and the lack of proper controls. The structure and logistics of integrated commercial poultry companies should be an ideal environment in which to conduct field trials. However, the normal variance in performance that occurs between and within flocks, barns, farms, geographic locations, seasons of the year, strain of bird, etc. all make it difficult to precisely measure treatment effects in the ranges at which they would be economically significant. The relatively low profit margins generated in the poultry industry make it necessary to accurately evaluate every action taken for its impact on returns. Those companies, which have good information management systems in place and conduct field trials that are of sufficient size and duration to generate meaningful results, will be better able to make management decisions that will lead to optimization.

Key Words: Research, Biometrics, Statistics

4 Field Research: A University Perspective of Successes and Failures. G. W. Malone*, University of Delaware, Georgetown, Delaware/US.

In the contract broiler production system, university sponsored field research studies must address all of the following areas to be successful: communication, cooperation, commitment, cost, and confidentiality. The biggest challenge in conducting field research is effective and continuous communication prior to, during and after the study. This requires a study that is well designed, planned and implemented. Every detail must be communicated to all participating parties. Never assume that the task will be accomplished based on a single communication. Success will also be predicated upon the appropriate selection of cooperators and those who will be committed to the study in its entirety. Both poultry companies and growers must be fully supportive of the study from the onset, be willing to participate as partners and if agreeable, should be highly recognized publicly for their contributions. Who pays for the cost of a field study? In addition to the direct and indirect costs often associated with typical university research projects, field research may have additional costs that need to be discussed and agreed upon before project initiation. If the field research has a negative impact on the income of the poultry company or grower, who pays and the level of retribution needs to be defined before starting the study. To avoid violating the confidentiality of a poultry company’s production values or costs, in comparative studies having control and treatment houses, it may be desirable to report data as the relative improvement of the treatment over the control group. Similarly, some sensitive issues such as environmental or food safety items may require some degree of confidentiality. Field research that has weaknesses in any of these five major areas may result in a less than desirable outcome. Finally, industry adoption of most new procedures often depends on it being cost-effective and practical. Examples of field research having or lacking in these essential components will be discussed.

Key Words: Broiler, Field research, University, Extension


Over the last 10 years, public awareness of welfare problems associated with intensive poultry production has been growing in Europe. Scientific debate and the influence of organisations such as the UK Farm Animal Welfare Council have guided public opinion and policy decisions. Some UK retailers have defined their own welfare codes, and schemes such as the RSPCA’s Freedom Foods have had an important role in informing consumer choice. The actions of animal rights groups and the media coverage they attract have also prompted debate. Attention has focused on particularly emotive issues such as cages for laying hens and beak trimming. Individual governments and the EU have implemented legislation designed to achieve common, minimum welfare standards. European legislation is binding across all member states, and the supremacy of European law makes it an attractive target for welfare lobbyists, since any resultant legislative changes will apply to 15 otherwise independent nations. The efficacy of such welfare legislation, however, depends on a number of the appropriate, religious and economic differences between countries will influence existing welfare legislation, speed of directive implementation and the extent to which regulations are policed. Importantly, countries belonging to the World Trade Organisation are not able to prevent the import of cheap poultry products from countries with less stringent welfare standards. In Switzerland, for example, a recent ban on the use of cages for laying hens made the Swiss egg industry so uncompetitive that 90% of its eggs are now imported from countries using cage systems. This illustrates that the introduction of radical legislation (such as the decision to ban cage production systems for laying hens in Europe by 2009) may only serve to export/w welfare problems, unless supportive economic and trade policies are also in place. Some aspects of the European experience may be relevant to future welfare development in the USA.

Key Words: Extension workshop, Poultry welfare, Europe, Legislation

6 The Virtual Revolution: Implications for Academe. S. L. Pardue*.

Technology has always influenced the delivery of information. Whether it was the refinement of photocopying by Xerox®, the application of television as an “educational” medium, the utilization of satellite up- and down-links, or the incorporation of video into teaching; we have all witnessed the subtle and occasionally profound influences of technology on education. The newest wave of technology to crash upon the shores of the academy, the InterNet, is not constrained by distance, time, state or national borders. It holds great promise to provide access to information that was previously limited to those in society who had the good fortune to attend one of our nation’s institutions of higher learning. Not only does it possess the ability to diminish the barriers of time and distance, but in doing so, it also creates a formerly uncharted, unutilized base of untapped students. It is this potential economic windfall that can be both blessing and curse. As budgets constrict, university administrators and state legislatures seek additional means to reduce costs and enhance revenues. Distance education has been viewed as a cost-effective tool to address the present day fiscal realities. Almost every state legislature has allocated significant financial resources for the development of on-line courses and other materials. In some cases these are “new” monies, while in others, it simply reflects a redistribution of educational dollars. Analysis of the long-term educational benefits of distance learning may require decades. How well the InterNet conveys the entire continuum of: data to information to knowledge to understanding to wisdom, remains to be seen. It may revolutionize teaching or become a footnote in the chronicles of over-hyped fads.

