CORNELL POULTRY POINTERS

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Barb Smagner, Managing Editor

MARK YOUR CALENDAR FOR 1999 CORNELL POULTRY CONFERENCE

(Wednesday, June 23 and Thursday, June 24)

This year's conference will be held on *Wednesday, June 23 and Thursday, June 24, 1999,* at the Statler Hotel, Cornell University. With the help of poultry producers and allied industry we are currently in the process of selecting the appropriate topics for this year's conference. You will be informed about the program in detail in the April issue of Cornell Poultry Pointers. Several changes have been made in the format for the upcoming conference. Based on the recommendations of the industry, the conference for the first time will be held at the Statler Hotel, Cornell University. The conference is divided into two half-day programs; the afternoon of Wednesday, June 23rd and the morning of Thursday, June 24th. This will allow the program to proceed more smoothly as compared to previous years. A block of about one and one-half hours will be allocated to sightseeing the recent developments on the Cornell campus. The topics related to poultry health will be discussed at the beginning rather than at the end of the program this year. The PAIR program again will be held in conjunction with the Cornell Poultry Conference and consists of an after-dinner speaker. This year there will be a happy-hour section that will follow the PAIR program which some of the poultry breeding companies have generously accepted to sponsor. The upcoming conference also involves a complementary breakfast that will be sponsored by BASF and the recent findings related to microbial phytase will be discussed in this part of the program. The program will start at 1:00 p.m. on the

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afternoon of Wednesday, June 23rd and will adjourn at 12:40 p.m. on Thursday, June 24th. The topics that will be covered in the scientific section include, new findings on chicken infectious anemia, avian influenza in New York State, poultry pest management update, an update on concentrated animal feeding operations and future challenges, making the case from eggs, the use of microalgae in the layer's diet for enrichment of eggs with omega-3 fatty acids, challenges and opportunities for production manager on an egg laying complex, managing the transition from pullets to early egg production, practical application of cryogenic cooling of shell eggs, the use of high oil corn for the egg industry, and an update on the results of the poultry nutrition studies at Cornell. *Please mark your calendar for June 23 and 24 and try to attend the 1999 Cornell Poultry Conference which is particularly designed for you and your business.*

K. Keshavarz
Department of Animal Science
Cornell University

CORNELL POULTRY POINTERS 50 YEARS LATER

The first volume of Poultry Pointers was printed in 1949 (actually before I was born!). So, it's no surprise that such a great newsletter continues fifty years later. We are proud of this newsletter and strive to make continuous improvements. I, myself, have been doing the newsletter since 1977. The look of the newsletter has changed over the past fifty years as we continue to update and try to improve its quality. As I look back, I wonder how I could have done the newsletter on a typewriter, lucky for me it had a correction feature! We continue to send the newsletter all over the world. As you will see from the following article, we are now on worldwide web. So in these times of hurry hurry hurry, just remember to stop and relax periodically and read our newsletter — it's good for you!

Barb Smagner, Managing Editor

CORNELL POULTRY POINTERS ON WORLDWIDE WEB

You can now read Cornell Poultry Pointers on worldwide web: http://www.ansci.cornell.edu/

Click on Extension (to the left of your screen) and then click on Poultry Program. This will bring you to the last two issues of Cornell Poultry Pointers. Click on the issue you want to see. This is for those that have Acrobat Reader. If you do not have Acrobat Reader, click on What's New??? and scroll down to section on Poultry Pointers, where you see the word HERE, click on this and it will load Acrobat Reader for you and you will be able to see Poultry Pointers.

We hope that you will enjoy reading the newsletter on the web.

Barb Smagner, Managing Editor

NEW CAFO TIMELINE FOR NEW YORK

New York State DEC listened to Farm Bureau Farmers' concerns about the upcoming CAFO permits and recently extended their timeline for implementing the Agricultural Waste Management Plans (AWMP) for the CAFO Permit. Here is the new timeline:

March 3, 1999 DEC will release the draft permit for public comment. Producers may receive a copy of the draft permit. The comment period will extend for 45 days to 4/14/99. If the comments that are received can be answered without holding another public meeting, the permit will be issued in July of 1999. Once the general permit is issued, farmers will have 180 days to send DEC their notice of intent (NOI) - as soon as DEC send confirmation of having received this notice, farmers will have 18 months in which to develop an AWMP - and they will have 5 years from the DEC confirmation in which to implement the plan.

