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By Kyle Richard Kohlhagen

Entitled Analysis and Evaluation of the Effectiveness of a Poultry Biosecurity and Disease Prevention Curriculum

For the degree of Master of Science

Is approved by the final examining committee:

Mark A. Balschweid
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ANALYSIS AND EVALUATION OF THE EFFECTIVENESS OF A POULTRY BIOSECURITY AND DISEASE PREVENTION CURRICULUM

A Thesis

Submitted to the Faculty

of

Purdue University

by

Kyle Richard Kohlhagen

In Partial Fulfillment of the

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of

Master of Science

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This thesis is dedicated to a number of amazing and dependable people. I cannot go without thanking God for giving me the wisdom and courage in all I do and leading me in the right direction. His blessings and strength are needed each day and to know all things are possible through Him. To my mother and father for raising us kids right, pushing us to work hard and never quit, and teaching us to appreciate what we have. To my family for always pitching in when needed and constantly reminding me of the final goal to complete my paper. To all my friends and family, thank you for your kindness and caring attitude in helping me along my journey. It has been quite the road, and I hope I can do the same for you.

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ABSTRACT

Kohlhagen, Kyle R. M.S., Purdue University, December 2008. Analysis and Evaluation of the Effectiveness of a Poultry Biosecurity and Disease Prevention Curriculum. Major Professor: Dr. Mark A. Balschweid.

This study was designed to assess the effectiveness of a poultry biosecurity and disease prevention curriculum. Objectives of this study included the determination of demographic information of participants, including 4-H and FFA involvement, date of birth, residing county, previous biosecurity training experience, gender, years in the 4-H project, and size of flock. Other objectives were to determine the knowledge level and attitudes of backyard flock owners in Indiana on biosecurity issues before and after an educational presentation concerning poultry biosecurity, and to determine if selected demographic variables influenced the change in knowledge and/or attitude of participants after an educational presentation concerning poultry biosecurity. The instrument used in this study was created by the researcher with information gathered from the United States Department of Agriculture, the Cooperative Extension Service, the Indiana State Poultry Association, and the Indiana State Board of Animal Health to assess the knowledge and attitudes of participants on poultry biosecurity issues. Of the 215 participants, half were 4-H members, 20% considered themselves poultry producers, and nearly 90% had no previous biosecurity training. Gender was balanced with 53% of the participants being

female. Results from statistical analysis revealed that there was a significant difference in both knowledge and attitude scores from the pretest to the posttest. Both differences in attitude and knowledge test scores were significant at the $p < 0.05$ level. The posttest scores for knowledge were higher than the pretest scores, and the posttest scores for attitude were not the same as pretest scores. It is recommended this poultry biosecurity education program be continued and used to help improve overall health of poultry through the use of biosecurity and disease prevention in Indiana and adapted for other states.

CHAPTER 1 INTRODUCTION

Background

Across the nation, academia, government, and trade associations have developed a wide array of materials concentrating on biosecurity in light of recent outbreaks of avian diseases such as Avian Influenza (AI) and Exotic Newcastle Disease (END) (Brennan & Kopp, 2005). However, biosecurity curricula have not been tailored for small flock owners and commercial poultry producers within the state of Indiana (Brennan & Kopp, 2005).

Included in Indiana's population of 6.2 million citizens are people interested in each of two distinct poultry sectors: small flock owners and the commercial poultry industry. Information from an Indiana study (USDA, 2005) estimated that tens of thousands of Hoosier households enjoy small flock poultry production. The project surveyed farms across the state in October and November 2004 (USDA, 2005). The majority of the state's approximately 250 National Poultry Improvement Plan (NPIP) certified blood testers are exhibition poultry enthusiasts who have dedicated their time and resources to learn about avian disease identification and control. Additionally, 91 of Indiana's 92 counties have a county fair poultry superintendent as well as support from the county cooperative extension educators and local poultry exhibition clubs (Brennan & Kopp, 2005).

In October 2005, the Purdue University Department of Agricultural Economics completed research on Indiana's livestock industry and released a report titled *The Economic Importance of the Indiana Poultry Industry* (Mayén & McNamara, 2006). The Indiana poultry industry is an important part of the state's agricultural sector. The industry is represented by firms devoted to the production and processing of ducks, turkeys, broilers and eggs. Total poultry product sales were $806.6 million in 2004. The industry paid $142 million in salary and wages to the 5,031 persons employed by the industry. Additionally, the industry had grower contracts with 651 farmers (Mayén & McNamara, 2006).

In 2004, the total output of poultry meat products was estimated at 607 million pounds with an approximate monetary value of $475 million dollars (Mayén & McNamara, 2006). Approximately $38.5 million of the total sales were due to exports to Mexico, Russia and Asian countries (Brennan & Kopp, 2005). The value of production for the turkey sector was higher than that of the broiler and duck sectors (Mayén & McNamara, 2006). At the national level, Indiana can boast about two rankings in this sector: 1st in duck production and 7th in the production of turkeys (Indiana Agricultural Statistics Service 2004-05, 2004).

Also in October 2005, the Purdue University Department of Agricultural Economics completed a report titled *Indiana's Egg Industry* (Mayén & McNamara, 2006). Indiana's egg production represents 8% of total table egg (eggs for consumption) production in the U.S. (Indiana Agricultural Statistics Service 2004-05, 2004). In addition to table eggs, Indiana also produces hatching eggs which are incubated to replenish the laying hen stock. Indiana ranks third among egg producing states in

number of commercial layers in egg production, behind Iowa and Ohio. In 2004, the number of laying hens in Indiana was approximately 22.7 million (Indiana Agricultural Statistics Service 2004-05, 2004) with production of 6.1 billion table eggs a year. In 2004 the industry had an estimated production value of $331 million. It employed 1,687 persons who earned wages and benefits of $46 million (Mayén & McNamara, 2006).

The human health concerns of Avian Influenza (AI) have brought additional scrutiny to the industry. Over the past five years, the number of outbreaks of Avian Influenza has increased significantly (Capua & Marangon, 2006). Some outbreaks have been minor, but other epidemics have become more serious, including the Italian 1999-2000, the Dutch 2003, the Canadian 2004, and the ongoing Eurasian outbreak (Capua & Marangon, 2006). Besides losing thousands of birds and changing the public perspective of the world food supply, AI outbreaks have created a major human health risk through possible mutations, or changes, of the virus (Capua & Marangon, 2006). The mutation toward infecting humans is unpredictable and may occur quickly soon after it reaches the flock or after it has circulated among the birds for several months (Munster, Wallensten, Baas, Rimmelzwaan, Schutten, & Olsen, 2005). This human link can especially have a significant impact on developing countries (Capua & Marangon, 2006).

In lieu of such concerns of poultry diseases, several organizations have taken steps toward practicing and educating the public about biosecurity. Various publications have been developed through the United States Department of Agriculture's Animal Plant and Health Inspection Service (USDA-APHIS, 2006). However, no educational program exists to promote the publications to Indiana poultry exhibitors and producers. Even the National 4-H Organization touches on disease prevention in their 4-H Poultry

Project Manuals, but no educational program accompanies the curriculum (National 4-H Organization, 2008).

