CORNELL POULTRY POINTERS

Cornell Cooperative Extension

Vol. 50 No. 4 October 2000 Barb Smagner, Managing Editor

The following information is from the Cornell Poultry Conference, held June 21, 2000, at the Ithaca Ramada Inn. Other writeups from the Conference can be seen in Volume 50, No. 3, July 2000.

THE IMPACT OF GENETIC ENGINEERING ON PLANT BREEDING

A few years ago, genetically engineered crops seemed to be poised for ready acceptance in the U.S. Despite concerns in Europe, adoption of genetically engineered cotton, soybeans, and corn by U.S. farmers grew dramatically in the first few years after their commercialization. However, public concerns regarding so-called "GMOs" (genetically modified organisms) now have risen to unprecedented levels in Europe, to the point where numerous U.S.-based food processors and some grain exporters are refusing to accept products derived from genetically engineered organisms in order to protect their export markets. Concerns in the U.S. are on the rise as well, and have manifested themselves in legislative proposals in 15 states to restrict use of genetically engineered crops.

Proponents of genetic engineering technology have supported their case by making the argument that genetic engineering is simply a logical extension of what has long been done through traditional plant breeding. However, a

CONTENTS

1) The Impact of Genetic Engineering on Plant Breeding

6) New York Egg Producers Are Using Innovative Approaches to Address the Issue of Waste Management--The Approach at Kreher's Poultry Farms

9) Proper Approach For Beak Trimming

10) The Geese and Avian Influenza Virus (AIV) are Flying

11) You Are Not Using Antibiotics! Shouldn't Your Customers Know?

11) Velogenic Viscerotropic Newcastle Disease (VVND) in Mexico—What is the Risk for NYS?

12) Developments in Research

recent survey of random samples of the U.S. general public showed that over half of the people surveyed believed that they had never, in their entire lives, consumed a fruit or vegetable that was the product of traditional cross breeding. This was the case despite how clearly and simply the concept of “traditional cross breeding” was explained to respondents before they answered the question. It is evident that most people do not understand the process of plant breeding. Under these circumstances, justifying genetic engineering as “simply a logical extension of what has long been done through traditional plant breeding” will offer little comfort to concerned citizens. Clearly, there is a tremendous need for education about plant breeding and genetic engineering to allow people to make informed legislative and personal choices about this new technology.

But the controversy about genetically engineered crops stems from factors well beyond poor understanding of the technology. Most consumers perceive very little, if any, benefit from currently commercialized genetically engineered crops — primarily the insect resistant “Bt” crops and several herbicide resistant crops. Such crops may benefit the producer by reducing losses to pests, potentially reducing pest management costs, and perhaps reducing environmental impacts of pest management, although these benefits have only been demonstrated in certain circumstances (not broadly) for the two most commonly used products, Bt corn and Roundup Ready soybean. At the same time as consumers perceive little or no benefit from genetically engineered crops, they have a broad range of concerns about them. This combination makes for a tough market sell, which is what Europe and other countries, and increasingly the U.S., are facing.

In this presentation, I will provide definitions and brief discussion of the similarities and differences between traditional plant breeding and genetic engineering, followed by a few comments about the genetics of plant traits. Finally, I will comment on the issues facing producers and consumers of genetically engineered crops.

BIOTECHNOLOGY AND GENETIC ENGINEERING

The term “biotechnology” is widely used in the popular literature, but with only limited understanding of what it actually means. Biotechnology is defined as the use of biological organisms or processes in any technological application. This would include ancient processes like making bread, beer, yogurt, or cheese. However, in its popular usage, this term has acquired a meaning that equates it to the “modern biotechnologies” or genetic engineering. Genetic engineering is actually a subset of biotechnology that uses techniques for altering the properties of organisms by transferring individual genes between organisms or modifying genes within an organism. Most of the popular focus has been on the former (the creation of transgenic organisms that carry genes derived from other species). However, the first genetically engineered crop that was marketed in the U.S. was actually a case of the latter. The “Flavr Savr” tomato, genetically engineered to retain better flavor and quality after it was picked, resulted from modifying a tomato gene involved with the ripening process. By eliminating expression of this gene, ripening after the red stage was slowed down dramatically.

Genetically modified organism or “GMO” is another term that has acquired widespread popular usage. It is a deceptive term, in that crops and animals have been genetically modified to better meet human needs ever since the dawn of settled agriculture. The earliest farmers selected seeds that came from plants with characteristics they found attractive, thus choosing and propagating a subset of the genetic variation in the wild plants from which they collected those seeds. Over generations, this led to domestication – change in the genetics of the wild species by selecting only certain variants from wild populations that were better suited to human needs. Farmer selection had been carried out on these domesticates for thousands of years, through the processes of choosing which seeds to save, which varieties to plant together (thus allowing recombinations to occur between them), and which varieties to import from other farmers in other areas. This has brought about further genetic change, resulting in yet more genetic modification with respect to the original wild relatives of domesticates. Finally, in recent year, scientifically-based plant breeding has focused on sexual crosses to create new types, resulting in broader possibilities for genetic change. It is clear that genetic differences distinguish domesticated crops from their wild relatives. Thus all of our current crops are truly “genetically modified organisms” in the literal sense.

In popular usage, however, the term “GMO” has been used to refer to the most recent techniques for genetic modification — genetic engineering. The distinction is important in light of the lack of public understanding about plant breeding. Survey results show that most people in the U.S. do not believe they have ever eaten a fruit or vegetable that was the product of traditional cross breeding (something that had been done by farmers even well before the re-discovery of Mendel’s laws of genetics). One cannot be surprised, then, at the public’s sense that heirloom and traditional varieties are somehow “natural” in a way that hybrid varieties and most certainly genetically engineered varieties are not. Enhancing understanding of the process by which our domesticated crops and livestock were derived and the subsequent breeding work that has been done with them will help people put genetic engineering technology in appropriate context.

It is important to realize the ways in which genetic engineering does and does not differ from "traditional" plant breeding. (In this context, "traditional" plant breeding means breeding that moves genes only via sexual crosses between individuals.) Genetic engineering includes modifying genes within an organism. Mutation is the natural process by which genes within an organism are modified. Naturally occurring mutations are the basis for genetic differentiation among and within species. Plant breeders have also used mutagenic agents (radiation, chemicals) to enhance the mutation rate and create more genetic variants from which to select. So modification of genes within an organism is not a new process. Genetic engineering also includes transfer of individual genes between organisms. This has also been done for centuries between organisms that are sexually compatible. Plant breeders have made crosses between crops and their wild and weedy relatives to transfer genes for traits like pest resistance to the domesticated crops. So neither of the processes that constitute genetic engineering is entirely new.

That said, there are some differences between traditional plant breeding and genetic engineering. Whereas traditional plant breeders are limited to transferring genes between sexually cross-compatible organisms, genetic engineering allows transfer of a gene from one organism into another regardless of species barriers to cross fertility. Genes from bacteria or animals can be (and have been) transferred into plants. A second difference is that in making sexual crosses, one of the two copies of each of the genes present in each parent is combined in the progeny of the cross, including both desired genes and others contributed by the two parents. Genetic engineering introduces only the designed DNA construct (the desired gene, an appropriate promoter, and a marker) into the target organism. Lastly, the ability to isolate, describe, and manipulate individual genes has led to the legal right to patent genes. This has altered the practice of plant breeding, which traditionally used existing products as raw materials to build into new crosses and new products. That usage has become more formalized and more costly, in that licensing agreements are required for the use of patented genes.