It's also important to note that DEC tentatively plans to hand out draft copies of their permit at informational meetings at the following locations:

March 16	Albany
March 31	Batavia
April 1	Syracuse
April 8	Canton

Call Peter Wright (607-255-2803) if you have questions or concerns about these proposed regulations.

P. E. Wright
Department of Agricultural and Biological Engineering
Cornell University

AVIAN INFLUENZA IS STILL AROUND

Avian influenza (AI), a respiratory disease of birds that can be deadly for chickens, was the center of attention during 1997 and 1998 as it surfaced in places as distant as Hong Kong, Iran, Pakistan, Saudi Arabia, Mexico, and Pennsylvania and New York in the U.S.

Internationally, AI figured prominently in the news when an AI virus (AIV), caused the death of 6 of the 18 known infected humans in Hong Kong. The virus was identified as having hemagglutinin (H) 5 and neuraminidase (N) 1 on its surface. This AIV had never been seen in humans before, and the mortality caused a major scare among human epidemiologists, bringing back memories of the world wide 1918 influenza pandemic that killed an estimated 18 million people. It was fortunate that the suggestions of highly qualified scientists were followed, and that all the chickens at risk of exposure (1,300,000) were killed and buried. Although much criticized, the depopulation was very effective, and new cases of H5N1 have not been reported in the world.

Elsewhere in the world, AIV has re-emerged as a threat for the poultry industry, causing severe mortality in Iran, Pakistan, Saudi Arabia and China, or loss of productivity in Mexico, and the U.S.

Nationally, AIV shows as a low-pathogenic virus that causes very little mortality. The main concern is loss of productivity, and the fact that it may switch to the lethal form, previously known as fowl plague. That is why the Pennsylvania poultry industry opted for eradication of AI from commercial farms, and killed more than 1,000,000 chickens. Spread of AI to the rest of the industry would have been devastating.

Although AIV is not present in commercial chickens, it is still seen in turkeys, game birds, and small backyard chicken flocks in that state, in New Jersey and New York State.

In New York State, H7N2 is commonly isolated from birds at the live bird market in New York City, and there is evidence of AI in one quail and one turkey farm.

Most times, AI is associated in our minds with live bird markets, backyard operations, auctions, shows, and free-range operations where biosecurity is lax or absent. It is worrisome when, even under what appear to be strict biosecurity measures, AIV gains entrance to a shower-in shower-out farm with a good overall biosecurity, and turkeys raised in confinement. Such cases call to mind an important question: how does AIV reach the birds?

It may be good practice to speculate, in order to prevent AIV from entering your farm. Think about the ways in which AIV may reach your birds, then determine methods of prevention.

Some of the ways in which AIV may be introduced to your farm, and the methods of controlling transmission are as follows:

Direct contact with infected birds, either sick birds, birds that have recovered but are still excreting AIV, or birds that picked up the virus from contaminated crates while being transported. When any of these are brought onto a clean farm, the risk of contamination is extremely high.

Prevention:

BE INFLEXIBLE WHEN IT COMES TO THE ORIGIN OF THE BIRDS YOU ARE BRINGING TO YOUR FARM, AND ABOUT THE CLEANINESS AND DIS-INFECTION OF CRATES AND TRUCKS USED TO TRANSPORT THEM.

Indirect contact. AIV may be transmitted mechanically on shoes, clothes, hands, and hair. People that have been in contact with an infected flock are a vehicle for the virus.

Prevention:

LIMIT THE ACCESS OF VISITORS TO YOUR FARM, YOU NEVER KNOW WHERE THEY WERE BEFORE. BE ESPECIALLY WEARY OF EGG AND POULTRY BUYERS. DO NOT ALLOW UNNECESSARY VISITORS IN THE CHICKEN HOUSE.

AIV may be transmitted mechanically by crates, trucks and equipment. If they have been in contact with an infected flock they are a potential vehicle for the virus.

Prevention:

CRATES, TRUCKS AND EQUIPMENT HAVE TO BE CLEAN BEFORE THEY ARE DISINFECTED. REMEMBER, DISINFECTANTS DO NOT REACH INTO SOILED CRATES.

Ducks, geese, waterfowl and other birds, including starlings, finches, weaverbirds and hawks are carriers of AIV, and shed virus in their feces.