Key Words: InterNet, Distance education, Information Technology

7 NetLearning: The Impact of the Internet on Higher Education. B. Oakley*, University of Illinois at Urbana-Champaign, IL.

Prof. Oakley will discuss in detail how networked personal computers can be used to implement innovative teaching and learning environments in higher education. Many college courses now have been restructured to use the Internet to provide learners with increased access both to learning materials and to people. Many online courses have learning materials, such as audio-enhanced lecture presentations, simulations, and interactive tutorials available via the World Wide Web. Some of these courses also have online homework that is computer-graded in real time, providing rapid feedback to students. Asynchronous conferencing via the Web provides increased communication between students and faculty. Also, discussions among students, and has been found to build community, to promote peer-to-peer learning, and to enable increased team-based activities. Overall, Internet-based learning environments can be more active and student-centered than those that in many traditional, lecture-based courses. A survey of online courses has found increased in student retention and student performance, as well as enhanced student satisfaction with the learning process. Prof. Oakley will demonstrate how the Internet is now being used in a number of courses at the University of Illinois. Some of these courses use the Internet to supplement lecture-based courses taken by on-campus students, while other courses are totally online and are taken by students far from campus. Finally, Prof. Oakley will discuss how the new Illinois Virtual Campus will provide citizens throughout Illinois with increased access to educational opportunities.

Key Words: Internet, World Wide Web, Virtual Campus
8 Real Problems in the Virtual World. E. L. Knox*.

Professor Knox has taught in the virtual world since 1995 and has been a denizen of the Internet since 1986. He has seen first-hand the benefits of the virtual classroom, but he has also seen the problems at close range. In this presentation he will talk frankly and in detail about the kinds of problems that attend using the Internet as a medium for teaching. Many of his remarks will reflect his experiences teaching history in a fully virtual environment, but his experience as the webmaster for Boise State University allows him to address other perspectives as well—the of the hard sciences, for example, and of those who use the Internet as an adjunct to live classes.

The talk will cover three main areas: technical issues, pedagogical issues, and administrative issues. Throughout, the focus is on the individual instructor and his or her students. Technical issues include choice of tools, bandwidth and performance, reliability, and various forms of media. Administrative issues include training, intellectual property and copyright, class and university support services. Most important, however, are the pedagogical issues. Professor Knox will speak to the difficulties of student training, trading away class time to teach computing, how to grade on-line discussion, academic honesty, and maintaining scholarly standards.

While the problems are real, on-line teaching is indeed viable. There are real problems in the real classroom, too.

Key Words: Internet, Virtual Classroom, Pedagogy

Tuesday, AM, John Q. Hammons Hall III, PUFA Symposium

9 Human requirement for n-3 polyunsaturated fatty acids. A. P. Simopoulos*, The Center for Genetics, Nutrition and Health, Washington, D.C.

The diet of our ancestors was less dense in calories, being higher in fiber, rich in fruits and vegetables, and consisting of lean meat and fish. As a result, the diet was lower in total fat and saturated fat, but contained equal amounts of n-6 and n-3 essential fatty acids (EFA). Linoleic acid (LA) is the major n-6 fatty acid and alpha-linolenic acid (LNA) is the major n-3 fatty acid. In the body, LA is metabolized to arachidonic acid (AA), and LNA is metabolized to eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The ratio of n-6 to n-3 EFA is 1-4 to 1 with more longer chain PUFA than today’s diet. Furthermore, the diet contained small but roughly equal amount of n-6 and n-3 PUFA, whereas today this ratio is about 10 to 1 to 20-25 to 1, indicating that Western diets are deficient in n-3 fatty acids compared with the diet on which humans evolved and their genetic patterns were established. The n-3 and n-6 EFA are not interconvertible in the human body and are important components of practically all cell membranes. N-6 and n-3 fatty acids influence eicosanoid metabolism, gene expression, and intracellular cell communication. The PUFA composition of cell membranes is to a great extent dependent on dietary intake. Therefore, appropriately amounts of dietary n-6 and n-3 fatty acids need to be considered in making dietary recommendations, and these two classes of PUFAs should be distinguished because they are metabolically and functionally distinct and have opposing physiological functions. Their balance is important for homeostasis and normal development. Studies with nonhuman primates and human newborns indicate that DHA is essential for the normal functional development of the retina and brain, particularly in premature infants. A balanced n-6/n-3 ratio in the diet is essential for normal growth and development and should lead to decreases in cardiovascular disease, other chronic diseases, and improve mental health.