A crucial time for an individual's education is through adolescence, since this is when people form attitudes and behaviors which shape their lives (Selman, 1980). In this study, the 4-H groups were targeted as a convenient group of adolescent flock owners. However, the study also examined adults who participated in the program.

One area of education can be focused on an individual's attitude toward a given topic. Attitudes are tendencies developed to respond in a consistently positive or negative way towards a given stimulus (Fishbein & Ajzen, 1975). Thus, it can be understood that individuals are not born with attitudes but rather learn through experience (Fishbein & Ajzen, 1975). Attitudes can be stable and relatively enduring (Fishbein & Ajzen, 1975). Judgment is placed on things either favorably or unfavorably through attitudes (Fishbein & Ajzen, 1975). Attitudes are generally thought to have three parts. The cognitive element is associated with knowledge, thinking and the processing of information; the affective element is linked to feeling and emotions; and the behavioral element is concerned with actions (Fishbein & Ajzen, 1975).

For an individual to modify or reject existing attitudes, a new experience needs to occur (Fishbein & Ajzen, 1975). On the other hand, attitudes may also change as a direct result of persuasion, a form of social influence aimed at encouraging people to reexamine specific attitudes and beliefs, and to adopt new ones (Fishbein & Ajzen, 1975). The basic assumption is that attitude change will promote behavioral change (Fishbein & Ajzen, 1975). These changes are made possible through education, and in this case, specifically poultry biosecurity.

A purpose of this research was to determine the attitudes of participants on the importance of poultry biosecurity and disease prevention before an educational seminar and then investigate attitudes after the educational program. Another purpose of the research was to raise awareness to flock owners of the importance of biosecurity and determine the change of knowledge before and after the program. Knowledge is that which is gained and preserved by knowing; instruction; acquaintance; enlightenment; learning; scholarship; erudition (Webster's Revised Unabridged Dictionary, 1998). It is that familiarity which is gained by actual experience; practical skill; as, a knowledge of life (Webster's Revised Unabridged Dictionary, 1998).

Poultry flock owners need awareness of the importance of biosecurity and disease prevention. This curriculum could be used to increase the knowledge and positively change the attitude of people involved in the poultry industry.

Statement of Problem

A diagnosis of H_7N_2 Avian Influenza, a low pathogenic strain of the virus with lower mortality compared to the highly pathogenic H_5N_1, occurred on the East Coast of the United States in March of 2002 (Brennan & Kopp, 2005). In three months the disease was eradicated. However, containing the disease took a heavy toll. Over five million commercial birds were destroyed on nearly 200 farms, costing producers over $160 million (Brennan & Kopp, 2005). In two years the budget for USDA's Animal and Plant Health Inspection Service (APHIS) for Avian Influenza (AI) control rose from one million dollars to $23.8 million in the 2005 APHIS budget (Brennan & Kopp, 2005).

In 2002, Exotic Newcastle Disease (END) was diagnosed in a California game bird flock, and in 2003 it was diagnosed in commercial layer flocks (Brennan, 2005).

Over three million birds were destroyed on over 2,500 premises in California, Nevada, and Arizona. The economic impact of this highly contagious disease included over $200 million in direct losses (Brennan, 2005). Both diseases caused trading partners of the United States to limit market access of poultry, compounding and spreading the economic impact.

Due to concerns of poultry diseases, several agricultural organizations have taken steps toward practicing and educating on biosecurity (USDA-APHIS, 2006). Various publications have been developed through the United States Department of Agriculture's Animal Plant and Health Inspection Service (USDA-APHIS, 2006). However, no educational program exists to promote the publications to Indiana poultry exhibitors and producers. Types of poultry diseases, how disease spreads, and how they can be prevented are topics which could be covered for all groups of poultry producers. It is necessary to develop a program on proper isolation of birds, procedures for cleaning and disinfecting, traffic control, minimizing exposure to wild animals, and other biosecurity practices to decrease the level of risk for disease to spread. If an owner notices a sick bird, he or she should know who to contact for help. Material should be developed and dispersed to encourage healthy flocks in Indiana.

The focus of this study is to determine if a poultry biosecurity curriculum can influence knowledge and change attitudes on the importance of poultry disease prevention and proper testing. The question being researched was: Does a poultry biosecurity curriculum influence associates of Indiana poultry production in knowledge and recognition of the significance of biosecurity? The intent of the curriculum project is

to teach those working with or exhibiting poultry the importance of biosecurity and practical techniques used to protect their flocks, their livelihood, and their passion.

Research Objectives and Procedures

This research project evaluated an educational methodology in poultry biosecurity education using a pre and posttest analysis to determine the effectiveness of the educational method in teaching important concepts pertaining to poultry biosecurity.

The objectives in this project were:

1. Determine Indiana poultry representatives' knowledge of the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
2. Determine Indiana poultry representatives' attitudes concerning the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
3. Determine demographic information of participants, including 4-H and FFA involvement, date of birth, residing county, previous biosecurity training experience, gender, years in the 4-H poultry project, and size of flock.
4. Determine if selected demographic variables influenced the knowledge and/or attitude of participants after an educational presentation concerning poultry biosecurity.

In order to achieve the objectives of this study, the following steps were taken:

1. Identify the core competencies needed for inclusion in the poultry biosecurity educational seminar;
2. Develop a pilot test curriculum and evaluation materials;

3. Develop an educational program and evaluation materials based on the results of the pilot test;
4. Analyze the collected data and form conclusions based on the analysis;
5. Determine if the poultry biosecurity program significantly changed the knowledge and attitude of poultry flock owners in Indiana.

Rationale

Disease in the poultry industry has always been a concern for flock owners especially with recent outbreaks (Brennan & Kopp, 2005). Efforts to prevent disease have been made through the use of biosecurity and promotion of practicing biosecurity, although not specifically for Hoosier poultry producers (Brennan & Kopp, 2005).

For the benefit of small flock owners and the continued health of the poultry industry, Indiana's poultry must be protected from potentially devastating diseases. If a highly devastating disease such as Avian Influenza reaches a flock, the flock may quickly reach 100% mortality with the potential to spread to neighboring flocks. Even if there were such things as simple methods to quarantine a flock of birds and stop the spread, the best alternative is to prevent disease from invading the premises in the first place. Through simple steps, poultry producers can significantly lower the risk of disease in their flock (Webster, 2008).

Millions of dollars in revenue for poultry producers is lost due to disease outbreaks each year (Carey, Jeffrey, & Prochaska, 2006). A key method of preventing such costly measures is biosecurity. This term biosecurity covers a wide range of methods to control pathogens, or disease-causing organisms, and those which carry such pathogens. It is important to carefully monitor the sources of disease including people,

traffic, and other vectors such as rodents, wild birds, insects, wind, and water. Prevention of spreading bacteria and viruses should start at the source (Penfold, 2007). Poor biosecurity can have severe consequences and cause an industry-wide wave of deadly disease. It is not only difficult to clean a contaminated building but also to recover from such a hit to the poultry industry (Carey, Jeffrey, & Prochaska, 2006).