Prevention:

PLACE FOOTBATHS AT THE ENTRANCE OF THE BARNS.

STEP INTO THE DISINFECTANT SOLUTION AND LET IT SOAK THE BOOTS FOR AT LEAST 30 SECONDS.

SKIMMING THE SURFACE OF THE DISINFECTANT SOLUTION DOES NOT KILL THE VIRUSES.

AIV is air-transmitted. Dust and feathers from infected flocks are a potential risk.

Prevention:

BE AWARE OF TRUCKS AND CRATES USED TO TRANSPORT FOWL OR MANURE, AND OF MANURE SPREADING NEAR YOUR FARM.

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

THE NEW YORK STATE EGG QUALITY ASSURANCE PROGRAM (NYSEQAP)

Where does it stand now?

The NYSEQAP which was officially started in October 1997 combines an Salmonella enteritidis (S.e.) surveillance program with recognition of best management practices on participating farms. During the December 1998 meeting the NYSEQAP Oversight Committee, representatives of the New York State Department of Health (NYSDOH) praised the poultry industry for their efforts to control S. enteritidis. SE outbreaks in humans in NYS have gone down from an all time high of 14 in 1994 to 0 in 1997 and 1998. At the same time, concerns were expressed that these figures may lead to a false sense of security leading to relaxation of enforcement of refrigeration and cooking temperatures at the retail and consumer levels, and that egg producers will not see the benefit of enrolling. To counteract this possible relaxation of good practices and re-emergence of SE outbreaks in humans, the NYSDOH plans to continue to emphasize the importance of proper egg handling. Participation in NYSEQAP is a good opportunity for NYS egg producers to promote their products as wholesome, fresh and locally produced.

Future promotional efforts will advise retailers and food handlers of the advantage of buying eggs from NYSEAQP participants. It is expected that these efforts will begin in approximately six months. Now is the time to enroll, if you have not done so. Contact the Department of Agriculture and Markets at 518-457-3502 for further information.

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

NATIONAL EGG QUALITY SCHOOL

The Sixth National Egg Quality School will be held during May 17 to 20, 1999 at the Holiday Inn Sunspree Resort, Asheville, NC. This-four-day program is designed for serious-minded students who are willing to learn as much as possible about egg quality in a concentrated, comprehensive approach. The class will be divided into groups of 5-6 students with one instructor who will be working with the students throughout the course, instructing them in the laboratory, and answering questions after each lecture. The course will cover nearly all of the important aspects related to egg quality. Among the topics that will be covered in this four-day program are: evaluating the wonderful egg, HAACCP in eggs and egg products, formation of the egg, California Egg Quality Assurance Plan, infectious bronchitis and egg quality, exterior and interior egg quality factors and determination, in-shell pasteurization of eggs, forced air cooling for shell eggs, being positive about egg safety, reducing shell damage, an update on poultry and animal rights, measuring Haugh units, eggs and foodborn diseases, how egg cooling works and what it does for processors.

We encourage one person from each farm in New York State to attend this well worth it program. Remember, the enrollment deadline is April 30, 1999. For more information about the program, registration costs, hotel reservations, etc., call United Egg Producers at 770-587-5871, or Dr. Kenneth Anderson, North Carolina State University at 919-515-2621. Meanwhile more information about the program can be obtained by visiting the web address of: http://www.ces.ncsu.edu/depts/poulsci/.

K. Keshavarz
Department of Animal Science
Cornell University

WHY SHOULD PHYTASE BE USED IN LAYER DIETS?

A considerable quantity of phosphorus (P) and nitrogen (N) are excreted annually by laying hens to the environment. Additionally, P and protein sources are among the most expensive components in feed formulation for laying hens. Consequently, any approach that could have the potential to reduce the dietary need of laying hens for P and protein without affecting their productivity not only would have the advantage of reducing feed costs, but could diminish the environmental pollution attributed to P and N excretion. Due to the great amount of publicity surrounding the contribution of P and N from animal operations to the environment and due to the imminent laws regarding the total nutrient management on “Concentrated Animal Feeding Operations”, it is advisable that producers be proactive in resolving these problems on their farms.