Despite these differences, it is important to realize that in many ways genetic engineering and traditional plant breeding do not differ. Both plant breeding approaches depend on variation in the sequence of the four base pairs of DNA as their fundamental basis. Both approaches aim to modify crops to better meet human needs, just as the earliest farmers who domesticated our crops aimed to do. Finally, it is not new that private companies seek a return on their investments in plant breeding research. With traditional plant breeding, they were able to do that through plant variety protection laws and, more effectively, through development of hybrid varieties (where a regular seed market was largely guaranteed). With genetic engineering, the option of patenting genes has provided another avenue for the private sector to seek a return on their research investment. Thus, although genetic engineering is a distinct new tool for plant breeders, it shares the same fundamental elements as traditional plant breeding: DNA variation as the basis, improving crops to better meet human needs as the goal, and mechanisms to insure a return on research investment if private sector resources are to be invested in plant breeding research.

GENETICS OF PLANT TRAITS

The genetic material of plants, like that of all known biological organisms, consists of strands of deoxyribonucleic acid (DNA) structured in chromosomes. The DNA code of an organism is based on four "letters" (nucleotide bases in the DNA molecule) and contains all the instructions necessary for producing that organism – its forms and structures, developmental pathway, cell maintenance processes, responses to stresses, etc. Perhaps not surprisingly, the DNA code is universal. All known organisms use essentially the same code for hereditary instructions. The degree of similarity between the base pair sequences in different species allows inferences about their evolutionary similarity. Comparison of DNA sequences between different organisms, known as comparative genomics, has revealed striking sequence similarity among related organisms, such as the grasses. For example, one can now identify the chromosome regions in rice that are analogous to those in all of the other major cereal crops. Similarity among more distantly related plants is also quite striking, and has allowed discovery of many gene families with related functions across diverse species.

It is this universality of the DNA code that has allowed genes to be moved from one species to another and still function. A gene that encodes for human insulin, for example, can be transferred to a bacterium that is easily grown in large numbers in culture medium. If the appropriate regulatory DNA sequence is attached to the gene, this bacterium will then read that gene just as it does any other gene naturally found in its DNA sequence and produce the corresponding protein – human insulin. This can then be extracted from the bacterial broth in which it was produced and marketed as a pharmaceutical. Virtually all the insulin now available for treatment of diabetics is produced in exactly this way.

Our ability to genetically engineer plants (or other organisms) to produce novel compounds or carry out novel processes is now limited primarily by our understanding of the genetic control of those compounds or processes. In contrast to the human insulin example mentioned above, most important compounds or processes are the product of multiple genes acting and interacting in concert. Our understanding of these multi-genic traits is fairly rudimentary and our ability to identify the many genes involved is limited. Most agronomically important traits are multi-genic, and hence have yet to benefit from the use of genetic engineering.

ISSUES OF CONCERN TO PRODUCERS AND CONSUMERS

A thorough discussion of the issues of concern related to genetically engineered crops is beyond the scope of this presentation. However, a brief summary of those issues is provided here in hopes that it will help in understanding others' perspectives.

Of primary concern to producers is the cost:benefit analysis for use of a genetically engineered crop. Numerous factors will contribute to this analysis. The seed cost for genetically engineered varieties is generally higher than that for non-genetically engineered varieties, and restrictive technology use agreements often apply to the genetically engineered varieties. In some cases, new genetically engineered varieties will allow reduced labor and production costs, greater flexibility in management, and increased convenience for producers. On the other hand, marketability may be limited for the products of some genetically engineered varieties. At present, there are some specific markets where products of non-genetically engineered crops are receiving a price premium. It is anticipated that in the future, there will be genetically engineered crops whose products have value-added benefits for consumers or processors and thus they will receive price premiums. What should be clear from this brief list is that costs and benefits are very case specific with respect to the genetically engineered crop and trait, the marketing environment, and the individual producer and farm management circumstances.

Both producers and consumers are concerned about environmental impacts of genetically engineered crops, although the level of concern varies widely. Some of these impacts may be positive (e.g., from reduced pesticide use, less need for tillage resulting in reduced erosion potential, lowered rates of crop nutrient application). On the other hand, there are concerns about the potential for negative environmental impacts, such as effects on non-target organisms, "gene escape" from genetically engineered crops to their wild and weedy relatives through sexual crosses, and the evolution of pests to overcome genetically engineered sources of host plant resistance. The latter is a risk for any pest control method, including traditionally bred resistance, chemical pesticides, and even some cultural control methods. However, it has been highlighted by the widespread use of crops genetically engineered to express the Bt toxin. The gene for this toxin was derived from a common soil bacterium, *Bacillus thuringiensis*, which has been widely used as an organic insecticide. Insect exposure to the Bt toxin is much greater when the toxin is deployed in genetically engineered plants than when it is deployed as a bacterial formulation. This has led to concerns about rapid evolution of resistance, and particularly to concerns that a popular organic insecticide will become ineffective due to deployment of genetically engineered Bt plants. These concerns resulted in the recent EPA ruling that limits the proportion of crop acreage that can be planted to Bt-carrying genetically engineered plants.

Health concerns are a major factor for consumers, and include concerns about food safety and about introduction of unanticipated allergens into common foods. Food safety testing is voluntary for the products of genetically engineered crops, unless they are determined to differ from the original crop beyond the range of normal variation found in that crop, or the introduced gene's product is expected or determined to have adverse food or feed characteristics. This approach does not sound particularly reassuring to concerned consumers. On the other hand, toxicological safety testing like that conducted on food additives, pesticide residues, etc., if applied to commonly eaten foods, would reveal a variety of natural toxicants and / or anti-nutritional substances in the foods we have all eaten and accepted as safe for decades. This creates a testing dilemma: if the product of a genetically engineered crop is found to carry potential toxicants but the non-engineered crop product does as well, what reasonable decision is to be made? This dilemma has led to the concept of "substantial equivalence." This concept encompasses the idea that a new variety should be as safe as traditional varieties that we have consumed over time, and requires safety assessment to focus on those cases where a product will not be "substantially equivalent" to its non-genetically engineered counterpart. Although it may seem logical, this approach is worrisome to concerned consumers, who note that all the genetically engineered varieties commercialized in the U.S. to date have been declared "substantially equivalent" to their non-genetically engineered counterparts, and that the assessment of substantial equivalence is made by the very companies aiming to market these products. Consumers worry that this language is being used simply to avoid careful food safety testing.

Concern about novel and unanticipated allergens is also important for consumers. The example most often cited in support of this concern is the case whereby a Brazil nut gene was genetically engineered into soybeans. The resulting soybean product caused allergic reactions in some people with allergies to Brazil nuts. The company developing this product immediately halted further development for this reason. However, concern has focused on genes from sources whose allergenic properties are less well known. People do not get exposed to foods from all organisms that might contribute genes of use in genetic engineering, so it is not clear in some cases what allergies to test for. Testing for allergens has relied on our scientific understanding of the general nature of dietary allergen molecules. Introduced genes that produce products anything like known allergens are extensively tested. However, this has not proven very reassuring to concerned consumers either.

Although food safety is a major consumer concern about genetically engineered crops, the voluntary nature of food and feed safety testing means that very little data on safety is publicly available to date. One recent article showed data based on feeding herbicide resistant corn to chicks. It claimed no significant differences in various parameters of chick growth and development, and thus concluded that the genetically engineered varieties were as safe and nutritious as non-engineered ones. However, two statistically significant differences in chick nutrient status were detected, each in only one year out of the two years of this study. The authors (who work for the private company marketing the product) claimed that these differences were not biologically significant as they did not show up consistently. The argument that these differences indicate biological significance under certain conditions could equally well have been made. With such limited data publicly available, most of it consisting of small-scale and short-term studies, there is little scientific basis for broad claims of safety for these products. This provides little basis for a scientific response to concerns about food safety.

