old English Games. A variety within a given breed may require a specific type of comb. In Leghorns, 6 of the 16 varieties have rose combs but plumage color and pattern the same as for 6 of the single-comb varieties. Likewise, the two varieties of Rhode Island Reds vary only in type of comb.

In "The Poultry Book", Vol. II: 699-701, 1904, there is a reprint of a letter from Ezra Cornell to T. E. Orr concerning the Golden Penciled type, later considered the Eastern Strain of the Partridge Wyandotte. A very similar Western Strain had been developed in Wisconsin. They were accepted by the American Poultry Association as one new variety in 1901. Ezra wanted the new variety to be named as the Golden Penciled so that it would be similar to the name of Silver Penciled that they were using for another type he and G. H. Brackenbury had also created. The Silver Penciled variety was accepted in 1902. As quoted on page 705: "The Eastern Breeders, under the leadership of Ezra Cornell, were loud in their claim that the name be Golden Penciled Wyandotte."

In both varieties the feather has three or more pencilings (black pigment) that are distinct in sharp contrast to the ground color, reddish or silver. The pencilings are regular in shape, uniform in width, and conform to the contour of the feather. The pencilling came from the Partridge Cochin.

The Eastern Strain of Partridge Wyandottes had been developed in New York State by Brackenbury and Cornell. In the process some birds that had some silver feather were observed, so Ezra wanted to develop a Silver Penciled variety. He began by mapping out a plan for the crosses necessary to reach the objective. He kept detailed records of what was involved. A quote from E. G. Wyckoff: "The known ancestry certainly adds flavor to the fancier's enthusiasm, and the lineage of very few varieties can be so truly traced as that of the Silver Penciled Wyandotte".

E. G. Wyckoff had been intimately associated with Ezra Cornell in business enterprises and the poultry industry for 6 years, including work on the Silver Penciled Wyandottes. Thus, he purchased the farm and all the chickens. He was the one who got the American Poultry Association to accept this type of a chicken as a new variety in 1902. A hen from this population won first prize at the Madison Garden Poultry Show in 1904. It also became one of the greatest of the domestic fowls; as egg producers there were none better. They laid well, if not better, than Single Comb White or Buff Leghorns. Their eggs were larger than those of Cochins and other Wyandottes. They also had remarkable fertility.

A quotation: "No one exhibitor at the poultry shows in New York ever captured as many prizes and in some instances his exhibits captured nearly all first prizes." Had Ezra survived, it is quite possible that he might have joined Professor Rice at the Poultry Department to teach students how to breed chickens. His proven procedure, that apparently also included traits of importance to the developing poultry industry (egg production, egg size, and reproduction), was used by many breeders of commercial chicken during the early part of the 20th century.

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CHANGING CONCEPTS FOR HOUSING AND EQUIPMENT

(THE FOLLOWING INFORMATION WAS PRESENTED AT THE PACIFIC EGG AND POULTRY ASSOCIATION CONFERENCE, MONTEREY, CA, MAY 10, 2001, BY JOHN GINGERICH, WEGMANS EGG FARM, WOLCOTT, NY.)

In approaching this issue, I would like to start by sharing my personal

views on animal welfare issues that our industry is working at currently. I was born and raised on a dairy farm, learning to care for animals at a very young age. I transitioned into poultry when I finished school, and have been associated with this industry for over 32 years. There has never been a time since I was a child - even when I was in school - that I have not been responsible for the care of production animals. I was brought up having impressed upon me that the care of animals and the land was an honorable profession. I still consider it a sacred trust.

Until recent years, our society overwhelmingly accepted that farmers predominately behaved with an acceptable level of integrity in how they cared for their animals, and showed little concern about how their food was being produced. However, persons with a whole different philosophical perspective regarding the role of animals in relationship to humans have become increasingly activist in promoting their agenda for animal rights. One of their tactics (with the underlying purpose of promoting not using animals for food) has been to raise questions about how farmers care for their animals. Misinformation has been intentionally or ignorantly presented in many media forms to a society which is largely urban and not well informed of the facts. Pressure has been placed upon retailers of food to assure the humane treatment of the animals utilized in the food they sell, or to not sell food of animal origin at all.