Nutrient balance with regard to P and N on a poultry farm simply means that the total entry of these nutrients to the farm through feed should be equal to their removal from the farm. A part of the P and N are leaving the farm in the form of products (eggs and meat). Depending on the farms, some other parts may also be used for growing crops if croplands are available to the producers. The balance should leave the farm in the form of manure. Naturally reducing the dietary need for these nutrients would diminish the quantity that should leave the farm. One approach for reducing the dietary need for N and P is through refining their requirements. This, in combination with the implementation of a proper feed quality control program, diminishes the margin of safety in feed formulation for these nutrients and would be effective in reducing the wasteful use of these nutrients on the farm. With commercial availability of several essential amino acids and a good promise for availability of other essential amino acids in the near future, feed formulation for layers based on the concept of low-protein amino acid-supplemented programs are approaching reality. Additionally, the potential for saving due to reducing protein input exist when feed formulation for layers are based on digestible or even available than on a total amino acid basis. With regard to P, the commercial availability of microbial phytase to the industry in recent years has provided a great deal of opportunity for egg producers to address the problem of P pollution on the farms. The P content of a typical corn-soy diet is very poorly utilized by laying hens. The results of previous experiments from our laboratory have indicated that about 70 to 80% of the total P intake from a corn-soy diet is excreted (Keshavarz, 1986; 1998). These results are not unexpected considering that about two-thirds of the total P in feed sources with a plant origin (including corn and soybean meal) is in "phytate" form, that cannot be utilized by monogastric animals including poultry.

What is phytate P? When a molecule of inositol reacts with six molecules of phosphoric acid, the product is a molecule of phytic acid. Phytic acid also is called hexaphosphoric acid inositol (Fig. 1). The negative charges of the phytic acid molecules react with the positive charges of divalent cations, including Ca, Mg, Zn, Cu, Mn, etc.; the resulting complex is called phytate. Some of the negative charges of phytic acid molecules also can react at low and neutral pH's with the positive charges of amino acids (such as lysine, arginine, histidine, etc.) of protein molecules including proteases and trypsin (the enzymes involved in the digestion of proteins). Due to a negligible amount of phytase (an enzyme necessary for the breakdown of phytate) in the digestive system of the monogastric animals, phytate P has a very low availability to these animals. Formation of complexes of phytic acid with divalent cations and amino acids not only reduce the availability of P, but also reduce the digestibility and availability of amino acids and Ca and a number of trace elements to monogastric animals. Some feed ingredients (wheat, wheat by-products, barley, amongst others) have very small quantities of phytase. However, the contribution of this phytase to utilization of phytate P of feed ingredients is very small and inconsequential.

Research during the early 1970's (Nelson et al., 1968) clearly indicated that the availability of phytate P to poultry can be increased considerably by the use of microbial phytase in the diet. However, the high cost of production was a prohibitive factor for the use of microbial phytase in poultry diets until recent years. Due to technological advances in recent years, microbial phytase with an affordable price has become available to the poultry industry. Due to this, and because of the high costs of inorganic sources of P together with the public concerns regarding P pollution, investigations on the use of microbial phytase in the diets of broilers, turkeys and laying hens has been renewed in recent years.