Concerns about genetically engineered crops have also focused on several areas that cannot be informed by increased scientific understanding. Perhaps the most significant of these is the structure of the agricultural industry. Genetically engineered crops are seen as a significant contributor to the overall trend toward consolidation, globalization, and industrialization in agriculture. The ability to patent genes appears to vest control over the raw material of agriculture – the genetics of our crops and livestock – in large private sector corporations. Much opposition to genetically engineered crops is closely related to concerns about this general trend in global economics and agriculture.

There are also concerns about genetically engineered crops that originate in belief systems. Some people have ethical or religious concerns about this technology. Those who follow ethically- or religiously-based dietary restrictions are concerned about how this will alter the nature of foods they consider inappropriate to eat. If a fish gene is present in a tomato plant, is that plant still an acceptable vegetarian food? If a pig gene is transferred to a beef cow or a wheat plant, will the products of those organisms be acceptable to somebody who does not eat pork for religious reasons? Again, these are concerns that cannot be answered by increased scientific understanding — they will need to be addressed through ethical and religious debate.

From this brief summary of issues related to genetically engineered crops, it should be apparent that there are many dimensions to the concerns. Decisions for individual producers and consumers will, in some cases, be quite complex. As noted at the outset of this presentation, there is clearly a tremendous need for education about plant breeding and about genetic engineering to help people make informed choices about this new technology. We should all strive to contribute to that educational process.

[Speaker: Margaret E. Smith, Department of Plant Breeding, Cornell University.]

NEW YORK EGG PRODUCERS ARE USING INNOVATIVE APPROACHES TO ADDRESS THE ISSUE OF WASTE MANAGEMENT

THE APPROACH AT KREHER'S POULTRY FARMS

New York State egg producers have been quite proactive in resolving the issue of waste management on their farms by adapting innovative and environmentally responsible approaches. In the next several issues of Cornell Poultry Pointers, the approaches that have been taken on several egg farms in New York State will be discussed. We hope the information will be useful to other producers in the U.S. and elsewhere who are searching to find a suitable approach for their specific situation. In this issue, the readers will be informed about an innovative approach that has been adapted at **Kreher's Poultry Farms**, Clarence, NY.

A Concise Look at Kreher's Poultry Farms

Kreher's Poultry Farms is located in Clarence, NY. It is a family-owned farm, which at the present time is managed by a third generation of the family. Five brothers and two cousins are partners in the farms. This family has always provided leadership to the farming community. They have served as presidents of the Erie County Farm Bureau, presidents of the New York Poultry Association, president of the Northeast United Egg Producers, Second Vice Chairman of the national organization known as United Egg Producers (UEP), member of three advisory committees at Cornell University, and also, have been involved in the development of a food safety program for eggs in New York State, among others.

Currently, 800,000 birds consisting of 600,000 layers and 200,000 growing pullets are kept on the complex. Additionally, the Kreher's are raising crops consisting of corn, soybean, wheat, peas, and sweet corn on 2,000 acres (including owned and rented lands). During recent years, some parts of the land have been allocated to the production of organic crops. In 1999, about 70 acres of land was allocated to the production of organic soybean. Also, they have a couple hundred acres of transition land for wheat. They also produce weekly about 500 cases of "Eggland's Best Eggs", a specific brand of eggs which is enriched with omega-3 fatty acids and vitamin E by using a specific diet. The farm has its own "gravimetric feed mill" which is working on weight rather than volume, and mills about 28,000 ton of feed annually for the birds in the complex. They have their own egg processing plant, and also purchase some extra eggs from other producers.

Decision for Expansion

The complex had about 300,000 hens in 1994. At that time, the Kreher family decided to expand the complex and increase the number of hens to 600,000. Such expansion made it necessary to expand the size of the growing facilities to 200,000 pullets for providing sufficient birds for the laying houses.

What was the Major Concern for the Expansion?

The Kreher family is very committed to the well-being of their community and protecting their environment from pollution among other pertinent issues. Their main challenge for the expansion of bird capacity in the complex was to find a practical and agronomically and environmentally sound approach for the use of a large volume of manure that is produced by the current modern high-producing birds. It was quite obvious to them that with the expansion of bird numbers, the production of manure would be considerably greater than what could be used on their own lands. They were also aware that, although crop farmers are generally willing to use poultry manure, the nature of fresh poultry manure has several problems associated with it that should be properly addressed before it becomes attractive and feasible for use by crop farmers. The problems associated with fresh poultry manure consist of: a) its high moisture content (about 75-80%) for transport and application to crop lands economically, b) typically, poultry manure has an offensive odor that causes crop farmers concern that can result in neighbor relationship problems, c) there are related concerns about flies and other insects, as well as, enteric pathogens (E. coli, etc.), and d) there are concerns about surface and ground water pollution. The Kreher family is quite aware that for the expansion of their poultry complex, first a feasible and economically sound approach should be in place to properly address the above-mentioned limitations. Furthermore, they were motivated to develop a manure management system that clearly solves the environmental issue at their complex.

INNOVATIVE APPROACH

Although Kreher's have been aware that composting poultry manure was an option, it was not practical for them due to the nonpresence of a carbon source which is necessary for composting, in the western part of New York State and, also due to the nonavailability to collect tipping fees. Consequently, they felt an alternative approach practically could be feasible and economically justifiable. Furthermore, they wanted that the new system would decrease factors associated with the risk of Salmonella enteritidis.

After an extensive study, they concluded that a practical approach would be construction of windowless compost houses and biodehydration and partial composting of poultry manure inside the compost houses. Through farm visits, both inside and outside the U.S., they noted that for satisfactory functioning of such a system, several key factors should be present. Among these, the manure should retain its integrity (i.e., it does not compress), the moisture content of the incoming manure should be reduced from its fresh level of about 75-80% down to 50-60%, the manure must be conveyed into a windrow and piled into a pyramid shape, the compost turner must rotate into the pile from the floor up as it agitates and moves the pile further down the bunker, and re-piling it into a pyramid shape. Having the above information, they realized that the type of cage system that should be selected for expansion must also have the potential to reduce the moisture content of the droppings. Consequently, they found the optimum cage system for their situation is the stack-cage system. The compost turner was constructed by a local farm equipment manufacturer to fulfill the specification of the new remodeled houses.

Compost house No. 1 was built in 1995 and the results have shown that the system has worked quite satisfactorily. However, due to the expansion of bird numbers in the complex, the capacity of compost house No. 1 was not sufficient to handle all the poultry manure. Consequently, compost house No. 2 was built in the year 2000. Compost houses No. 1 and No. 2 together have the capacity to handle quite satisfactorily all the fresh manure which is produced by the growing and laying birds in the complex (200,000, and 600,000, respectively).

The Environmental Management Investment Group of Empire State Development provided funding toward the construction of compost house No. 2, and the New York State Energy Research and Development Authority provided funding for the equipment in compost house No. 2. Funds from both agencies were on a matching funds basis as part of a major investment by the Kreher's in this large renovation and expansion project.

A LOOK AT THE KREHER'S POULTRY FARMS GROWING AND LAYING HOUSES

Growing houses: Two pullet grower houses with capacities of 80,000 and 125,000 currently exist in the complex that provide pullets for the six laying houses. Each growing house has six rows of cages and each row is three tiers high.