Assumptions

For this particular research project, several assumptions were made. It was assumed participants would read all of the test questions and would answer them to the best of their ability. Even with the wide age range, it was assumed that the pretest and posttest was at the appropriate reading level for the target audience. Another assumption made in this study was that each participant had a basic knowledge of poultry since all were involved in some way with the 4-H Poultry Project. It was assumed all educational programs were presented consistently to the different audiences. Finally, it was assumed that not all participants would be familiar with proper poultry biosecurity.

Limitations

To ensure other researchers could replicate or expand this study, the researcher of this poultry biosecurity education program attempted to minimize limitations. However, potential problems were identified that could increase the risk of research flaws. First, the size of the sample and the non-random selection of the participants prohibit the results from being generalized across the entire population. In this study, the sample of participants was selected based on respondents to an offer of a biosecurity education program. Participants were contacted through county offices of the Purdue University Cooperative Extension Service. Any county could have participated if they chose. All

groups who responded were included in the study. Participants with prior disease and biosecurity experience could have an effect on the data collected. All participants were involved in some way with 4-H poultry exhibition as they were the group invited to the seminar. This may have increased the possibility of having participants with prior experience.

No control group was used and no control measures were enacted to account for individual differences in subject intelligence or previous experience with poultry disease and biosecurity. However, the analysis was based on the pre and post response of the same population.

Lastly, a limitation was the possible reluctance of the participants to report their knowledge and/or attitude accurately on the pre and posttest. He or she may not have wanted anyone to see their lack of knowledge or attitude toward the necessary biosecurity practices. Some also may have felt rushed to complete the tests even though it was clearly stated the tests had no time limit. Participants may not have wanted to be the last person finishing the test and thus not accurately depict their true level of knowledge or attitude.

Definition of Terms

Agricultural Education: The teaching of agriculture in secondary schools supported by funds through the Smith-Hughes Act of 1917 (National FFA Organization, 2006).

Attitude: Tendency developed to respond in a consistently positive or negative way towards a given thing (Fishbein & Ajzen, 1975).

Avian Influenza (AI): A virus which infects chickens, turkeys, pheasants, quail, ducks, geese, and guinea fowl and causes varying degrees of clinical illness (USDA-APHIS, 2002).

Cooperative Extension Service (CES): A federal-state-local partnership of service established through the Smith Lever Act in 1914 with a mission to help people help themselves through decision making and problem solving (Seevers, Graham, Gamon, & Conklin, 1997).

Curriculum: a small or short course (Webster's Revised Unabridged Dictionary, 1998).

Disease: An alteration in the state of the body or of some of its organs, interrupting or disturbing the performance of the vital functions, and causing or threatening pain and weakness; malady; affection; sickness; disorder (Webster's Revised Unabridged Dictionary, 1998).

Exotic Newcastle Disease (END): A contagious and fatal viral disease that can cause death in birds without having developed any clinical signs and affects all species of birds (USDA-APHIS, 2003).

Flock: As applied to disease control. All of the poultry on one farm except that, at the discretion of the Official State Agency, any group of poultry which is segregated from another group and has been so segregated for a period of at least 21 days may be considered as a separate flock (USDA-APHIS-Veterinary Services, 2007).

Health: The state of being hale, sound, or whole, in body, mind, or soul; especially, the state of being free from physical disease or pain (Webster's Revised Unabridged Dictionary, 1998).

Isolation: Confinement of animals within a controlled environment (Cardona, 2003).

Knowledge: That which is gained and preserved by knowing; instruction; acquaintance; enlightenment; learning; scholarship; erudition (Webster's Revised Unabridged Dictionary, 1998).

Low Pathogenic H_7N_2 Avian Influenza: A subtype of Avian Influenza virus which has been classified as low pathogenic based on laboratory testing. Low pathogenic subtypes typically cause less severe disease in poultry than high pathogenic subtypes. (U.S. Animal Health Association, 2008).

National 4-H Organization: A national youth program involving a dedicated network of Cooperative Extension Service educators, parents, local leaders and volunteers who help develop individual talents, life skills and leadership abilities among Indiana's young people through 4-H clubs and county fairs as well as through field-tested school enrichment materials and local community programs. (Seevers et al., 1997).

National FFA Organization (FFA): One of the largest youth education programs for high school students in the United States which paves a way for achievement in premier leadership, personal growth, and career success through agricultural education (National FFA Organization, 2006).

Poultry: Domesticated fowl, including chickens, turkeys, ostriches, emus, rheas, cassowaries, waterfowl, and game birds, except doves and pigeons, which are bred for the primary purpose of producing eggs or meat (USDA-APHIS-Veterinary Services, 2007).

Poultry Biosecurity: Methods to protect the life of the birds by keeping diseases and the organisms that cause them out of flocks through disease prevention, cleaning

programs, and vaccination and strategic medication (International Poultry Production, 2006).

Prevention: Action taken to reduce disease and its spread (Cardona, 2003).

Sanitation: The disinfection of materials, people, and equipment entering the farm and the cleanliness of the personnel on the farm (Cardona, 2003).

Traffic Control: Manage of people, animal, and equipment traffic onto the farm and patterns within the farm (Cardona, 2003).

CHAPTER 2 REVIEW OF LITERATURE

The purpose of this chapter is to discuss research previously conducted in the areas related to this study. The literature review included books, electronic media, professional journals, research articles, and reports.

Literature Review Methodology

1. Background of U.S. Education, Cooperative Extension Service, and Agricultural Education
2. Explanation of the 4-H Poultry Project
3. Destructive Diseases in Poultry
4. Explanation of Programs in Poultry Biosecurity
5. The National Poultry Improvement Plan and Disease Prevention
6. Effectiveness of Informal Education and Use of Technology

Background of U.S. Education, Cooperative Extension Service, and Agricultural Education

Agriculture was not studied as a science until the 19th century (Cochrane, 1993). However, individual farmers made great strides in farming prior to that time. Even as the English settlers became established in the New World, they learned from the Native Americans how to grow new crops and how to improve old ones (Cochrane, 1993). But

the actual establishment of the study of agriculture as a science was not made until the 1800s, much later than the first settlement in the Americas (Barrick, 1989).