Van Der Klis et al. (1996) from the results of two long-term experiments with laying hens, concluded that 0.12% available phosphorus (AP) was not adequate to satisfactorily maintain egg production performance. However, the addition of 0.06% P from monocalcium phosphate or adding 200 units phytase/kg diet overcame all the signs of the P deficiency. Supplemental phytase was effective to reduce P excretion under the conditions of their experiments. Gordon and Roland (1997) concluded that an available P level of 0.1% was not adequate to support egg production performance. However, the addition of 300 units phytase/kg diet was effective in alleviating all the deficiency signs attributed to feeding 0.1% AP (high mortality, low bone density and bone breaking strength, inferior egg production, egg weight and shell quality). Production performance was not different among hens fed 0.2 to 0.5% AP, and phytase did not have an effect on performance of these hens. The information from a subsequent experiment (Gordon and Roland, 1998) substantiated their previous findings and indicated that microbial phytase was effective in improving the utilization of Ca. Punna and Roland (1998) reported that supplemental phytase at 300 units/kg diet was effective in overcoming all the adverse effects of 0.1% AP on performance during the growing and laying periods. Carlos and Edwards (1998a) reported that the use of 600 units phytase/kg of a low-P layer diet (0.29% total P) significantly improved body weight, plasma dialyzable P, tibia ash, and phytate P retention. Phytase had a beneficial effect on egg production in one but not in another experiment. Egg weight and specific gravity were not influenced by phytase in either experiment. In a subsequent experiment (Carlos and Edwards, 1998b), the effect of graded levels of phytase (0 to 1000 units/kg diet; in increments of 200 units) on performance of hens fed a diet containing 0.29% total P was investigated. Increasing the level of phytase had a significant linear effect on feed consumption and body weight and a curvilinear effect on increasing plasma level of dialyzable P, tibia ash, and phytate P retention. Egg production and egg weight were also increased by adding phytase to the diet. However, egg specific gravity was not affected. Boling et al., 1998, reported that all the signs of P deficiency resulted from feeding a diet with 0.1% AP to laying hens were alleviated in the presence of a low level of 100 units phytase/kg diet. Also, an AP level of 0.15% in the absence of phytase was sufficient to support optimum performance as compared to hens fed a 0.45% AP in this long-term (20 to 70 wk of age) experiment. Their study involved supplemental phytase levels of 0, 100, 200, 250, 300 units/kg diet. Recently, Um and Paik (1999) reported that egg production performance of hens fed diets containing 0.37, 0.24, and 0.12% AP plus 500 units phytase/kg diet were greater or equal to the control group which were fed a diet containing 0.37% AP without phytase. Egg specific gravity and shell thickness (but not shell strength and broken eggs) were significantly or numerically lower for the phytase-fed groups than the control group. Retention of ash, Ca, Mg, Fe, and Zn were consistently greater for hens fed supplemental phytase than the control group. The results of our current experiments also show a very favorable effect from phytase both in the growing pullets' and layers' diets.

Although the recent university reports clearly show that in the presence of phytase dietary P can be reduced considerably (to as low as 0.1% AP) and for the entire egg production cycle, we do not recommend that the industry should use such a low level of AP at this time. However, we feel that the industry should follow the recommendation of the manufacturer (BASF), i.e., reducing the AP which is normally used in the layer diets by 0.1% and adding 300 units/kg diet phytase in the diet. Even if such an approach would not have a cost advantage, it certainly would have a great deal of environmental advantage due to reducing the P need for feed formulation and the reduction of excreta phosphorus. We are more than happy to talk with you about this issue if you have any questions or concerns. Meanwhile, please let me know if you need any references which were cited in this article.

K. Keshavarz
Department of Animal Science
Cornell University

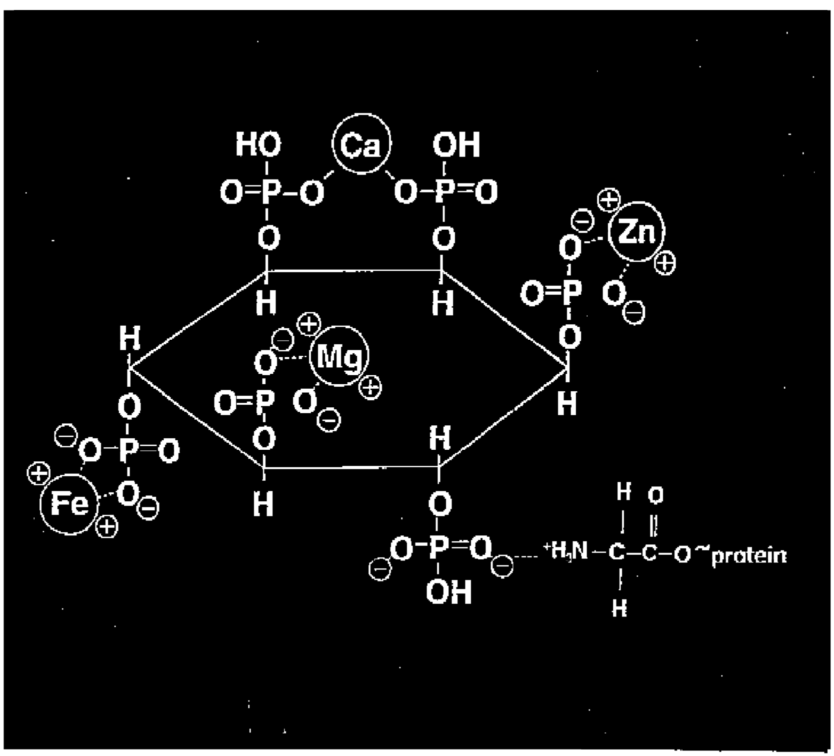

Figure 1. Example of a complex molecule of phytic acid with calcium (Ca), zinc (Zn), magnesium (Mg), iron (Fe), and protein.