Laying houses: Six laying houses currently are present in the complex. Five houses were completely remodeled in recent years. The remodeling process took place during 1995 to 2000 and was completed by August 2000. The remodeled houses are the original high-rise laying houses in which the old cages were replaced with the stack-cage system. Also, the pits section in these houses are properly changed and equipped with the stack-cage system. Three remodeled houses each have a capacity of point it drops to the third tier belt. The third tier belt then carries the manure back to the front of the house again to be dropped on the bottom tier manure belt. From the bottom tier belt, the manure falls onto the belt conveyor running perpendicularly across the back of the barn which removes the manure from the house. Since the belts on all four tiers of the rows are advanced only one length each day, therefore, manure falling off the bottom tier onto the belt conveyor is 1/4 fresh manure, 1/4 1 day old manure, 1/4 2 days old manure, and 1/4 3 days old manure with an average moisture of approximately 65%. By leaving the manure on the belts an extended period of time in this manner, approximately 10 - 15 points of moisture are removed. The second stage of moisture removal takes place as the manure of these two 75,000 layer houses passes first through a "drying room" prior to being conveyed to the compost house No. 1. The "drying room" has a dimension of 10 feet wide X 150 feet long X 12 feet high, with proper heating system that can raise the temperature of the room easily to about 90ºF. One of the specifications of the "drying room" is that it is equipped with a seven tier high manure conveying belt. The belt moves the manure in a zig-zag fashion through its seven tiers. Usually it takes 24 hours for the entering manure to leave the "drying room". While the manure which enters the "drying room" has a moisture content of about 65%, its moisture reduces to 50-60% by passing through the "drying room". As was mentioned before, this is an optimum moisture level for manure prior to entering the compost houses.

The construction of compost house No. 2 was recently completed. This composting house has dimensions of 100 feet wide X 380 feet long and receives manure from five houses; two laying houses each with a capacity of 125,000 hens, one high-rise turbo-system laying house with a capacity of 75,000 hens, and two growing houses with a capacity of 80,000, and 125,000 pullets, respectively. The manure of the three laying houses directly and through a common conveyer belt reaches to compost house No. 2. However, the manure of the two growing pullet houses currently is conveyed by truck to compost house No. 2.

What Events are Taking Place Inside the Compost Houses?

Compost house No. 1 has three bunkers and each bunker is 20 feet wide and 300 feet long. Compost house No. 2 has six bunkers and each bunker is 15 feet wide and 300 feet long. Manure from the above-mentioned houses through proper manure conveying belts enters the composting houses and are dropped at the beginning of the bunkers. Each compost house has a separate compost turner. The function of each compost turner is that while it turns the manure, it also moves the manure gradually forward inside each bunker. It takes approximately six weeks for the manure to move from the beginning to the end of each bunker while continuously subjected to aeration and turning. It takes approximately 12 hours for the compost turner to reach from the beginning to the end of a bunker in compost house No. 1; whereas the improved design turner in compost house No. 2 can accomplish the same in less than half the time. Then, the same compost turner moves to the beginning of the second bunker and starts moving and turning the manure in the same fashion as mentioned for the first bunker. The same approach is used for the subsequent bunker. When the composter reaches to the end of the last bunker, the cycle starts over again. For the first 100 feet of each bunker, a one foot wide air trench is formed in the center of the concrete floor to allow injecting fresh air into the manure to enhance dehydration and aerobic composting of manure. Although the system is not a true compost due to an incorrect blend of carbon and nitrogen going into the process, nevertheless, manure goes through aerobic composting in the same manner. The manure stays at a temperature of 130-150ºF for the six weeks of the process while it is dried from about 50% moisture to about 20% moisture. The evaporated moisture is removed from the building by a proper number of exhaust fans.

What is the Specification of the Final Product?

As was mentioned before, while the fresh manure has a moisture content of about 75-80%, due to bio-dehydration and composing process, the final product has a moisture content of about 20%. Consequently, while the annual fresh manure which is produced by 600,000 hens and 600,000 pullets (three batches of 200,000 pullets) in Kreher's Poultry Farms is about 28,000 ton, due to the aforementioned and innovative approach, the final weight of the product is reduced to about 7,000 ton.

The final product has the following specifications: a) it has a very suitable flowability due to having a moisture content of about 20% and, consequently, it does not have the problems associated with the transport of fresh manure, b) it does not have any offensive odor, c) it does not contain any weed seeds, d) it is free from insects or larvae, e) due to exposing to a temperature of 130-150ºF, it is free of various pathogens, and f) it is quite concentrated in nitrogen, phosphorus, potassium (approximately 5-5-2) and other useful trace elements.

Marketing of the Dehydrated Manure

Kreher's convert over 1,000 tons of the final product to pellets in their own pelleting facility. Based on the desired level of N-P-K for a special market and after analyzing the final product, proper levels of these minerals are also added to the final raw mix prior to pelleting. The finished pellets that have known composition of N-P-K are bagged and are being marketed for gardening purposes. About 5% of the dehydrated manure is used for feeding cattle and the remaining amount is sold to organic crop farms.

We would like to acknowledge and congratulate the Kreher family for their efforts and their environmental stewardship. Their approach converted so-called "waste" to a product that is environmentally safe and nutritionally suitable for use by organic crop and vegetable growers.

The Kreher's efforts have been outstanding in today's climate where the environmental issues have been receiving so much publicity. By removing excessive nutrients from their farm, they do not have the challenge of nutrient balancing in their farm that other producers may be confronted with. The excess nutrients are used in agronomically appropriate manner by crop growers. The product is concentrated in nutrients and is easy to handle by crop farmers. The Kreher's neighbors are not exposed to flies, odor, and the possibility of contamination of their water with excessive nutrients. The Kreher's approach has demonstrated that expansion of poultry farms even under today's environmental regulations is possible without compromising the environment.

The Kreher's welcome visitors to their complex and are willing to discuss with them in detail their approach that truly took lots of effort and years of investigation. We encourage all New York egg producers and others who are searching to find an appropriate approach to converting fresh poultry manure to a useful product, to visit this complex and overcome the challenge of nutrient balancing on their farms.

K. Keshavarz
Department of Animal Science
Cornell University

PROPER APPROACH FOR BEAK TRIMMING

The United Egg Producers (UEP) recently published a booklet entitled, "Animal Husbandry Guidelines for U. S. Egg Laying Hen Flocks". The information in this booklet is based on the recommendation of a scientific advisory committee to UEP, which are made up of knowledgeable academia and non-academia individuals in the field of animal behavior, physiology, and management. This booklet has lots of useful information for poultry producers. The following article on beak trimming is taken from the guidelines.

Beak Trimming

Scientific evidence suggest that primary breeders of egg laying strains can select a more docile bird and minimize the need to beak trim, from a behavioral point of view. Using genetic stocks that require little or no beak trimming is the most desirable approach. However, under certain management systems (e.g., exposure to high intensity natural lighting) and with some genetic stocks, beak trimming is recommended. Therapeutic beak trimming is recommended at any age if an outbreak of cannibalism occurs.

Advantages of beak trimming may include reduced pecking, reduced feather pulling, reduced cannibalism, better feather condition, less fearfulness, less nervousness, less chronic stress, decreased mortality.

Bird behavior, production, physiological measurements of stress, as well as neutral transmission and anatomy of the beak have been used as criteria to determine if beak trimming compromises animal well-being. In addition, the welfare of those birds that are pecked by beak-intact birds has been evaluated. Welfare disadvantages are applicable to individual birds whose beaks are trimmed and may include the bird's ability to feed itself following beak trimming, short-term pain, perhaps chronic pain, and acute stress.

Recommendations for Single-Trim Program

1. The beaks of chicks should be trimmed at 10 days of age or younger with a precision automated cam activated beak trimmer with a heated blade.
2. Crews responsible for beak trimming must be trained and monitored for quality control.
3. Approximately 2 days before and 2 to 3 days after beak trimming, vitamin K (5 mg / liter or 20 mg / gallon) and sometimes vitamin C (20 mg / liter or 80 mg / gal) should be added to the water to facilitate clotting, to alleviate stress, and reduce dehydration.
4. The levels of feed and water should be increased until beaks are healed.
5. Recently beak trimmed chicks may have difficulty activating watering devices; therefore, producers should consider

incorporating management procedures to facilitate the bird's ability to drink. Examples include lowering water pressure or manually triggering cup waterers for several days following trimming.