The Morrill Acts of 1862 and 1890 contributed greatly to the development of the study of agriculture. With the realization of the importance of higher education in agriculture came a system of public institutions of higher education called the land-grant colleges. The acts granted each state in the United States 30,000 acres of federal land for every senator and representative. Each state sold the land and invested the proceeds in an endowment to establish at least one college to teach the public agricultural science and mechanical arts. Not only did the Morrill Acts provide access to higher education for more people, later including African Americans, but they also recognized agriculture as an actual science to be studied. The Hatch Act of 1887 provided subsequent federal legislation for an agricultural experiment station to be established in each state (Cochrane, 1993). Each state has a station usually located and associated with the land-grant university and used to conduct agricultural research and test new methods and developments in agriculture systems. These methods involve research on the physiology of plants and animals, diseases, proper crop rotations, and stages of growth. Many states have branch stations to meet the special needs of different climate and geographical zones in those states. The knowledge gained from these experiments is published in reports and disseminated to the public (Barrick, 1989).

The Cooperative Extension Service was established through the Smith Lever Act in 1914 with a mission to help people help themselves through decision making and problem solving (Cochrane, 1993). The Cooperative Extension Service works to improve peoples' lives and communities through an educational process that uses

scientific knowledge focused on issues critical to the agricultural, economic, environmental, health, safety, and societal progress of all Americans (Rasmussen, 1989). Today, agricultural knowledge continues to be extended through land grant colleges to the public (Rasmussen, 1989). The Smith Lever Act also designed the partnership of the United States Department of Agriculture and the land-grant universities (Seevers, Graham, Gamon, & Conklin, 1997). By design, the Cooperative Extension Service organization's foundation is a nationwide partnership composed of three distinct but related groups (Seevers et al., 1997). First, the federal partner of the Cooperative Extension Service is the United States Department of Agriculture (Seevers et al., 1997). Second, the state partner is the Cooperative Extension Service in each state (Seevers et al., 1997). Third, the county or local partner consists of committees with local authority as an elected board or appointed by the Extension Director or Administrator to advise the work of Cooperative Extension Service (Seevers et al., 1997).

These three levels of governance provide a unique and coordinated effort among federal, state, and county governments that involve three sources of public funds for Cooperative Extension Service work and three levels of perspective on the mission, goals, and priorities of the educational programs. The Purdue University Cooperative Extension Service has an office in each of Indiana's 92 counties. Depending on the county's level of funding and needs, each county has at least one Extension Educator in one or more of the following program areas: 4-H and Youth Development, Agriculture and Natural Resources, Consumer and Family Sciences, and Economic and Community Development.

The 4-H and Youth Development program is a dedicated network of Extension Educators, parents, local leaders and volunteers (Phipps, Osborne, Dyer, & Ball, 2008). Purdue Cooperative Extension Service 4-H and Youth Educators develop individual talents, life skills and leadership abilities among Indiana's young people through 4-H clubs and county fairs as well as through field-tested school enrichment materials and local community programs. The 4-H program creates supportive environments in which youth can reach their full potential in creativity, professionalism, and career success. The organization works to help young people become self-directed, productive adults. Members of 4-H participate in projects such as arts, crafts, animals, and science, to improve responsibility, time management, and communication and thinking skills. The mission of 4-H also empowers adult volunteers to join efforts with the Cooperative Extension Service to increase program effectiveness (Phipps et al., 2008).

The Agriculture and Natural Resources Extension program offers information on agricultural production and financial management for farmers, food and fiber processors, manufacturers and consumers (Phipps et al., 2008). It assists people in improving productivity, promotes management skills, and increases income through better practices (Phipps et al., 2008). The program also provides expertise in environmental issues, natural resource conservation and land use (Phipps et al., 2008). Indiana citizens are helped in achieving their goals of profit in agriculture, abundant and safe food, a clean environment and effective stewardship of natural resources (Seevers et al., 1997). With information being gathered through research at Purdue University in the areas of agriculture and natural resources, the information is disseminated through the county Extension Educators to the local communities and agricultural producers. Ranging from

pest control management to flood emergency response, the Extension Educators often provide workshops or presentations to local producers and consumers.

The Consumer and Family Sciences Extension program helps communities analyze, identify and meet the needs of families (Seevers et al., 1997). The Extension Educators work to train volunteers and paraprofessionals in family concerns, motivate people to become leaders in community issues, and collaborate with agencies, community organizations, and educational groups to address the needs of families (Seevers et al., 1997). The focus is on economic well-being, nutrition, and health (Seevers et al., 1997). The program develops ways for families to become healthy in the areas of nutrition, food preparation, child care, financial management, and health care (Phipps et al., 2008). It provides informal educational programs that increase knowledge, influence attitudes, teach skills, and encourage working toward higher aspirations (Hurt, 2002).

The Economic and Community Development program provides Indiana citizens with educational programs and information useful to increase community vitality, build leadership capacity, enhance public decision-making, and resolve public issues (Phipps et al., 2008). The Educators focus on improving the cultural, economic, institutional, physical, and social environment in which the people of the community work and live. Working with local government, the Extension Educators help create viable options for economic and community development (Seevers et al, 1997). Workshops for local citizens include everything from how to fill out a checkbook to key points in starting a personal business. The Cooperative Extension Service continues to adapt to changes in the needs of the local communities.

The Smith-Hughes Act of 1917 provided federal funds to support the teaching of agriculture (Hurt, 2002). This act stated that the purpose of vocational agriculture was to train people who have entered or who are preparing to enter the work of the farm (National FFA Organization, 2006). The agricultural education program provides a well-rounded, practical approach to learning through three components: Classroom education in agricultural topics such as plant and animal sciences, horticulture, forestry, and agri-marketing; hands-on supervised agricultural career experience such as starting a business or working for an established company; and FFA, which provides leadership opportunities and tests students' agricultural skills (National FFA Organization, 2006).

The Future Farmers of America, as it was called when it was founded in 1928, brought together agricultural students, teachers, and businesses to support agricultural education (Cochrane, 1993). Today, the Future Farmers of America is called the National FFA Organization, and it is one of the largest youth education programs for high school students in the country. It paves a way for achievement in premier leadership, personal growth, and career success through agricultural education (Phipps et al., 2008). The organization is evolving from a "traditional" way of agriculture to include new technologies and incorporate all innovative areas of agriculture (National FFA Organization, 2006).

Recognizing the importance of the FFA as an integral part of the program of vocational agriculture, the 81st Congress of the United States granted a Federal Charter to the FFA in 1950 (Phipps et al., 2008). On August 12, 1998, the 105th Congress of the United States reviewed and passed technical amendments to the organization's statutes (Phipps et al., 2008). These revisions became Public Law 105-225 after the technical

changes (Phipps et al., 2008). The purpose of the organization is to create, foster, and assist subsidiary chapters composed of students and former students of vocational agriculture in public schools qualifying for Federal reimbursement under the Smith-Hughes Vocational Education Act and associations of those chapters in the States, territories, and possessions of the United States (National FFA Organization, 2006).

The agricultural education program is built on the three core areas of classroom/laboratory instruction, supervised agricultural experience programs, and FFA student organization activities and opportunities (Phipps et al., 2008). The areas each provide hands-on activities and allow learners to experience real-life situations. The establishment of leadership events gave the programs a focus on personal leadership development, and awards were created to reward members, local chapters, and state associations (Phipps et al., 2008). Education in agriculture includes the subjects of Agribusiness Management, Agricultural Mechanization, Animal Science, Farm Management, Food Science, Fundamentals of Agricultural Science and Business, Horticulture Science, Landscape Management, Natural Resources Management, Plant and Soil Science, and Supervised Agricultural Experience (Phipps et al., 2008).