DEVELOPMENTS IN RESEARCH

The following are extracts of some papers presented at the 1998 Annual Meetings of Poultry Science Association or were published in 1998 issues of the Poultry Science Journal.

* Pesti and Bakalli (1998, Poultry Sci. 77:1540-1545) conducted two experiments to determine the effect of supplementing laying hen diets with cupric sulfate pentahydrate ($CuSO_4$, $5H_2O$) on cholesterol content of eggs. In these experiments, 30-31 wk old hens were fed diets supplemented with 125 or 250 ppm Cu as $CuSO_4$, $5H_2O$ for 8 wk. The cholesterol content of plasma and egg samples and also the copper content of egg and excreta samples were determined after 4 and/or 8 wk on experimental diets. The pharmacological levels of copper (125 and 250 ppm) used in these experiments did not produce any adverse effect on egg production performance. In fact, supplemental copper tended to increase egg production in the second 4 wk of feeding in both experiments. In both experiments, milligrams cholesterol per yolk or milligrams cholesterol per gram yolk were decreased by feeding copper at 125 and 250 ppm (Table 1). The hypocholesterolemic effect from supplemental copper was observed after 4 wk of feeding the experimental diets. The first level of copper had the greatest effect in reducing egg cholesterol, although egg cholesterol was reduced further by the highest level of copper used. After 8 wk on experimental diets, the cholesterol level of yolk was reduced by 20 and 28% in Experiment 1, and by 30 and 35% in Experiment 2, from feeding 125 and 250 ppm copper, respectively. Plasma level of cholesterol was also reduced due to the first supplemental level of copper. Copper levels in

yolk, albumen and shell as well as excreta were increased due to supplemental levels of copper (Table 2). The results of previous experiments from the same investigators also indicated that plasma, liver, and meat cholesterol levels were reduced in broilers due to supplemental copper (Pesti and Bakalli 1996, Poultry Sci. 75:1086-1091; Pesti and Bakalli, 1997, Poultry Sci. 76:948-951). The investigators speculated that the hypocholesterolemic effect of copper could be due to the effect of copper in changing the enzymes responsible for regulation, synthesis, oxidation, or elimination of cholesterol. The investigators compared the hypocholesterolemic effect of copper observed in their experiments with the hypocholesterolemic effects of several other compounds reported in the literature [including a reduction of 13.2% of yolk cholesterol due to increasing the dietary level of fiber (McNaughton 1978, J. Nutr. 108:1842-1848); a 5-7% reduction of egg cholesterol due to the use of oat bran or cottonseed hulls (Lirette 1993, Can. J. Anim. Sci. 73:673-677); a 5-7% decrease in egg cholesterol due to feeding probucol (Waldroup et al., 1986, Poultry Sci. 65:1949-1954); a 5% reduction in egg cholesterol due to feeding probucol (Naber et al., 1982, Poultry Sci. 61:1118-1124); a 22% reduction of egg cholesterol due to feeding lovastatin (Elkin and Roger 1990, J. Agric. Food Chem. 38:1635-1641); a 35% reduction of egg cholesterol due to feeding PD 123244-15 (Elkin et al., 1993, J. Agric. Food Chem. 41:1094-1101); and a 47% reduction in egg cholesterol due to feeding atorvastatin (Elkin et al., 1997, Atherosclerosis 134:123)]. These comparisons indicated that the hypocholesterolemic effect of copper was greater or similar to several compounds reported in the literature. Supplemental copper increased the copper in one egg's content by 4 to 9 µg (i.e., from a basal level of 26 µg to 30 or 35 µg). This increase was felt by the investigators not to be a matter of concern with regard to toxicity or dietary value. Supplemental cooper also increased the copper content of excreta. However, based on the information in the literature, the investigators concluded that increasing the copper content of excreta should not create any potential problems. The investigators recommended that experiments of longer durations are needed to determine whether copper supplementation could be a viable means of reducing cholesterol in consumable eggs.