6. To minimize weight loss, birds can be fed a prestarter, starter, or high-density stress diet for about 1 week following beak trimming.
7. The blade and the guide holes of the beak trimmer should be cleaned regularly.

Recommendations for a Second-Trim Program

If the trimmed beak grows back, a second trim may be needed. A second trimming is more permanent in that the beak does not grow back as easily. Some strains of layers, especially under conditions of high light intensity, may need to be subjected to a second trim when pullets are 5 to 8 weeks of age.

To avoid a drop in egg production, beak trimming is not recommended after 8 weeks of age.

When avoidable, birds should not be subjected to stressful conditions such as handling, moving, vaccination, etc., for two weeks following beak trimming.

K. Keshavarz
Department of Animal Science
Cornell University

THE GEESE AND AVIAN INFLUENZA VIRUS (AIV) ARE FLYING

The annual migration of the geese has started. The geese, and other migratory birds are moving from their northern grounds to more temperate climates. These birds congregate in the Northern United States and Canada in the spring. They bring with them different strains of AIVs. During the following months these AIVs have ample chance to infect susceptible birds: newly hatched birds susceptible to all 15 serotypes, and adults that are not immune to the newly arrived viruses. Young and old birds constitute the breeding ground for new AIVs.

During the fall when young and old start moving in great numbers, they bring their AIVs south. The AIVs are deposited on the soil, pastures and ponds when the migratory birds defecate. These viruses, given adequate conditions (cold and organic matter to protect them) may survive for up to 35 days.

It has been calculated that the droppings of an infected bird contain enough viruses to infect thousands of chickens. To make things worst once a chicken is infected, AIV will multiply in the chicken and infect other chickens very fast. In 24 to 48 hours close to 100% of the chickens in a flock may be infected. A highly pathogenic AIV (fowl plague) will kill them in a week.

Once the AIVs start multiplying in the bird there is always the potential for mutation. When these changes affect their antigenic characteristics the immunity that a bird had acquired previously will not provide protection to the new virus. The genetic changes may affect the pathogenicity of AIV, and a mild virus may become highly pathogenic. More disturbing are observations that some changes allow the virus to ?jump? from one species to another, as was the case in Hong Kong in 1995 and Canada in 2000. In the AI episode in Hong Kong, a H5N1 AIV from chickens caused disease (and death) in humans. The Canadian outbreak in pigs was caused by H4N6 AIV originated from Canadian ducks, and is of concern because the most accepted theory is that the pigs infected with AIV are the source of new human influenza viruses.

It has been a long time since fowl plague (H5N2 AIV) affected chicken flocks in the United States. After fowl plague was eradicated in 1985, the most prevalent AIV affecting chicken flocks has been a low pathogenicity H7N2 AIV. But even this low pathogenicity H7N2 AIV may cause heavy losses in layers and broilers.

New York State has been fortunate that H7N2 AIV is restricted to the live-bird markets in New York City, and producers that deal with it. Only three cases of H7N2 AIV in commercial broiler flocks have been recorded since 1995. H7N2 AIV has not been reported in layer flocks.

On the other hand, it is disturbing that in the winters of 1998 and 1999, two different AIVs were detected in commercial egg layers in NYS: H1N4, and H9N1 AIV, respectively. These two serotypes are not common in chickens, and most likely were brought to the farms by migratory waterfowl.

How to Protect your Chickens?

Revise your biosecurity. Remember that biosecurity is very complex, and there is a need to design a system that is effective and practical for each particular farm.

New York State producers have to their advantage that the most expensive component of biosecurity: Isolation is already in place. The distances between New York State farms are large enough that the risk of air-borne transmission is negligible.

In the case of AIV, the greater risk is the introduction of diseases birds, cages, foot-ware, clothing, crates, trucks and other objects that may be contaminated with AIV.
When moving birds demand that:

The truck and crates are washed and disinfected before they come to the farm.

The moving crews wear clean clothes and foot-ware.

Place foot baths at the entrance of each house.

The footwear should not have deep grooves that catch dirt, preventing penetration of the disinfectants.

Do not allow rendering trucks into the farm.

If you render your birds, place the cans with dead birds out of the farm.

Discourage geese and other migratory birds from settling in the fields and ponds close to the farm.

B. Lucio
Department of Microbiology and Immunology
College of Veterinary Medicine
Cornell University

YOU ARE NOT USING ANTIBIOTICS! SHOULDN'T YOUR CUSTOMERS KNOW?

It seems that every day there is something about the use of antibiotics in animals and increased bacterial resistance in humans.

The latest is the action of the United States Food and Drug Administration (FDA) to prevent the use of fluoroquinolones in poultry.

The fluoroquinolone producers and the poultry industry claim that there is no proof to link its use with the emergence of fluoroquinolone-resistant strains in poultry. FDA claims that the contrary is true.

Meanwhile, the consumer looks at headlines such as the following:

- New Model Relates Antibiotic Use To Resistance
- Farm Animals Breeding Superbugs?
- Humans Can Catch Antibiotic-Resistant Infections From The Meat They Eat, U.S. Report Warns
- Fears Over Growth of Drug-Resistant Bugs
- Local Approaches to Combating Antibiotic Resistance are Doomed to Failure
- Swedish Pigs Showing Resistance
- Do Livestock Breed Drug-Resistant Bugs? Antibiotics on Farms May Threaten Humans
- New Study Raises Concerns Over Use of Antibiotics in Farm Animals

These headlines scare consumers away from all animal products. Consumers don't know which animals receive antibiotics on a regular basis, and they put meat, milk and eggs in the same category.

Shouldn't the egg producer educate the consumer about the absence of antibiotics (and artificial hormones) in the eggs?

I don't think that the egg producer should rely on the media (newspapers, radio, television) to educate the consumer.

B. Lucio
Department of Microbiology and Immunology
College of Veterinary Medicine
Cornell University

VELOGENIC VISCEROTROPIC NEWCASTLE DISEASE (VVND) IN MEXICO– WHAT IS THE RISK FOR NYS?

What Happened in Mexico?

The year 2000 VVND in Mexico affected chicken broilers in an area with close to 30 million chickens. Seventy-seven farms with close to 12 million broilers were depopulated in an effort to control the disease.

What are the Forms of ND?

Newcastle disease has different forms of presentation, denominated Hitchner, Beaudette, Beach and

Doyle, after the people that described them. For each of these forms there is a representative NDV strain: B1 for Hitchner, Roakin for Beaudette, Texas GB for Beach, and Largo for Doyle. Very mild respiratory signs and no nervous signs characterize the Hitchner form of ND. The Beaudette ND produces a slightly more severe respiratory disease, with nervous signs in chickens younger than 4 weeks of age. The Beach ND causes severe respiratory disease, nervous signs and mortality even adult susceptible birds. The Doyle ND also called VVND because of the lesions in the viscera (mainly digestive tract) is the most severe and difficult to control. Only chickens with a strong immunity will survive the infection. Hitchner ND is the only form diagnosed in commercial poultry in the United States since the VVND in the last 10 to 15 years. Beach ND was diagnosed in turkeys in Minnesota and cormorants in Lake Ontario and a small back-yard flock diagnosed with VVND in Fresno, CA, in 1998.

Is VVND in Mexico a Risk for NYS poultry producers?

Considering that VVND has been prevalent in Mexico since 1948, and that the outbreaks of ND in the few cases of ND in the U.S. have not originated from Mexico, it is safe to say that there is a very low risk.