As a result, we, who are the caretakers of these animals, are being placed under a scrutiny in a way that is relatively new to us. We are needing to re-evaluate every detail of how we care for our animals, not only for appropriate ethical reasons (yes, I think that proper care of animals - their welfare - is an ethical one), but also for the marketability of our products. It is for these reasons that UEP commissioned a Scientific Advisory Committee for Animal Welfare, and in response to the recommendations given by that committee, has released its 2000 edition of Animal Husbandry Guidelines for U.S. Egg Laying Flocks.

Antagonists of animal agriculture have tried to paint the picture that advanced farming (a more appropriate phrase than "factory farming" which activists have tried to impose upon us) cares only about profits, and that profits are inherently opposed to proper care of animals. Those of us who care for those animals know that viewpoint is overwhelmingly distorted. Yes, sadly, there have been a few operators who have treated their animals badly, but few of them stay in business long. Animals are productive in direct relationship to the quality of their care, and only highly productive animals are profitable. Advanced farming makes use of an ever-increasing body of knowledge to increase animal well-being, productivity, and profitability in direct relationship to each other.

That said, there is one issue (more than any other we are faced with) that I feel that profit vs. optimum care (within certain constraints) is on a collision course, and that is bird stocking density. There is no question that, up to a certain point (which varies between farm situations), there is more return on investment in going to higher stocking densities for laying hens. In doing so, performance per hen declines which in my mind is also indicative of bird well-being. In the past, the line which I personally have refused to cross is a stocking density of less than 53 sq. in. per bird. In addition to the bird performance correlation, I have found in the many tours that I have given to persons without poultry backgrounds that the single most common comment involving negative perceptions that they have is the small amount of space that we give the chickens. The reality is that we also deal in perceptions, and those perceptions affect our futures.

I would next like to talk about the company I work for - its core values, and the foundational principles which are guiding the way we are responding to these issues. Wegmans Egg Farm is a division of Wegmans Food Markets - a privately held regional supermarket chain with 60 stores in New York, Pennsylvania, and New Jersey. Wegmans operates its own egg farm in order to ensure that it is providing its customers with the best possible consistent quality product. Wegmans is a premier grocery merchandiser who goes to great lengths to provide outstanding customer service, which includes variety, prepared foods, quality, food safety, how to prepare foods at home, and being responsive to customer needs and wants. Of course, this all functions in a cost competitive marketplace.

In helping to facilitate these goals, Wegmans encourages customers to communicate with the company throughits Consumer Affairs Department. As a result, we frequently interact with customers regarding their concerns and expectations around a variety of issues - everything from quality complaints to questions about egg nutrition, how to prepare eggs, environmental concerns, what we feed our chickens, how we care for them and so forth. This places us closer to the consumer than perhaps most farms are, and we frequently get to deal with sensitive issues. It is very important from a marketing standpoint that our farm presents a positive image for the company.

In providing what consumers want, Wegmans works from three basic principles. First, we give all customers the very best we can from a quality and food safety standpoint. For example, we set our check detector for very low check tolerance, maintain all points of quality to the degree that all our retail packs are AA, have invested in a cooler that