Table 1. Effect of dietary copper on egg cholesterol level

Supplemental copper (ppm)	Experiment 1 (mg/yolk)	Experiment 2 (mg/yolk)	Experiment 1 (mg/yolk)	Experiment 2 (mg/yolk)
	week 4			
0	—	162.7[a]	—	11.5[a]
125	—	121.4[b]	—	8.4[b]
250	—	113.6[a]	—	7.7[b]
	week 8			
0	192.9[a]	176.2[a]	11.6[a]	11.7[a]
125	153.8[ab]	123.2[b]	9.0[ab]	8.2[b]
250	138.6[b]	116.4[b]	8.0[b]	7.7[b]

[a,b]Means within a column within a week with no common superscript differ significantly (P < 0.05).

Reference: Adapted from Pesti and Bakalli (1998 Poultry Science 77:1540-1545).

Table 2. Effect of dietary copper on egg and excretra copper levels (Experiment 1)

Supplemental copper (ppm)	Egg: white (micrograms)	Egg: yolk (micrograms)	Egg: shell (micrograms)	Egg: yolk/white (micrograms)	Total	Excreta: Dry (micrograms/g)	Excreta: Fresh (micrograms/g)
0	15.83	9.43[a]	30.72	26.09	57.51	35.70[a]	8.20[c]
125	15.57	11.88[b]	31.87	29.82	61.43	539.90[b]	135.10[b]
250	20.91	13.87[b]	32.25	34.57	66.70	937.40[c]	242.90[a]

[a-c]Means within a column with no common superscript differ significantly (P < 0.05).

Reference: Adapted from Pesti and Bakalli (1998 Poultry Science 77:1540-1545).

Comments: The egg cholesterol reducing effect of supplemental copper at pharmacological levels as observed in this report is very exciting. However, the method used for determination of egg cholesterol in this report was based on an older method (Zlatkis et al., 1953; J. Lab. Clin. Med. 41:486-492) with proper refinements (Washburn and Nix 1974; Poultry Sci. 53:1118-1122). The investigators were aware of this issue. Because pharmacological levels of copper results in reducing both meat and egg cholesterol, experiments involving high levels of copper and determination of egg and meat cholesterol both with the older and the newer HPLC methods is a well worth it attempt so that the use of high levels of copper with confidence can find practice application. (K. Keshavarz)

* Corless and Sell [(1998, Poultry Sci. 77(Suppl. 1):45)] reported the results of two experiments with turkeys to determine the influence of delayed access to feed and water on the development of the digestive system. In these experiments, poults were provided with feed and water after 6, 30, and 52 h posthatch. Sample birds were examined on various intervals up to 10 d of age in Experiment 1 and up to 28 d of age in Experiment 2. Delaying access to feed and water for 52 h adversely affected bird weights through 10 d of age in Experiment 1 and through 28 d of age in Experiment 2. Delayed access to feed and water decreased the weights of the small intestine, pancreas, proventriculus, and also reduced lengths of the small intestine through 5 d posthatch. Densities (g weight/centimeter) of the duodenum and jejunum were decreased through 5 d posthatch in birds held 52 h before access to feed. Weight of the residual yolk decreased rapidly until 3 d of age and by d 5 was essentially depleted. Treatments did not have an effect on the yolk weight loss. The activity of digestive enzymes involved in the digestion of carbohydrate and protein were reduced in poults placed on feed after 52 h. The determined metabolizable energy value of feed was lower for poults withheld from feed for 52 h than 6 h. The authors concluded that a 52 h delay in access to feed and water generally delayed the development of the digestive system and pancreas and impaired nutrient utilization.
Comments: The results of these experiments re-emphasize the significance of reducing the time interval between hatching and placement in commercial practice to secure normal growth and development of the digestive system. (K. Keshavarz)

* Koelkebeck et al. [(1998, Poultry Sci. 77(Suppl. 1):83)] reported the results of an experiment which was conducted to determine the effect of water quality on the performance of laying hens. The hens in this experiment had access to two sources of water; city water or farm water (drilled well). The results of the water analysis indicated that farm well water had sodium and chloride concentrations of 0.019 and 0.021%, respectively. The concentration of these elements in city water were 0.0029 and 0.0080%, respectively. The pH of the farm water was 7.8 compared to 8.4 for the city water. Average water consumption for the 4-wk experiment was significantly reduced for hens consuming the farm's well water compared to city water. Overall hen-day egg production was significantly lower (75.3 vs 82.3%) for hens consuming the well water. Other production traits were not affected by water source. The results indicated that the quality of drinking water may negatively affect layer performance.
Comments: Although water is the most important nutrient for well-being and production, it is the most neglected nutrient in managerial practices. In most instances when production problems are experienced on the farm, the producers are looking for nutritional or pathological attributes as the contributing factors. As the result of the above study indicates, in fact, the quality or quantity of water may be the reason for experiencing the production problems. It is important that producers pay the utmost attention to the quality of water which is used on the farm and at least on a quarterly basis send a representative sample for analysis to a reputable lab. (K. Keshavarz)