What may happen if VVND gains entrance to a commercial farm in NYS?

Depends on the immunity of the birds at risk. If the affected birds have received only live vaccines in the water, mortality in excess of 10 to 20% can be expected. Birds vaccinated with La Sota by spray will withstand the challenge better. Laying hens vaccinated with oil-emulsified vaccines may be expected to experience drops of production, with low mortality.

HOW IS VVND CONTROLLED?

In Mexico, VVND has been endemic since 1948, and it has been controlled by vaccination with variable success. The first vaccines used to prevent VVND in the late 40's and early 50's were prepared with inactivated virus adsorbed in aluminum hydroxide, and these vaccines induced a reasonable good titer of humoral (blood) antibodies. They were later replaced with live B1 and La Sota strains that induced protection at the respiratory level, with low humoral antibody levels. These vaccines worked well through the 60's. Then, high poultry population, and immunodepressive diseases demanded better protection. This protection was achieved by the application of both, live La Sota (respiratory immunity) and oil-emulsified vaccines (high humoral antibody levels).

The year 2000 VVND outbreak resulted in great part when large American broiler producers insisted in using labor-saving vaccination programs, abandoning the use of eye-drop application and oil-emulsified vaccines, in favor of mass application of live vaccines in the water.

B. Lucio
Department of Microbiology and Immunology
College of Veterinary Medicine
Cornell University

DEVELOPMENTS IN RESEARCH

The Annual Meeting of Poultry Science Association and the 21st Meeting of the World's Poultry Congress were held back-to-back August 18th to August 24th in Montreal, Canada. The following are extracts from the papers presented at the Annual Meeting of the Poultry Science Association. In future issues of Cornell Poultry Pointers, we will also provide you with important papers presented at the 21st World Poultry Congress.

- Snow et al. (University of Illinois) conducted two experiments to examine the repeatability of the results of their previous experiment which indicated laying hens requirement for available P is only 0.15% of the diet (160 mg / hen / day). DeKalb Delta was used in the experiment and birds were fed a corn-soy diet. In experiment 1, the available P used consisted of 0.1, 0.115, 0.125, 0.135, 0.15, and 0.45%. The birds fed the last P level was considered as the control group. Hens were fed the experimental diets from 40 to 56 wk of age in experiment 1. Egg production and egg mass were reduced by all levels of available P except 0.15% when compared to the control group. Body weight was significantly lower for all groups as compared to the control group. The results indicated that 0.15% available P was marginal or slightly deficient. In experiment 2, available P levels of 0.10, 0.12, 0.14, 0.16, 0.18, 0.20%, and 0.45% were used from 21 to 37 wk of age. Egg production was significantly reduced by 29, 31, and 35 wk of age for hens fed 0.10, 0.12, and 0.14%, respectively, compared to higher available P levels. There were no significant reductions in any production parameters of hens fed 0.16, 0.18, and 0.20% as compared to the control group. Based on the results of these experiments, the investigators concluded that the minimal available P requirement for laying hens is approximately 0.16% or 161 mg / hen / day.

Comments: Although the results of the above experiments were consistent with the results of previous work of these investigators and indicated that an intake of 160 mg available P per hen per day is adequate to support performance, such a low level of available P should not be used in layer diets in commercial practice. Many factors including strains, environmental temperature, Ca:P ratio of the diet, the P levels used during the growing period, the presence of mycotoxins in the diet, among others, can influence the daily P requirement of laying hens. (K. Keshavarz)

• Harms et al. (University of Florida) compared the performance of four commercial layer strains (Hy-Line W-36, Hy-Line W-98, Hy-Line Brown, and DeKalb White) fed three levels of dietary energy. The three energy levels used were 1145 (low), 1272 (control), and 1399 (high) kcal ME / lb diet, corresponding to 2519, 2798, and 3078 kcal ME / kg diet, respectively. The low- and high-energy diets contained 10% lower and 10% higher kcal ME / kg diet, respectively, than the control energy level. Experimental diets were used from 36 to 44 wk of age (8-wk period). Feed intake was increased by 8.5% due to consumption of a low-energy diet, and was decreased only by 1.5% due to consumption of the high-energy diet as compared to birds fed the control energy level. These results indicated that hens are more sensitive to intake of low- than high-energy diets. Hy-Line W-98 and Hy-Line Brown were more sensitive to change in dietary energy than the other two strains. Egg production was not affected by energy levels. Consumption of a high- energy diet significantly increased egg weight. This diet contained 5.96% corn oil. The investigators concluded that the use of the high-energy diet containing a high level of corn oil may be of value in increasing early egg weight.

Comments: It is well known that an inverse relationship exists between the daily feed consumption and the energy content of the diet; higher feed consumption from lower energy diets, and lower feed consumption from higher energy diets. However, this relationship is not perfect. The results of the above experiment indicated that when hens are fed a low-energy diet, they are almost successful in fulfilling their daily energy need by increasing the feed intake. However, when hens are fed high-energy diets, they are less successful in reducing their daily feed consumption for maintaining energy intake according to their requirement. Due to this, the use of high-energy diets may cause obesity. (K. Keshavarz)

• Feed deprivation is used in laying hens to induce molting and stimulate multiple egg-laying cycles. The stress during molting causes an increase in susceptibility to Salmonella enteritidis (SE) and increase the risk of SE-positive eggs and internal organs. Cabana et al. (USDA-ARC, College Station, Texas), reported the results of an experiment which was conducted to determine whether the use of certain acids in the water during the molt can diminish the colonization of SE in the organs. Laying hens were molted by nine days feed removal or kept on a full-fed program. Each group was subjected to ad libitum consumption of distilled water, or water containing 0.5% citric acid or 0.5% acidic acid. All hens were orally challenged with 10^5 SE on day 4 of feed removal. Weight loss and water consumption was significantly greater in the molted group. Crop pH was higher in the molted group that received distilled water, but was reduced in the control full-fed group by either acids. Incidence and the number of SE was higher in the crop and caeca of the molted group and were not affected by the acids. The authors concluded additional experiments involving utilizing various acid treatment regimens is needed and may prove to be a useful tool for reducing the incidence of SE due to force resting of laying hens.

• Kerf et al. (University of Saskatchewan) conducted three experiments to determine the influence of gastrointestinal tract (GET) microorganisms (MO) and dietary phytase on hydrolysis of inositol hexaphosphate (IP6) in the GI tract of chicken. Laying hens (Exp. 1) and broiler chicks were raised under conventional (Exp. 2) and gnotobiotic (germ-free, Exp. 3) conditions and were fed low phosphorus corn-soybean diet with and without phytase. Disappearance of IP6 and lower penta- through triphosphate derivatives was measured during GET transit and in the faeces. IP6 hydrolysis occurred in the crop in all experiments regardless of phytase treatment, but the extent of hydrolysis was greater in the presence of phytase. This information indicated that the involvement of crop MO in the IP6 hydrolysis and also dietary phytase is active in the crop. IP6 disappearance was noted in the gizzard and the upper parts of the small intestine. Supplemental phytase was active in the jejunum and ilium, with more IP6 disappearance in the terminal ilium in two of the three experiments. With the exception of gnotobiotic experiment, levels of IP6 and lower phytate derivatives were very low in the caeca, indicating rapid and nearly complete hydrolysis of IP6 by cecal MO phytase. Comparison of ileal and fecal IP6 indicated that hindgut MO have a great impact on IP6 hydrolysis. Final fecal IP6 disappearance values reflect the use of supplemental phytase but may give an inaccurate estimate of P that is available. The investigators suggested that further research is required to determine the nutritional impact of P released as the result of hindgut IP6 hydrolysis.