permits very rapid cooling through high air velocity at 40 degrees F, regularly monitor each flock for Haugh units and specific gravities, use extensive vaccination programs to reduce the impact of respiratory challenges, are in New York's egg quality assurance program, and vaccinate for SE even though we have never had a positive test on the farm since we started testing eleven years ago. Those things cost us money to do, but we are committed to not cutting corners in these areas. Our customers expect nothing less from us. Our second principle is that science will prevail over the popular sentiment of the moment if there is a conflict between the two as long as there is a distinct advantage in staying with our current practice. One example of this is the concern some customers have had over our usage of meat and bone meal. Unless science shows its usage in poultry represents a food safety concern, we will still take advantage of its benefits. The third principle we operate by is that we will give our customers options if possible if they want alternatives to our primary product. An example that bridges both last principles was when environmental concerns about polystyrene egg cartons was a hot topic. Our assessment was that there was not sufficient legitimate scientific reason to change away from those cartons (which had many positive benefits to us). As an alternative, we offered eggs on display in flats, providing empty cartons that they could pack their own eggs into and return them in the future to re-use again themselves. That entirely defused the issue for the small minority that was concerned about the issue while allowing the vast majority of our product to be handled in what we felt was the best way. Now that this seems to be a dead issue, we no longer do so, and no one is expressing concern. We offer two nutritionally-enhanced eggs, organic eggs, floor bird eggs, and eggs produced without using animal origin feed ingredients for those persons, who for personal reasons, do not want to use our conventional eggs.

Using these principles, this is how we are approaching the animal welfare issue. We have (as long as it has been in place) used UEP's Animal Husbandry Guidelines for laying flocks as our operational guideline. We see the 2000 edition as a watershed-operating document for our industry. We feel that it represents a careful study that balances legitimate concerns with science-based recommendations. Wegmans feels that it is indefensible when interacting with our customers to not be able to honestly say that we are following those guidelines. In fact, we feel so strongly about it that we will (as far as existing facilities permit) be fully in compliance with the UEP 2012 timeline goal by the end of 2002. We do so understanding the economic implications. I have examined UEP's projected cost numbers, and have run my own profiles for our operation. While I am not free to discuss our own estimated numbers, I feel that UEP is not far off - perhaps the real increased cost of production may not be quite as high as they estimate.

I would like to comment on a few key issues that were examined in the recommendations. First, I see beak trimming, for the most part, a necessary procedure for the foreseeable future for the well-being of the birds. I observe 7-10 day beak trimming, and see little evidence that the bird suffers from the procedure. The birds will eat and drink immediately after it is done, and continue doing so. If they will eat feed which has sharp edges on the ground corn in it, I question how much pain they are experiencing. Even if there is a bit of temporary pain, it certainly is nothing compared to being attacked by an untrimmed neighbor which has cannibalistic instincts (and yes, that will happen in any housing system).

Induced molting is a practice that we have generally not followed industry direction. The only times that we use it is if we need to reschedule a flock because of construction or a growing availability situation. There is no doubt in my mind that the way molting is generally induced is stressful to the birds. Because of the image issues associated with that, we have very closely examined the economics around molting. I have a computer program which permits me to analyze the net profits thoroughly. I have run hundreds of scenarios which involve sequential flocks for a period of years, determining ROI on an average weekly basis. My analysis indicates that whether molting is economically valuable or not depends primarily on two factors - market value of eggs, and bird productivity. The lower the value of eggs, and the lower the rate of production, the clearer the advantage molting has from an economic standpoint. Clearly, there is no one standard answer for all farms on this one. In our case, over the long haul, there is very little economic advantage for the practice. With that being the case, I prefer to stay away from molting for image purposes, at least at this point. When I last did molt a flock, however, I tried a program that involved feed restriction, but not total feed withdrawal. While it took about one week longer to get to zero production, the flock performed well on its second cycle. If I molt again, I will use that program, because the birds were clearly less stressed during the molt.

Stocking density per bird is the adjustment that we are most focused on at this point. At the end of this year, our farm average stocking density for layers will be 65.5 sq. in. per bird. By the end of 2002, it will be 74 sq. in. per bird. This is new and uncharted territory for us. We definitely will need to make some