Beyond FFA and the agricultural education classes in high school is a 6.5 million member youth organization called the National 4-H Organization (National 4-H Organization, 2008). The 4-H program is the only youth development program with a direct connection to technological advances from research conducted at state land-grant universities (Hurt, 2002). In urban, suburban, and rural communities throughout the United States as well as military installations worldwide, boys and girls participate in a

wide range of 4-H activities. These activities occur either in school-based, after-school or camp settings and community clubs (Hurt, 2002).

Youth in 4-H come from all races and ethnic backgrounds throughout all fifty states and Washington, D.C., American Samoa, Guam, Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands. Fifty-two percent of the members are female while 48% are male (National 4-H Organization, 2008).

The fundamental 4-H ideal of practical, "learn by doing" experiences encourages youth to experiment, create and think independently (Hurt, 2002). The 4-H program has three primary areas: science, engineering and technology; healthy living; and citizenship (National 4-H Organization, 2008). Through involvement in 4-H, young people are given the opportunity to learn leadership, citizenship, and life skills through more than 1,000 projects with topics ranging from veterinary science to public speaking and from photography to nutrition and community service. (National 4-H Organization, 2008).

The 4-H youth development movement began more than 100 years ago. It evolved by introducing new technology to a country consisting predominantly of rural communities in the early 20th century. Over the decades, 4-H adapted to meet the needs of young people as the nation's economic and demographic profiles became more diverse (Hurt, 2002). Today, trained youth and adult volunteers alongside Educators at 106 land-grant universities manage the 4-H program (National 4-H Organization, 2008). The program offers youth supervised independence, a sense of belonging with a positive group, a spirit of generosity toward others and a wide variety of opportunities to master life challenges (Rasmussen, 1989). The 4-H program is managed and supported by the National 4-H Headquarters; USDA within the Cooperative State Research, Education and

Extension Service; Cooperative Extension Educators at land-grant universities; National 4-H Council; 4-H associations and foundations; and volunteers (National 4-H Organization, 2008).

In a recent 2008 study conducted by the Institute for Applied Research in Youth Development of Tufts University, youth who participated in 4-H programs were compared to those who participated in other out-of-school-time programs. It was found that those who participated in 4-H programs had consistently higher scores on the assessment for Positive Youth Development (PYD). Positive Youth Development is a framework which views young people as resources to be developed rather than problems to be managed. The PYD approach builds upon what have become known as the "Five Cs": Competence, Confidence, Connection, Character, and Caring (Lerner, Lerner, & Phelps, 2008). Researchers from Tufts University believed that young people whose lives incorporated these "Five Cs" would be on a developmental path that demonstrates a "Sixth C": Contributions to self, family, and community (Lerner, Lerner, & Phelps, 2008). In addition, those young people whose lives contained lower amounts of the "Five Cs" would be at higher risk for a developmental path that included personal, social, and behavioral problems and risks (Lerner, Lerner, & Phelps, 2008).

Those who participated in 4-H compared to those in other out-of-school-time programs also had lower scores on measures of depression and risk / problem behaviors (Lerner, Lerner, & Phelps, 2008). Students in 4-H had higher grades in school, greater emotional engagement in school, and were more likely to see themselves going to college (Lerner, Lerner, & Phelps, 2008). Former 4-H members are more likely than others in their age groups to participate in and become leaders of their community (Rasmussen,

1989.) The 4-H program has served as an effective educational tool and can create a positive experience for those involved both young and old (Rasmussen, 1989).

Explanation of the 4-H Poultry Project

The 4-H program has been used as an effective educational tool and creates a positive experience for its members and adults associated with the program (Rasmussen, 1989). This is true also in the area of 4-H poultry. In 2007, 5,682 Indiana youth participated in the 4-H poultry project (National 4-H Organization, 2008). At the 2007 Indiana State Fair, 161 4-H members exhibited poultry with 1,181 birds (National 4-H Organization, 2008). With this level of interest in poultry, a study on the effectiveness of an educational program is feasible in Indiana.

The poultry project develops youth in the area of responsibility, teamwork, leadership, and proper care of animals (National 4-H Organization, 2008). The objectives of the 4-H poultry project is to help youth to:

- Experience the pride and responsibility of leasing/owning and caring for poultry.
- Learn how to feed, fit, show, breed and raise poultry.
- Learn proper handling procedures to prevent injuries to 4-H members and their poultry projects.
- Become good citizens by working together in groups and supporting 4-H poultry project activities and events.
- Develop leadership initiative, self-confidence, sportsmanship and other desirable character traits.
- Promote a greater love of animals and a humane attitude towards animals.
- Develop and define career choices. (National 4-H Organization, 2008, p 1).

Members participating in the 4-H poultry project can meet periodically with the project leader to receive instruction on subject matter related to poultry and to achieve goals which, together and individually, they have set. The youth can actively participate in the care and management of their birds and learn about financial issues regarding poultry (National 4-H Organization, 2008). The 4-H program is an opportunity for young people to work with adults and build an understanding of the importance of agriculture (Hurt, 2002).

Destructive Diseases in Poultry

For the continued poultry health for small flock owners including 4-H poultry members, Indiana's poultry should be protected from potentially devastating diseases (Brennan, 2005). Disease outbreaks cost poultry producers millions of dollars in revenue each year (Carey, Jeffrey, & Prochaska, 2006). If a highly devastating disease such as Avian Influenza (AI) or Exotic Newcastle Disease (END) reaches a flock, the flock may quickly reach 100% mortality with the potential to spread to neighboring flocks (Brennan, 2005).

Exotic Newcastle Disease is a contagious and fatal viral disease affecting all species of birds (USDA-APHIS, 2003). It is so virulent that many birds die without having developed any clinical signs (USDA-APHIS, 2003). It can infect and cause death even in vaccinated poultry (USDA-APHIS, 2003). Exotic Newcastle Disease affects the respiratory, nervous, and digestive systems and can cause sneezing, gasping for air, nasal discharge, and coughing (USDA-APHIS, 2003). Other clinical signs include greenish, watery diarrhea, depression, muscular tremors, drooping wings, twisting of the head and

neck, reduction or loss of egg production, swelling of the tissues around the eyes and neck, and sudden death (USDA-APHIS, 2003).

Exotic Newcastle Disease (END) was found in a California game bird flock in 2002 and in commercial layer flocks the following year (Brennan, 2005). The disease outbreak resulted in the destruction of over three million birds in California, Nevada, and Arizona (Brennan, 2005). The direct losses of this highly contagious disease included over $200 million (Brennan, 2005).