- Adoudabo et al. (Clemson University) reported the results of an experiment that was conducted to determine the ability of chicken to utilize phytate phosphorus by indigenous phytase in the gastrointestinal tract, the location of this activity, and to find out whether gender differences and diet composition is involved in this degradation. The method involved an extract of intestinal mucosa and incubating it with phytic acid as substrate and measurement of released phosphorus. The results showed that intestinal phytase activity is most predominant in the duodenum. Maximum phytase activity was detected at pH of 5.6 to 6.2, and activity was very low and almost negligible at pH of 7.0. Phytase activity was 39% greater in the proximal duodenum compared to distal region. Storage of duodenal phytase for two weeks at -20 C did not affect its activity. Additional studies which involved measurement of phytase activity in both male and female broilers from two to eight weeks of age indicated that the activity was neither age nor gender related. Iron supplementation significantly reduced duodenal phytase activity. The results of this study indicated that phytase activity exists along the gastrointestinal tract of the chicken. The investigators further concluded that the higher phytase activity in the proximal region of duodenum and sensitivity to dietary iron implied that intestinal pH and nutrient composition may be important modulators of intestinal phytase activity and phytate P utilization.

- Spencer et al. (University of Missouri-Columbia) conducted an experiment with broilers to determine to what extent P excretion can be reduced by using low-phytate P content corn and low-phytate P and low-oligosaccharides content soybean meal in the diet. The experiment consisted of three treatments with a three-phase feeding regimen: 1) diets with low-phytate P corn and low-phytate P soybean meal to NRC (1994) available P requirement, 2) diets with normal corn and normal soybean meal to NRC (1994) available P requirement, and 3) diets with low-phytate P corn and low-phytate P soybean meal to 75% of NRC (1994) available P requirement. Determined available P values of 0.17 and 0.02% for low-phytate P corn and normal corn, and 0.41 and 0.20% for low-phytate P and normal P soybean meal were used in feed formulation. No differences in body weight, feed intake and feed conversion were noticed at 42 days of age. Total P excretion was reduced by 40 and 60% in groups fed diets 1 and 3 as compared to those fed diet 2, respectively. The results of this experiment indicated that a great deal of opportunity exists for reducing excreta P safely by using low-phytate P content corn and low-phytate P content soybean meal in poultry diets.

- Norty et al. (University of Manitoba) reported the results of an experiment in which the performance of hens fed wheat was compared to those fed five varieties of hulless barley. The experiment consisted of a 5 X 2 factorial arrangement of the treatments with four varieties of hulless barley diets and one wheat diet each with or without an enzyme cocktail. The experimental diets were used for nine periods of 28 days. Feed efficiency, egg mass and egg weight of hens fed varieties of 1, 3, and 4 were comparable to hens fed the wheat-based diet, but were significantly lower than hens fed variety number 2. Egg production was lower for hens fed varieties number 3 and 4 than those fed varieties number 1 and 2 or the wheat-based diet. Hens fed different hulless barley varieties with enzyme had performance which were similar to the control and better than the unsupplemented barley diets. The investigators concluded that hulless barley plus enzyme can replace wheat in layer diets.

- Persia and Parsons (University of Illinois) conducted an experiment to determine information regarding nutritional value of tomato seeds, a by-product of the tomato cannery industry. On a dry basis, tomato seeds contained 28.5% protein and 3.8% ash. The mean true dry matter digestibility was 44.7%, and the TME_n was 1484 kcal ME / lb on a dry matter basis. On a dry matter basis, the tomato seeds contained 1.6% lysine, 0.48% methionine, 0.97% threonine, and 1.25% valine. The mean true amino acid digestibility was about 69%. The results indicated that tomato seeds contained a significant amount of energy and digestible amino acids for poultry.

- Stilborn et al. (Optimum Quality Grains, IA, and Pioneer Hi-bred International, IA) conducted an experiment to compare the performance of hens (20 wk duration) fed diets made up of four levels of available P (AP) originated from normal corn or high AP corn (HAPC). The four AP used were 0.26, 0.33, 0.4, and the 0.47% of the diet. At the end of the study, weight gain was greater for hens fed the three highest AP levels as compared to hens fed the lowest AP level. Hens fed the 0.47% AP level made up of HAPC had the highest egg production, while those fed 0.26% AP made up of HAPC, had the lowest egg production. Hens fed diets with 0.33 or 0.4% AP made up of HAPC, had comparable egg production to those fed a diet with 0.47% AP made up of normal corn. Hens fed the lowest AP level had the poorest feed conversion. The lowest AP used was not sufficient to maintain egg production. Reducing AP from 0.47 to 0.4% with HAPC did not affect egg production. Egg weight was decreased as the dietary AP was decreased particularly with the lowest two levels. However, the egg weight of hens fed 0.47% AP in the form of normal or HAPC were identical. Egg yolk was lightest for hens fed 0.26% HAPC, and albumen weight was reduced with the two lowest AP levels. The data indicated that the use of HAPC may have the potential to reduce egg cholesterol (mg/egg). As was expected, daily P excretion was lower for groups fed HAPC than the normal corn. **Comments:** The results of this experiment, in combination with those studies related to phytase, suggests that excreta P can be reduced considerably by the use of the combination of HAPC and phytase without affecting the hens' productivity. The use of HAPC reduces the phytate phosphorus content of the diet, and the use of phytase increases the utilization of phytate phosphorus by hens. (K. Keshavarz)

- Cachaldora et al. (University of Madrid) conducted an experiment to determine the effect of linoleic acid and the type of fat added to the diet on early egg size and overall egg production performance. Ten dietary treatments were used including different sources of fat (soy oil, animal fat, and fish oil), and linoleic acid levels that varied from a low level of 0.77% to a high level of 2.74%. A linoleic acid level of 1.02% was sufficient to support early egg size. Linoleic acid level above 1.02% did not have a beneficial effect on early egg size; but a value lower than 1.02% reduced early egg size. Egg production and egg mass were impaired when 4% soy oil was replaced with animal fat or fish oil. Comparing the two sources of animal fat (fish oil vs animal fat), the fish oil reduced egg production, egg weight, egg mass and feed conversion. The investigators concluded that 1.02% linoleic acid is sufficient to support egg size and the performance of hens were poorest when fish oil was used as source of fat in the diet.

- A series of experiments were conducted by Latshaw (Ohio State University) to determine the daily requirement of laying hens (Hy-Line W-36 and DeKalb XL) for valine, threonine, tryptophan, and isoleucine. Proper diets were formulated to contain all the essential amino acids adequately, except the one that its daily requirement was intended to be determined. The results of broken-line regression on the data indicated that the daily requirement of Hy-Line W-36 for valine for egg production and egg mass were 0.66 and 0.68 g/day, respectively, and for DeKalb XL were 0.63 and 0.65 g/day, respectively. The threonine requirement of Hy-Line W-36 for egg production and egg mass were 0.5 and 0.52 g/day, respectively, and for DeKalb XL were 0.52, and 0.52 g/day, respectively. The tryptophan requirement of Hy-Line W-36 for egg production and egg mass were 0.146 and 0.149 g/day, respectively, and for DeKalb XL were 0.138 and 0.138 g/day, respectively. With regard to isoleucine, two series of diets were formulated and based on broken-line regression with one series of diets, the isoleucine requirement for egg production and egg mass were 0.46 and 0.58 g/day respectively, and with the second series of diets, the requirement for egg production and egg mass were 0.52 and 0.50 g/day, respectively.