management adjustments, but if the first flocks are any indication, I think we are going to be pleasantly surprised with bird performance. I think that UEP may be conservative in what they are projecting for bird performance improvements. One of the reasons I think this is that we have historically had some flocks that were housed at 60 sq. in. Our numbers comparing 53 sq. in. vs. 60 sq. in. show more advantage in that increased space than what UEP published. I have analyzed 75 flocks on our farm over a 10-year period (45 flocks at 53 sq. in., 30 flocks at 60 sq. in.). 60 sq. in. out-produced 53 sq. in. by 7 eggs per hen housed to 75 weeks. They ate only .1# per 100 birds/day more, resulting in improved feed conversion of .07#/doz. eggs because of better production. Another interesting thing that isn't being talked about a lot, but maybe should be, is birds per cage. We have some houses that have had 6 birds per cage at 53 sq. in., and others with 9 birds per cage at the same space per bird. The 6 bird cages produced 6 eggs per bird to 75 weeks more than the 9 bird cages.

As new facilities are constructed, design issues will certainly be impacted by these issues. Optimum cage configuration, feeder space, head space, cleanliness, and air quality will be driving forces in design as well as environmental impact issues. We have just completed a new pullet house, and the design we chose definitely included features to maximize bird comfort.

I believe that our industry is at a crossroads on the animal welfare issue. UEP has taken outstanding leadership in commissioning an excellent study, and publishing recommendations. If the industry acts upon these recommendations, I think that we have an excellent opportunity to be in a proactive position. Failure to do so may help to further radicalize and expand activism. There could be increased risk of finding ourselves being imposed with regulations that may have less to do with good science than with misguided zeal. Additionally, I believe that the marketplace will insist that we respond. McDonald's requirements is evidence, and I believe that many more will follow. If we are following recommended guidelines, we will be in a much better position to market our product. It certainly looks risky in making moves that will increase cost of production, but I feel that in this case, the risk takers will be rewarded. Our company intends to lead the way.

ANIMAL WELFARE ACTIVITIES

The Food Marketing Institute, the major trade association of the supermarket industry, and the National Council of Chain Restaurants, a unit of the National Retail Federation, have created a professional third-party Animal Welfare Advisory Committee. This committee of mainly academics, of which I am a member, is working with the various production agriculture trade associations to develop a set of guidelines for animal welfare that can be quantitatively measured by independent third party auditors. Our first effort was to identify what such guidelines should look like and how the guideline should relate directly to the auditing function. Although most production agriculture groups have animal welfare guidelines, many of the suggestions in the current documents are too general and do not lend themselves to outside auditing as part of a retailer's (supermarket's or chain restaurant's) purchasing specifications so these documents will need to be updated to be more quantitative. We anticipate that some of the quantitative standards that will result from this process will have a significant impact on animal production, but that the improved welfare standards will benefit the industry and its public image in the long run. For example, the United Egg Producers have accepted a higher square footage for caged layers. The actual numbers and how they will be implemented are still being discussed, but with many of the supermarkets and chain restaurants likely to require adherence to the agreed upon numbers, the impact will be significant and the process will, of necessity, have to proceed at a reasonable pace.

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DEVELOPMENTS IN RESEARCH

The following articles are extracts of papers which were presented at the annual meeting of the Poultry Science Association, July 2001, in Indianapolis.

* Kim and Lee (Chungnam University, South Korea) conducted an experiment to determine the nutritional value of high oil corn (HOC) as compared to normal corn in an experiment with laying hens. The period of experiment was 15 wk and ISA-Brown layers were used in the experiment. The experimental diet consisted of: 1) a corn-soy diet containing normal corn, 2) a corn-soy diet in which the HOC was

substituted with normal corn, but the diets were maintained isocaloric, and 3) a diet similar to treatment 2, but HOC was replaced on an equal weight basis with normal corn and, consequently, it contained a higher energy value. Two metabolism studies were conducted with roosters and laying hens to determine the energy content of HOC. The HOC used in this study had 94% more oil than the normal corn (6.6% as fed-basis). The GE (gross energy), AME_n (apparent metabolizable energy), and TME (true metabolizable energy) of HOC were 5.7-7.7% higher than the normal corn. Performance including the physical quality of eggs were not influenced by the type of diets used, probably because the control diet already had sufficient nutrients for maximum performance. The polyunsaturated fatty acids in egg yolk from hens fed HOC were higher than the normal corn.