Another destructive disease is Avian Influenza. The numerous strains of Avian Influenza virus can cause varying degrees of clinical illness in poultry (USDA-APHIS, 2002). Avian Influenza viruses can be classified into low pathogenic (LPAI) and highly pathogenic (HPAI) forms based on the severity of the illness they cause (USDA-APHIS, 2002). Most AI virus strains are LPAI and typically cause little or no clinical signs in infected birds (USDA-APHIS, 2002). However, some LPAI virus strains are capable of mutating under field conditions into HPAI viruses, which cause more illness in infected birds (USDA-APHIS, 2002). Avian Influenza can strike poultry quickly causing high numbers of deaths without any warning signs (USDA-APHIS, 2002). Once established, the disease can spread rapidly from flock to flock (USDA-APHIS, 2002). The virus can have varied levels of infection, being more severe in turkeys than chickens, for example (U.S. Animal Health Association, 2008). Clinical signs of Avian Influenza include sudden death, lack of energy or appetite, decreased egg production, swelling of parts of the body, purple discoloration of the combs and legs, nasal discharge, diarrhea, coughing, and sneezing (USDA-APHIS, 2002).

A low pathogenic strain of H_7N_2 Avian Influenza, which has lower mortality than highly pathogenic strains, was found on the East Coast of the United States in March of 2002 (Brennan & Kopp, 2005). With biosecurity practices in place, the disease was eradicated in three months. However, the disease still caused the destruction of five million commercial birds and cost producers over $160 million (Brennan & Kopp, 2005). Both Avian Influenza and Exotic Newcastle Disease caused trading partners to impose bans on the United States poultry market, compounding the economic impact.

Concerns for human health have brought additional scrutiny to the poultry industry. In addition to causing the destruction of thousands of birds and affecting the public perspective of food safety, AI outbreaks have created a major human health risk through possible mutations of the virus (Capua & Marangon, 2006). The change in the virus is unpredictable and may occur quickly or after it has circulated for several months (Munster, Wallensten, Baas, Rimmelzwaan, Schutten, & Olsen, 2005).

Poultry diseases have always been an issue for the industry (Brennan & Kopp, 2005). Through the promotion and use of biosecurity practices, steps toward disease prevention have been made, although no program exists specifically for Indiana flock owners (Brennan & Kopp, 2005). Improvement in flock health and a decrease in disease outbreaks can happen through the teamwork of poultry producers (Brennan & Kopp, 2005).

Explanation of Programs in Poultry Biosecurity

National poultry organizations and the USDA have recognized the importance of the industry and maintaining healthy flocks and a safe food supply. Several publications have become available to interested parties in recent years to combat such destructive

diseases as Avian Influenza and Exotic Newcastle Disease (Brennan & Kopp, 2005). Throughout the United States, where animal and plant agriculture is vital to the economy, it has become increasingly critical to educate livestock and poultry owners on the consequences of foreign animal diseases. A variety of associations have taken on the responsibility to create educational programs on the ramifications of poor animal disease control practices (USDA-APHIS, 2006).

The USDA-Animal and Plant Health Inspection Service's Veterinary Service designed an educational guide on backyard biosecurity explaining good practices to keep birds healthy (USDA-APHIS, 2006). The United States works hard to prevent infectious poultry diseases from being introduced in the country through regular and reliable testing of imported birds as well as surveillance of U.S. poultry flocks (Brennan & Kopp, 2005). Since 2004, APHIS has been conducting an extensive education program called Biosecurity for the Birds (USDA-APHIS, 2006). The program reaches out to backyard poultry producers and bird owners to educate them about the need to practice biosecurity, the signs of infectious poultry diseases, and the importance of reporting sick or dead birds (USDA-APHIS, 2006). The material is offered in the form of written materials in English and Spanish as well as digital video.

The U.S. Poultry & Egg Association developed a resource compact disc on risk management of poultry disease (U.S. Poultry & Egg Association, 2005). The video overview is designed for management and farm personnel in the commercial industry. The material covers the links of a chain which if broken or weakened would reduce infection pressure and the risk of costly disease in flocks. Proper sanitation, traffic

control, pest control, and management issues are other topics reviewed for individuals involved in commercial poultry (U.S. Poultry & Egg Association, 2005).

The California Poultry Federation created a biosecurity newsletter featuring articles on the biosecurity and educational programs they offer and how to respond to disease (Penfold, 2007). The group works to build relations with the poultry owners particularly with a program in the San Joaquin Valley (Penfold, 2007). The federation also held a day-long program on Game Bird Health with a focus on biosecurity designed specifically for producers who raise upland game birds used in hunting preserves. The seminar focused on Avian Influenza, bacterial and parasitic illnesses and biosecurity programs, and the National Poultry Improvement Plan (NPIP). The over forty participants gained an understanding of disease prevention and the importance of the NPIP (Penfold, 2007). No evaluation was done before or after the program, but the California Federation found over half of the producers expressed further interest about the NPIP (Penfold, 2007). The California Federation hoped to expand the seminar to include other poultry producers if funding allows with more focus on biosecurity practices and examples of its success (Penfold, 2007).

The National Poultry Improvement Plan and Disease Prevention

The National Poultry Improvement Plan (NPIP) was initiated in 1935 to coordinate state programs aimed at the elimination of pullorum disease from commercial poultry (USDA-APHIS-Veterinary Services, 2007). Pullorum is a bacterial disease of poultry that is transmitted from a hen to her chicks via the egg (Rhorer, 2008). By testing adult birds and eliminating disease carriers from the breeding flock, commercial poultry producers have all but eliminated this costly disease (Rhorer, 2008).

The objective of the NPIP is to provide a cooperative industry-state-federal program through which new technology can be effectively applied for the improvement of poultry and poultry products throughout the country (Rhorer, 2008). The provisions of the NPIP have been developed jointly by industry members and state and federal officials (USDA-APHIS-Veterinary Services, 2007). These groups establish standards for the evaluation of poultry breeding stock and hatchery products with respect to freedom from egg-transmitted and hatchery-disseminated disease (USDA-APHIS-Veterinary Services, 2007). The program certifies that poultry and poultry products for interstate and international shipment are free from certain egg-transmitted and hatchery-disseminated diseases (USDA-APHIS-Veterinary Services, 2007). Any person producing or dealing in products may participate in the NPIP when he or she has demonstrated, to the satisfaction of the Official State Agency, that his or her facilities, personnel, and practices are adequate for carrying out the applicable provisions of the NPIP (USDA-APHIS-Veterinary Services, 2007).

The NPIP may have improved overall flock health nationally, but biosecurity and disease prevention should still be a high priority for poultry producers (Rhorer, 2008). In response to the need for biosecurity education, Dr. Carol J. Cardona of the University of California-Davis created a list of recommended practices for disease prevention. The information was utilized in the development of this study's presentation and curriculum for the Poultry Biosecurity and Disease Prevention Program:

I. ISOLATION

Confinement of animals within a controlled environment. A fence keeps your birds in, but it also keeps other animals out.