Key Words: N-6 and n-3 essential fatty acids, N-6/n-3 ratio, Requirements, Normal development, Chronic diseases

10 Feed Modifications for the Docosahexaenoic Acid Enrichment of Poultry. M. E. Van Elswyk*, 1 OmegaTech, Inc.

Consumption of the long-chain omega-3 fatty acid, docosahexaenoic acid (DHA;22:6n-3), in the U.S. is estimated at 150 mg daily. Many international groups recommend at least 1 g daily to support good health. Given the responsiveness of poultry meat and eggs to changes in dietary fatty acids, enriched poultry could help narrow the discrepancy between DHA intakes and recommendations. Direct sources of DHA for poultry supplementation include fish oil or marine algae. Flaxseed supplies linolenic acid (18:3n-3) which has a limited capacity to be further metabolized to DHA in the body. The following will discuss the usefulness of DHA-rich marine algae as a poultry fed supplement. Supplying 230 mg of DHA daily to hens from Gold DHA TM increases egg yolk DHA to 150-175 mg per egg. This would represent DHA levels of 1-2% of the total of ordinary eggs and 75% depression efficiency from the diet. Importantly, only algal sources supply this level of DHA without potential for off-flavors. Golden marine algae also contributes to the darkening of yolk color. Supplying broilers with 245 mg of DHA from Gold DHA TM yields breast meat with 75 mg of DHA per 100 g without adverse changes in shelf-life. This increase would represent DHA levels 5 times higher than that found in typical broiler meat. The use of dried algal products such as Gold DHA TM in poultry feed provides a pure, sustainable, and stable resource for increasing DHA in the U.S. diet via poultry.

Key Words: Docosahexaenoic acid, egg fatty acid modification, meat fatty acid modification, omega-3 fatty acids, marine algae

11 Enriched Eggs as a Source of Omega-3 Fatty Acids for Humans. N. Lewis* and S. Seburg.

Dietary intake of omega-3 fatty acids (n-3 PUFA) decreases the risk of heart disease, inhibits the growth of prostate and breast cancer, delays the loss of immunological functions, and are required for normal fetal brain and visual development. The U.S. has not established a Recommended Daily Intake for n-3 PUFA. However, Canada has established the Canadian Recommended Nutrient Intake (CRNI) at 0.5% of energy. Dietary sources of n-3 PUFA include fish, chicken, eggs, canola oil, soybean oil. Food consumption studies in the U.S. indicate that the majority of Americans do not meet the CRNI for n-3 PUFA. Mean n-3 PUFA consumption was 78% of the CRNI for midwestern women during pregnancy. In midwestern women at risk for breast cancer, the mean n-3 PUFA consumption is approximately 50% of the CRNI. Increasing the consumption of n-3 PUFA requires identification of a food source that the public would eat in sufficient amounts to meet recommended intake. n-3 PUFA enriched eggs can be produced by modifying hens’ diets. When 70 g/kg of cod liver oil, canola oil, or linseed oil are added to a commercial control diet, the n-3 PUFA are increased from 1.2% of egg yolk fatty acids to 6.3, 4.6, and 7.8%, respectively. Feeding flaxseed increases linolenic acid in the egg yolk about 30-fold and docosahexaenoic acid, increases nearly 4-fold. When individuals are fed four n-3 PUFA enriched eggs a day for four weeks, plasma total cholesterol levels and LDL-C do not rise significantly. Plasma TG are decreased by the addition of the n-3 PUFA enriched eggs to the diet. N-3 PUFA may influence LDL particle size, causing a shift toward a less atherogenic particle. Blood platelet aggregation is significantly decreased in participants consuming n-3 PUFA enriched eggs. Overall results of studies to date demonstrate positive effects and no negative effects from consumption of n-3 enriched eggs. Three n-3 PUFA enriched eggs provide approximately the same amount of n-3 PUFA as one fish meal. It is recommended that n-3 PUFA enriched eggs be used as one source of n-3 PUFA to increase individual consumption to meet the current Canadian recommendations.

Key Words: Omega eggs, Omega-3 fatty acids, Alpha linolenic acid, DHA (docosahexaenoic acid), Serum lipids


Eggland’s Best, Inc. markets premium quality shell eggs under the Eggland’s Best (EB) brand name. The company, started in 1988, is comprised of a franchise network of established egg producers which covers most of the United States. EB provides its franchisees with marketing and technical support. The franchisees produce, process and distribute Eggland’s Best eggs according to the strict program established and monitored by EB. Production follows the all-natural vegetarian feed program in accordance with the company’s U.S. patent entitled “Eggs Compatible with a Cholesterol Reducing Diet and Method of Producing the Same.” The EB program excludes animal fat and other animal by-products. EB eggs have seven times the generic level of vitamin E, nearly 3 times more

Key Words: Eggland’s Best, Inc., specialty egg marketing

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