*Ruedi et al. (Swiss Poultry Husbandry School, Switzerland) conducted a 2 X 2 factorial experiment with laying hens to determine the effect of Eggshell-49 and mussel shell on performance of laying hens. Eggshell-49 was used at 0 or 1 kg per ton feed and hens had no access to mussel shell or they had access to mussel shell on an ad libitum basis during the afternoon hours. Experiments involved two phases with phase 1 from 49 to 60 wk of age and phase 2 from 61 to 68 wk of age. White Lohmann hens were used as the experimental animal. The feed contained 3.75% Ca during phase 1 and 3.9% Ca during phase 2. Egg production and feed consumption were not influenced by treatment during the entire experiment. However, mortality for the entire experiment was reduced by adding Eggshell-49 (3.2 vs 1.8%). Eggshell-49 changed the egg size distribution. Eggshell-49 reduced the proportion of large-sized eggs and increased the proportion of small-sized eggs. Egg shell quality and percentage cracks were not influenced by dietary treatments. Also, free access to mussel shell did not have a beneficial effect on performance and shell quality.

*Faria et al. (Faculdade de Zootecnia e Engenharia de Alimentos, SP, Brazil) conducted an experiment to determine the effect of vitamin D and vitamin C on performance and shell quality of laying hens. The experiment involved a 2 X 3 factorial arrangement of the treatments with two sources of vitamin D [vitamin D_3 vs Hy-D (25-OH-D_3)] each at 2,756 IU / kg diet and three sources of vitamin C (0, 100, and 200 ppm). Babcock B-300, at 23 wk of age, were fed the experimental diets for 12 wk. Feed intake, egg production, egg weight and egg mass were not influenced by dietary treatments. Feed conversion was improved in the presence of Hy-D when vitamin C was not added to the diets. Haugh units and yolk index were not influenced by the treatments, but the presence of interaction indicated that albumen percent and yolk percent were increased with 200 ppm vitamin C. Percent shell and blood total and ionic calcium were not influenced by treatments. It was concluded that with young laying hens, feed conversion can be improved by Hy-D and the inclusion of vitamin C was not beneficial.

Ao et al. (University of Kentucky) conducted an experiment to determine the effect of supplementing a low-P diet with Alltech phytase and Eggshell-49 (an organic source of Mn, 4.5 ppm; Zn, 7.5 ppm, and Cu, 1 ppm) and the age of hens at photostimulation on egg production performance. Hy-Line pullets (brown egg layers) were subjected to photostimulation at 16, 17, and 18 wk of age. The four dietary treatments used consisted of the control diet which was not supplemented with phytase or Eggshell-49, the control diet plus 11,500 ptu phytase per kg diet, the control diet plus Eggshell-49, or the control diet plus phytase and Eggshell-49. The control diet contained 0.17% NPP, 3.75% Ca, 51 ppm Mn, 60 ppm Zn and 8 ppm Cu. Feed intake during the period of experiment (52 wk) were not influenced by diets, but it was linearly influenced by the age of housing. Hens housed at 16, 17, and 18 wk of age consumed 104, 105, and 107 g feed / day, respectively. Egg production during 52 wk of the experiment (average = 81.5%) was not influenced by the age of housing or diets. Housing at 17 wk of age (as compared to 15 and 16 wk) increased egg weight (61.6, 60.5, 60.4 g, respectively), but reduced the average percent shell (8.93 vs 9.18 and 9.12%, respectively). Phytase significantly increased the breaking strength of the humerus, but not the tibia measured after 45 wk of production. The results indicated that early photostimulation decreases egg weight and feed intake, and increases percent shell. Additionally, the level of NPP, Mn, Zn, and Cu in the control diet were adequate to support the performance. However, increasing the breaking strength of the humerus indicated that the level of P was marginal for maintaining bone strength.