- Establish perimeter control. Installing perimeter fencing is a great way to isolate your birds. Perimeter fencing needs to completely surround the birds and include gates that are closed when not in use. If there are birds on properties immediately adjacent to your flock, maintain a buffer zone between the two populations and prevent them from mixing.
- Be careful when introducing new birds to your flock. New birds can carry disease into your flock even if they are not showing signs of disease. As a general rule, all birds should be tested for diseases that threaten birds before bringing the new birds onto your property. Establish a place to segregate new birds from the established flock for at least 21 days. Birds that develop any signs of disease during this quarantine period should not be introduced into your flock. Traffic flow should always be from your flock to the new birds.
- Avoid contact with other birds. Anyone working with your birds or visiting your flock should not have had contact with other birds for at least 24 hours before they visit. Activities that should be avoided include hunting, visiting live bird markets, swap meets with birds, or pet stores, and handling dead birds.
- Prepare a plan for self-quarantine. If your birds get sick, stop all visits immediately and get birds to a certified laboratory or to your veterinarian for a diagnosis. During the time that you are waiting for a diagnosis, keep movement to a minimum.

II. TRAFFIC CONTROL

Traffic control includes both the traffic onto your farm and the traffic patterns

within your farm.

- Set up a visitor policy. Visitors should be limited and should be scrutinized before you let them on your farm. Know where they have been and provide them with protective clothing. Keep track of who has been on your farm and put up signs to prevent people from wandering onto your facility.
- Separate clean and dirty functions. Clean functions include bird handling, egg pickup, and feed handling. Dirty functions include manure pickup, and dead bird handling. One should not go from dirty to clean functions without a shower and complete change of clothes. Employees and owners should wear specific clothes to work in clean areas, and these clothes should not leave those areas.
- Isolate dead bird pickup and manure hauling functions. Trucks that pick up dead birds and manure are doing the same thing at other farms, so they can easily spread disease agents. It is important to separate these activities completely from your birds. It is best if pickup can be in an area that is outside the perimeter of the farm or at least away from the flock.

III. SANITATION

Sanitation addresses the disinfection of materials, people, and equipment entering the farm and the cleanliness of the personnel on the farm.

- Disinfect vehicles that enter your property. All vehicles entering a farm must be cleaned and disinfected. High pressure sprayers that can effectively remove organic material are critical to effectively remove and inactivate disease agents. Vehicle wheel wells and undercarriage must be fully cleaned

and disinfected before entry to the farm and also upon exit. Usually it is easier to establish a place where vehicles can be parked outside of clean areas on the farm.

- Disinfect equipment as it arrives and leaves your property. Equipment coming onto or leaving the farm must be cleaned and disinfected. Equipment moving from dirty to clean functions must be thoroughly cleaned and disinfected.
- Clean and disinfect between flocks. A minimum of 21 days downtime is suggested between flocks. Complete removal of bedding, feed, complete cleaning and disinfection of the housing area and inspection is critical to preventing diseases.

IV. PREVENTION

Practicing these biosecurity procedures will decrease the risk of spreading disease:

- Isolate newly acquired birds and those returning from fairs for at least 3 weeks
- Maintain high sanitation on your farm
- Control the presence of rodents, insects, and wild birds
- Minimize contact with wildlife
- Limit the traffic on your farm
- Properly clean and disinfect any shared equipment
- After visits to farms, markets, exhibitions, etc. wash your hands and change clothes and footwear before handling your birds
- Wash hands and change or disinfect clothing and footwear after contact with

sick birds

- Provide adequate shelter and nutrition to your birds
- Maintain up-to-date vaccinations
- Report unusual signs of disease or high mortality to your veterinarian or regulatory authorities (Cardona, 2003, p 2-5).

The list of suggested biosecurity practices created by Dr. Carol Cardona was used in the presentation and material for this study. Beyond material that has already been developed, an educational program for Indiana backyard enthusiasts is needed. It is necessary to institute some aspect of a biosecurity program in order to maintain a healthy flock (Morishita, 2004.) With foreign animal diseases having no definite borders, it is critical for *everyone* with poultry to understand the importance of biosecurity.

Effectiveness of Informal Education and Use of Technology

Informal education can increase public understanding of science, mathematics, and technology (National Science Foundation, 2006). Projects within informal education have as their primary audience the informal learner (National Science Foundation, 2006). Informal learning is a lifelong process in which an individual acquires knowledge, skills, attitudes, and values from daily experiences and resources in his or her environment (National Science Foundation, 2006). Informal learning, in contrast with formal learning, occurs outside formal classroom settings and is not part of a school program, activity, or assignment (National Science Foundation, 2006). It is voluntary, self-directed, lifelong, and motivated mainly by inherent interests, curiosity, exploration, fantasy, task completion, and social interaction (National Science Foundation, 2006). The poultry 4-H

project utilizes informal education to increase understanding of proper care for animals and build life skills (National 4-H Organization, 2008).

The building of life skills through 4-H programs was evident in a study on healthy choices completed in May 2008 at Cornell University's Cooperative Extension Service (Winter, 2008). A course on healthy eating through the informal education approach was given to 360 4-H participants (Winter, 2008). Ninety-two percent of participants who completed the post-course survey felt fairly confident or extremely confident in their ability to help improve their community collaborations in support of healthy eating and active living, compared with twenty-five percent before taking the course (Winter, 2008). Follow-up survey results show that six months later, seventy-eight percent had applied what they learned in the course, and seventy percent had implemented at least some of their action plans (Winter, 2008).

Through informal education, individuals can practice creativity and be motivated for further activity and learning (National Science Foundation, 2006). The outcomes of an informal learning experience in science, mathematics, and technology include a better understanding of concepts, topics, processes, and thinking in scientific and technical disciplines, as well as increased knowledge about career opportunities in those fields (National Science Foundation, 2006). The experience can stimulate parents and other adults to become involved in the child's education (National Science Foundation, 2006). Cooperative Extension Service programs, in particular, can inform and influence the knowledge and decision of families, and are well poised to promote sustainability (Broussard & Bliss, 2007.) Workshops or seminars outside of school can be effective tools to instruct informal learners on topics not covered in the classroom which may

include poultry biosecurity (National Science Foundation, 2006). A higher level of learning and positive results can occur in such an environment (National Science Foundation, 2006).

Learners can also respond positively to interactive software and the technological environment (Diem & Katims, 1997). In the late 1990s, studies indicated that college students found PowerPoint-based lectures more interesting than traditional lectures (Lowry, 1997). Student scores on tests improved from 43.5% to 51.8% with PowerPoint lectures as opposed to traditional lectures (Lowry, 1997). Features of the lecture style that students found appealing were the use of a PC (43%), the visual aids (22%), presentation format (16%), lecture structure (16%), and clarity (12%) (Lowry, 1997). Other elements which increased interest in the lesson were the use of color, line-by-line or concept-by-concept presentation of information, flexibility for adding graphics, and organization of ideas (Lowry, 1997).