- Korver (University of Alberta) conducted an experiment to determine the effect dietary fat sources on performance of laying hens and the *Trans* fatty acid content of eggs. Four sources of fat were used each at 4% in the diets: canola oil (CO, highly unsaturated, low in *trans* fatty acids content), tallow (T, highly saturated, low in *trans* fatty acids content), hydrogenated canola oil (moderately polyunsaturated, high in *trans* fatty acids content), and restaurant grease (RG, moderately unsaturated, high in *trans* fatty acids content). Diets containing T, CO, HCO, and RG contained 1.44, 0.17. 7.08, and 5.08% *trans* fatty acids, respectively. The consumption of these diets resulted in production of eggs with *trans* fatty acid in yolk of 0.7, 0.56, 4.5, and 3.5%, respectively. Overall egg production was greatest for HCO and lowest for RG diets, indicating that *trans* fatty acids are not necessarily detrimental to production performance. The reduced egg production due to consumption of RG diet may have been due to products of lipid pro-oxidation.

- Sloan et al. (University of Florida) conducted two experiments to determine the effect of phytase in P utilization by the laying hens. The first experiment involved a 2 X 3 X 2 factorial arrangement of the treatments with two levels of Ca (3 and 3.5%), three levels of added P to a corn-soy diet (0, 0.1, and 0.2%), and two levels of phytase (with or without phytase). Hy-Line W-36 were fed the experimental diets for 12 wk (48 to 56 wk of age). Production traits were adversely affected by diets containing no added P, and these adverse effects were alleviated when the diet contained 0.1% added P plus phytase. Manure phosphorus levels were significantly reduced at the 0 and 0.1% added P with or without phytase. These results apparently indicated that a diet with an available P content of 0.2% plus phytase can support egg production performance and was effective to reduce phosphorus excretion. In experiment 2, Ca level was kept constant (3.5%) and inorganic P was added to this diet at levels of 0.08, 0.11, 0.14, 0.17, and 0.2% with and with phytase. The experimental diets were used from 61 to 70 wk of age. Production performance was not affected by either phosphorus level of phytase. These results apparently indicated that a diet with about 0.18% available P was sufficient to protect egg production performance.

• Owens and Ledoux (University of Missouri) conducted an experiment to determine the effect of increasing the level of 25-OH-D_3 on performance of turkey poults. Two basal diets which were deficient or adequate in available P (0.45% and 0.6%) were used. Both diets were supplemented with four levels of 25-OH-D_3; 60, 75, 90, and 105 mg/ton diet (equivalent to 1,200, 1,500, 1,800, and 2,100 IU/lb diet). The period of the experiment was from day-old to 21 days of age. Most production traits and bone quality were affected by P level; they were inferior for birds fed the lower phosphorus diets, but were not affected by the level of 25-OH-D_3 used. It was concluded that levels of 25-OH-D_3 ranging from 60 to 105 mg/ton diet were equality effective in supporting poult performance, bone ash, and bone breaking strength when added to diets containing 0.45 to 0.6% available P.

• Puthpongsiriporn et al. (University of Nebraska) conducted an experiment to determine the effect of omega-6/omega-3 ratio of the diet on performance and immune response of growing chickens. By using corn oil (a rich source of omega-6 fatty acids) and flaxseed (a rich source of omega-3 fatty acids) diets were formulated with omega-6/omega-3 ratios of 17:1 (control group), 8:1, 4:1, and 2:1. The diets were fed to day-old Hy-Line W-36 white or brown chicks from day-old to 16 wk of age. The chicks were vaccinated for several diseases including Marek's, Newcastle (NCV), infectious bronchitis (IB), infectious bursal disease (IBD), Laryngotracheitis (LT), fowl pox, and salmonellosis according to commercial vaccination program practices throughout the trial. Several immunological responses were measured. At 11 weeks of age, supplementation with omega-6/omega-3 ratios of 8:1, 4:1, and 2:1 caused significantly greater antibody response against NDV vaccine than the control group. At 15 wk of age, chicks fed diets with omega-6/omega-3 ratios of 4:1 and 2:1 had higher antibody responses against NDV. Also, at week 15, antibody responses to IBD increased significantly due to consumption of diets with omega-6/omega-3 ratio of 2:1, 4:1, and 8:1 than the control group. The results generally indicated that the use of diets with omega-6/omega-3 ratios of 2:1 and 4:1 enhance antibody responses against NDV and IBD vaccines in developing chicks without any negative effect on growth rate.

• Douglas and Parsons (University of Illinois) conducted an experiment to determine whether extruding or expander processing of soybean prior to solvent extraction could have any effect on enhancing the nutritional value of soybean meal. Processing method did not have any effect on amino acid concentrations or protein solubility in 0.2% KOH of soybean meal. Also, the results of a broiler study indicated that processing method did not have any effect on chick weight gain or feed consumption. The results generally indicated that presolvent processing method (expander or nonexpander) had no significant effect on nutritional value of soybean meal.

• Gernat (Escula Agricola Panamericana/Zamorano) studied the effect of using shrimp meal in place of soybean meal in layer diets. According to the investigator, a large quantity of waste is generated by the shrimp industry, including heads, exoskeleton, and soluble components. The shrimp meal (SM) replaced soybean meal at levels of 20, 40, 60, 80, and 100%. Laying hens were fed the experimental diets from 18 to 38 wk of age. Egg production was not affected by different levels of SM used. Feed consumption was increased and feed conversion was adversely affected only at 100% level of inclusion. Additionally, egg weight was 2-3 grams lighter for hens fed SM at 100% level. Mortality was not affected by various levels of SM used. Yolk color became lighter with increasing the level of SM in the diet. Slightly lower specific gravity was observed with all levels of SM used. The investigator concluded that properly processed SM can be used in relatively high levels in place of soybean meal in layer rations without causing any detrimental effect on layer performance.

• An experiment was conducted by Hebert (Louisiana State University) to determine the effect of feeding 1X, 2X, 3X, and 4X of three amino acids, leucine, isoleucine, and valine on egg production performance of 50-wk-old laying hens. The results of a 10 wk study indicated that none of the production traits were influenced by the levels of the three amino acids used.

• Aydin and Cook (University of Wisconsin) conducted an experiment to determine whether high embryonic mortality resulted from feeding conjugated linoleic acid (CLA) to laying hens was due to the reduced oleic acid content of eggs. This was based on the results of their previous experiment which indicated dietary supplement of CLA reduces oleic acid and increases stearic acid concentration in eggs and causes high mortality. Hens fed four dietary treatments consisting of 1) 0.5% linoleic acid, 2) 0.5% CLA, 3) 0.5 CLA plus 3% linoleic acid, and 4) 0.5% CLA plus 3% oleic acid. Hatchability of eggs from hens fed only CLA was reduced to zero only 7 days after feeding the CLA. However, hatchability of eggs from the other three dietary treatments were not affected. The result of fatty acid analysis of eggs indicated that reduced hatchability due to feeding CLA is due to changing the ratio of saturated to unsaturated fatty acids rather than due to specifically reduced oleic acid of egg yolk.

• Cantor et al. (University of Kentucky) conducted an experiment to determine the effect of feeding low-protein, amino acid-supplemented diets on performance of broilers. Birds were fed similar diets during the fi[illegible] days [illegible] Thereafter, four d[illegible] treat[illegible] were [illegible] the grower [illegible] days of ag[illegible] finisher (35 [illegible] days of age) [illegible]ods. The d[illegible] protein in the [illegible]wer and fi[illegible] [illegible] were, a) 2[illegible] [illegible] lo[illegible] sup[illegible]hly[illegible] meth[illegible]nine [illegible] [illegible]line t[illegible] [illegible]r two [illegible]s were [illegible]st and [illegible]atio of [illegible]weight [illegible] were [illegible]ducing [illegible]es for [illegible]sing [illegible]tly [illegible]el of [illegible] fat [illegible]he d[illegible]n [illegible] to [illegible]

"The information given herein is suppli[illegible] and no endorseme[illegible]