*Cormier et al. (Universite Laval, Quebec, Canada) conducted an experiment to determine the effect of linear increase in dietary protein level on performance, carcass yield and health of ostriches. Sixty-four unsexed ostriches were used in this study. The birds were fed four protein sequences from 2 to 10 months of age. The protein treatments involved: 1) starter diets which contained 18 to 23% protein and were used during 2 to 4 months of age, 2) grower diets which contained 14 to 18% protein and were used from 4 to 7 months of age, and 3) finisher diets which contained 12 to 15% protein and were used from 7 to 10 months of age. With the exception of protein, each series of diet contained equal quantities of

the fiber, energy, methionine, and lysine. Body weight, feed efficiency, and feed intake were measured throughout the trial. Live weight (LW), carcass yield (YC), viscera weight, heart and liver weights, and meat yield, meat cuts yields, and meat pH and color were also measured at the end of the experiment. Mean live BW and carcass weight were 95.15 and 55.83 kg, respectively. Adjusted daily gain was 310 g and feed efficiency (kg weight over kg feed) was 0.16. Total meat cuts yield was 40.56% of the carcass. The results suggested that growing ostriches can perform equally well across a wide range of dietary protein without a negative impact on performance, carcass yield and health.

*Kamyab and Nikkhah (University of Tehran, Iran) conducted an experiment to determine the effect of protein and energy levels on performance of Hy-Line W-36. The experiment involved three levels of energy (2,770, 2,880, and 2,900 kcal ME / kg) and four levels of protein (14, 15, 16, and 17%) in a 3 X 4 factorial arrangement of the treatments. The experimental period was from 27 to 40 wk of age. Egg production was not influenced by dietary protein, energy or their interaction. Increasing the dietary protein tended to increase the egg weight with values of 57.1, 58.3, and 58.5 g for 14, 15, and 17% protein. Feed intake was significantly reduced with increasing the dietary energy level. Feed intake per dozen of egg was 2.5 g lower with increasing the dietary energy level. Economic analysis showed that returns were less with 2,900 kcal / kg and tended to reduce with increasing the protein content of diets. Body weight was not influenced by the energy levels, but it was affected by the protein levels. Albumen quality, cracked and soft shell were not influenced by dietary treatments. Maximum egg production, feed efficiency and lowest feed cost which belonged to the diet contained 2,800 kcal ME / kg and 14% protein level.

*With public concern regarding the use of antibiotics in poultry diets, the willingness for use of probiotics by the industry are increasing. However, sufficient information should become available so that the industry becomes convinced that a particular probiotic or a combination of certain probiotics, in fact, provide beneficial effect on performance. Kim et al. (Chonbuk National University, Republic of Korea) conducted an experiment to determine the influence of Lactobacillus, live yeast (Y), and its mixture (L + Y) on the performance and intestinal microflora of laying hens. Two hundred-forty ISA-Brown hens were fed six treatments. The six treatments consisted of: 1) a control group (without probiotics), 2) the control plus Pichia farinosa (Y), 3) Lactobacillus crispatus avihen 1 (LC), 4) Lactobacillus crispatus avihen 2 (LV) isolated from hen=s cecum, 5) LC + Y, and 6) LV + Y. The probiotics were used at 0.3% from 21 to 30 wk of age. Various indices of production performance were periodically measured during the course of the experiment. Intestinal microflora and fecal NH_3 emissions were examined at the end of the experiment. Egg production and daily egg mass were significantly higher due to receiving either microorganisms or their combination than the control group. Egg weight and feed intake were not influenced by treatments. Feed conversion was significantly improved in groups fed Y, YC, Y + LC compared with other treatments. Eggshell quality was similar in all the strains except Y-fed treatment. Total Lactobacillus spp. and anaerobes of ilium seem to increase greater than in LV, LV + Y, LC + Y than other treatments. Fecal NH_3 emission was significantly lower in LV, LV + Y and LC + Y than other treatments. The results of a second experiment by the same investigators confirmed the results of the first experiment and the use of probiotics increased egg production and daily egg mass. Additionally, similar to the results of the first experiment, the concentration of Lactobacillus spp. in the ileum of probiotic-fed groups significantly were greater and the NH_3 emission released from the fecal was significantly lower. The results of a second experiment with laying hens also indicated that a concentration of 10^4 cfu / g feed was as effective as a concentration of 10^7 cfu / g feed.