* Zuidhof et al. [(1998, Poultry Sci. 77(Suppl. 1):19)] reported the results of an experiment which was conducted to quantify egg weight and internal quality losses over a 3-wk storage period. A total of 1920 eggs were stored up to 3 wk in a 4 X 4 X 4 factorial arrangement of treatments. Four storage temperatures (41, 50, 59, and 68° F), four relative humidity (25, 45, 65, and 85%), and four egg sizes (small = 42 g, medium- = 50 g, large = 56 g, and extra-large = 63 g) were combined for a total of 64 treatments. After 3 wk of storage, egg weight loss was less at the lower temperature, ranging from 0.65 g at 41° F to 1.76 g at 68° F, respectively. Weight loss was less at the higher relative humidity ranging from 0.13% at 85% to 2.29% at 25%. Egg weight loss ranged from 0.96 g for small eggs to 1.31 g for extra-large eggs. The effect of relative humidity on egg weight loss was less pronounced at the lower than at the higher temperatures. Albumen quality was significantly reduced at the high temperatures. After 21 d of storage, egg quality was significantly greater in small and medium-sized eggs than in large and extra-large eggs. Egg weight loss during the storage period was more affected by temperature than by relative humidity. At higher temperatures, differences in relative humidity have a greater effect on weight loss of stored eggs.

* Collins et al. [(1998, Poultry Sci. 77(Suppl. 1):12)] conducted an experiment to determine the effect of corn hybrids and bird's age on metabolizable energy of corn. Total collection methodology was used for determination of the energy (AME_n) with both broilers and adult roosters. The results indicated that the energy value varied among corn hybrids, and broiler chicks recovered significantly less energy than did adult birds. The investigators suggested that cultivar, as well as bird maturity, may be important considerations when considering corn ME values for ration formulation.

* Paton et al. [(1998, Poultry Sci. 77(Suppl. 1):11)] reported the results of an experiment which was conducted to determine the effect of organic forms of selenium and chromium (both as enriched yeast) on egg selenium and cholesterol

concentrations. Laying hens were fed a diet without selenium supplementation for 8 wk. Hens were then fed one of the following five diets: 1) control basal diet [(corn, soybean meal, 4% meat and bone meal, 1.5% animal-vegetable fat) plus 0.3 ppm selenium as sodium selenite]; 2) control basal plus 0.3 ppm selenium as selenized yeast (Sel-plus 50, Alltech, Inc.); 3) all-vegetable basal diet [(corn, soybean meal, 2% canola oil) plus 0.3 ppm selenium as sodium selenite]; 4) all-vegetable basal plus 0.3 ppm selenium as selenized yeast; and 5) diet 4 plus 0.6 ppm chromium as chromium-enriched yeast (Bio-chrome, Alltech, Inc.). Selenium content of the egg content prior to feeding the experimental diets was 0.06 ± 0.01 ppm (mean ± SD, fresh basis). After 2 wk, the selenium concentration in the egg content was significantly higher for hens fed selenized yeast than those supplemented with selenite, regardless of the basal diet (0.31 vs 0.19 ppm). Similar results were observed after 4 wk of feeding. Egg cholesterol that ranged from 185 to 193 mg per 50 g egg contents after 4 wk, egg production and other production parameters were not affected by treatments. The investigators concluded that the transfer of dietary selenium to the egg is more efficient from selenized yeast, compared with sodium selenite.

Comments: Normally, people prefer to take their vitamin and trace mineral needs from the natural foods than in chemical forms. Using selenized yeast as a more efficient source than sodium selenite may have practical application for enrichment of eggs with selenium for human consumption in selenium-deficient areas of the world. (K. Keshavarz)

K. Keshavarz
Department of Animal Science
Cornell University