*The objectives of another experiment by the same investigators (Kim et al., Chonbuk National University, Republic of Korea) was to determine the effect of feeding various Lactobacillus isolated from broilers and laying hens on fecal noxious gas and performance of broilers. Broilers were fed control, Lactobacillus crispatus avibro 1 (LRB), Lactobacillus reuteri avibro 2 (LRB), Lactobacillus crispatus avihen 1 (LCH), Lactobacillus crispatus avihen 2 (LRH) at the level of 10^4 and 10^7 cfu / g feed for 5 wk. Broiler performance and intestinal microflora were measured on a weekly basis. Nutrient digestibility and fecal NH_3 emission were measured at the end of the experiment. Weight gain of chickens fed Lactobacillus tend to increase and were significantly heavier than the control group at 5 wk of age. Feed intake and feed conversion were not different between the Lactobacillus-fed groups and the control group. The total Lactobacillus of ileum of birds fed various Lactobacillus was significantly higher at 5 wk of age, but was not significantly different in the cecum. The total number of yeast was significantly increased from 3 wk of age in the ileum and cecum, whereas the total number of anaerobic in both sections of intestine started increasing from one wk of age. Litter moisture of birds fed Lactobacillus was varied from 27-30%, but was 38.3% for the birds of the control group. Fecal NH_3 gas emission was significantly decreased in groups fed

Lactobacillus. Dry matter Ca, P and protein, fat and ash digestibility tended to be higher in Lactobacillus-fed group. The investigators concluded that feeding various Lactobacillus improved performance and reduced fecal noxious gas. The results also indicated that the optimum Lactobacillus number seems to be higher than 10^4 / g feed.

*****In a subsequent study, the same group of investigators (Kim et al., Chonbuk National University, Republic of Korea) studied the effect of two types of Lactobacilli and Virginiamycin on performance, nutrient digestibility and intestinal microflora of broiler chicks. Day-old chicks were fed six treatments for 5 wk. The treatments included: 1) the control, 2) control plus 0.5% Virginiamycin (VM), 3) Lactobacillus crispatus (LC), 4) Lactobacillus reuteri (LR), 5) LC plus VM, and 6) LR plus VM which were incorporated into the diets. Weight gain of groups fed Lactobacillus or Virginiamycin was significantly greater than the control. Feed conversion was lower for these groups than the control. Feed intake was significantly increased in the supplemental groups than the control. Digestibility of protein Ca and P were increased alone or combined Lactobacillus treatments. However, fat, dry matter and ash digestibility were not influenced by treatments. Feeding Lacobacilli tended to increase the concentration of Lacobacillus spp. in ileum at one and 3 wk of age and showed a significantly higher level in cecum than the control at 5 wk of age. Total yeast was not different at 1 and 3 wk of age between treatments. The ileal and cecal anaerobes started to increase from the first week of age. Fecal NH_3 gas tended to decrease in Lactobacillus treatments compared to that of the other treatments. The results of this experiment were consistent with their previous reports concerning the beneficial effect of including Lactobacillus in poultry diets.

Comments: Because in contrast to antibiotics, the problem of resistance does not seem to be a public concern, investigation in the area of the probiotics should receive serious consideration for improving the productivity of various classes of poultry. The results of the above experiments are very promising with regard to increased egg production and egg mass in layers and increasing weight gain, nutrient digestibility and reducing moisture content of fecal material and fecal NH_3 emission due to use of probiotics. (K. Keshavarz)

*Although many enzyme or enzyme complexes are available that successfully can help increase the digestibility of barley or wheat-type diets, still, no enzyme or enzyme complexes are available to improve the digestibility of corn-soy diet. Kang et al. (Konkuk University) reported the results of an experiment on the use of an enzyme complex with the commercial name of Endopowr which contained alpha-galactosidase, galactomannanase, and alpha amylase, and was claimed that specially is formulated to be useful for corn-soy type diets. The experiment was conducted with 3-d-old broilers. The four experimental diets in a 2 X 2 factorial arrangement consisted of two levels of energy 2980 and 3100 TME kcal / kg and two levels of enzyme supplementation of 0 and 0.1%. There were no differences in feed intake or feed conversion. The body weight gain of the low energy group plus enzyme was significantly increased indicating that the enzyme complex increased the energy utilization of this diet greatly. However, the body weight gain of the group containing the higher energy level was not increased by the enzyme complex. The enzyme supplementation slightly reduced the abdominal fat. The relative intestinal length (cm / BW) was lower in birds fed the low-energy diet and was not supplemented with enzyme complex than the other groups. The duodenum weight (% of BW) of birds on a high-energy diet was greater than those on low-energy diets. The villi of the group fed diets without the enzyme complex were shorter and more thickened than those fed the enzyme complex regardless of the energy content of the diets. The investigators concluded that the enzyme complex increased the energy utilization, reduced the abdominal fat and increased intestinal development.

*Ahmad et al. (Tuskegee University and Auburn University) conducted an experiment to determine the effect of Allzyme phytase on performance of laying hens. The experiment consisted of a 2 X 3 factorial arrangement of the treatments with two levels of lysine (0.83 and 0.92%) and three levels of NPP (0.4%, 0.1%, and 0.1% plus 11,400 units / kg diet Allzyme phytase). Bovans hens, 40 wk old, were used in this experiment. The results indicated that reducing the lysine level from 0.92 to 0.83% significantly reduced the egg weight and feed consumption, but did not drop egg production. Reducing the NPP from 0.4 to 0.1% reduced the egg production, egg weight, and feed consumption. Supplying phytase to the negative control diet with 0.1% NPP significantly increased the egg production, egg weight and feed consumption and these traits were comparable to the positive control. Feed efficiency of the negative control plus phytase was even better than the positive control. The investigators concluded that Allzyme phytase supplementation reversed all the adverse effects of the phosphorus-deficient diet and further improved the feed efficiency.

*Kamberi et al. (University of Prishtina, Kosova, University of Georgia, and University of Sarajevo, Bosnia and Herzegovina) conducted a 2 X 2 factorial experiment to determine the effect of adding phytase (BASF) to corn-soybean laying diets with different NPP on

performance of laying hens. The period of experiment was for 8 wk and Hysex Brown laying hens were used in their experiment. The diets consisted of 0.12 and 0.42% NPP each with 0 or 600 units phytase / kg diet. The performance of hens fed 0.12% NPP plus phytase was very similar to groups fed 0.44% NPP without phytase for egg production (96 vs 93%), egg weight (63 vs 63 g), shell weight (6.3 vs 6.4 g), and feed intake (106 vs 105 g / hen / day). Hens fed the diets with 0.12 and 0.44% NPP utilized only 10.6 and 7.95% of the phytate P, respectively. When 600 units phytase was added to the diets, phytate P utilization increased to 41.02 and 33.45%, respectively. Both the level of NPP and phytase significantly affected phytate P utilization (their interaction was not significant). The investigators concluded that corn and soybean meal diets contained 0.18 to 0.22% phytate P that can be made partially available by adding phytase to the diet.

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This publication is issued to further Cooperative Extension work mandated by acts of Congress of May 8 and June 30, 1914. It was produced with the cooperation of the U.S. Department of Agriculture; Cornell Cooperative Extension; and College of Agriculture and Life Sciences, College of Human Ecology, and College of Veterinary Medicine at Cornell University. Cornell Cooperative Extension provides equal program and employment opportunities. D. Merrill Ewert, Director.
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