An alternative learning environment that incorporates technology may have broad range effects on attitudes about learning (Diem & Katims, 1997). In a study at Nottingham Trent University in England, participants expressed their appreciation of variation of fonts, the use of illustrations, a preference for light-colored background, the use of colors, and the line-by-line projection of lecture concepts (Szaba & Hastings, 2000). Seventy-two percent of the respondents reported that they wanted PowerPoint presentations to be adopted in all their classes. With a PowerPoint equipped with slides of information and pictures, students can be engaged as they see information on the screen rather than only hearing it (Diem & Katims, 1997). The video can add variety to improve learning and serve as a complete summary of what is stated in the presentation

(Brennan, 2005). Based upon this information, an educational program can be fun and interesting if the student enjoys the time of learning. For a poultry biosecurity education program, it can be beneficial to utilize an informal environment with video and PowerPoint technology.

CHAPTER 3 METHODOLOGY

Purpose of Study

The purpose of this study was to determine whether a poultry biosecurity curriculum influences knowledge and attitudes on the importance of poultry disease prevention and proper testing methods. It also was to collect selected demographic variables for poultry producers participating in the poultry biosecurity curriculum. The question being researched was: Does a poultry biosecurity curriculum influence associates of Indiana poultry production in knowledge and recognition of the significance of biosecurity?

This research project was intended to:

1. Determine Indiana poultry representatives' knowledge of the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
2. Determine Indiana poultry representatives' attitudes concerning the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
3. Determine demographic information of participants, including 4-H and FFA involvement, date of birth, residing county, previous biosecurity training experience, gender, years in the 4-H poultry project, and size of flock.

4. Determine if selected demographic variables influenced the knowledge and/or attitude of participants after an educational presentation concerning poultry biosecurity.

Pretest/Posttest Statistical Design Research

The design to be used for this research project was a nonequivalent statistical pretest/posttest descriptive design. This was selected as it was difficult to completely randomize the assigned subjects. The target audience consisted of those involved in poultry and did not represent the entire human population. The representatives were from several counties throughout Indiana and given the same treatment (same information and amount of time involved in the educational presentation). The group of subjects was given a pretest, participated in the poultry curriculum, and later given a posttest of the same questions. Knowledge and attitude change was assessed to determine the effectiveness of the program.

Participants

The number of participants in the study was 215 Indiana poultry representatives from various small flocks and the commercial industry. The group was eight to 68 years old. The 4-H groups were selected for convenience and recommended by professional educators.

An e-mail was sent on May 22, 2007 to Indiana county Extension Educators to promote the program. Prior to sending the e-mail, the researcher contacted Purdue University's Director of the Indiana Cooperative Extension Service, Dr. David Petritz, and the 4-H Youth Development Assistant Director and Program Leader for the Cooperative Extension Service, Dr. Renee McKee. Drs. Petritz and McKee endorsed the

program and sent an e-mail to encourage participation from the counties (Appendix A). The detailed letter explaining the program was included as an attachment (Appendix B). The researcher's contact information was included on the e-mail flyer that gave information about the program (Appendix C). The county Extension Educators and/or 4-H poultry leaders contacted the researcher concerning possible dates their 4-H poultry group could meet and participate in the educational seminar.

Over the next two months, a total of 21 Indiana county Extension Educators and poultry leaders replied. Another round of responses was received in fall 2007 when 4-H meetings started again. This came to a total of 28 groups willing to participate. Three groups joined other counties to hold a multi-county 4-H poultry meeting. Those who responded were then contacted on specific details about the program. Instructions were given for a suitable location with a room compatible with projection equipment and a sound system. The researcher continued to correspond with the county Educator or leader through e-mail and telephone until all plans were finalized. Upon final decision of logistics, e-mail verification was sent to communicate in writing the final times, location, length, and expectations of the researcher. A sample of this e-mail can be found in Appendix D.

Instrument

Utilizing a pretest and posttest procedure, the change in knowledge and attitude on the importance of biosecurity from before to after the program was assessed. The pretest and posttest were identical except the posttest did not include demographic information and the questions were in a different order. The test consisted of seven

demographic questions (only the pretest), fourteen knowledge-based questions, and three attitudinal questions (Appendix E & F).

The participants' identity was concealed by using their six-digit birth date for their unique identifier. These numbers were used on both tests in order to match and sort the tests. It was also used as a method to gather information on their age.

The first part of the pre and posttest involved an assessment of knowledge about poultry biosecurity. This portion consisted of fourteen questions on poultry biosecurity, disease, and its impact on bird health. The questions were a mixture of multiple choice, fill-in-the-blank, true and false, and circling numbers that indicated level of agreement. The measurement scale used for the Likert-type statements was 5=Strongly Agree, 4=Agree, 3=Undecided, 2=Disagree, 1=Strongly Disagree.

The second part of the pre and posttest had three questions to determine the attitude of participants toward poultry biosecurity. The attitudinal questions were answerable by circling numbers that indicated level of agreement. The measurement scale used for the Likert-type statements was 5=Strongly Agree, 4=Agree, 3=Undecided, 2=Disagree, 1=Strongly Disagree.

The final part of the pretest was the seven demographic questions. These included gender, affiliation with 4-H and FFA, years in the 4-H poultry project, involvement with poultry, county of residence, number of birds in their flock, and types of birds raised. The information was not asked on the posttest because the data would not change after the educational presentation.

Following brief introductions by the presenter, the pretests were administered before the start of the educational presentation to determine the participants' knowledge

level and attitude toward poultry biosecurity. Data was collected by distributing and administering a pretest to each 4-H poultry participant which took approximately fifteen minutes. The instructor presented the educational program to participants with a 30-minute discussion and 16-minute video. The discussion consisted of a PowerPoint presentation on basic disease information on Avian Influenza and Exotic Newcastle Disease, biosecurity practices, who to contact for diagnosis, and the importance of securing healthy birds. The video covered the definition of biosecurity, effects of Avian Influenza and Exotic Newcastle Disease, how disease spreads, and backyard biosecurity for small flock owners. The video expressed the underlying message that the flock owner is the best protection the birds have. The video's basic rules for biosecurity were:

1. Keep a distance from potential disease-carrying agents.
2. Keep the area with birds clean.
3. Do not haul disease home on vehicles.
4. Do not borrow disease from neighbors through use of their equipment.
5. Know the warning signs of infectious bird diseases.
6. Report sick birds to a local veterinarian, the diagnostic laboratory, and USDA's toll free number.

The posttest was distributed immediately following the conclusion of the program to each participant. The collection of data took approximately fifteen minutes. The demographic questions were categorical information while the scores were compared using quantitative methods to determine the change in knowledge and attitude. Reliability and validity of the scores were noted, and measures were checked through

calculation of Cronbach's alpha (Moore, McCabe, & Craig, 2007). The reliability score of the attitudinal instrument on the pilot test of the program was 0.71.

Validity

Validity refers to appropriateness, meaningfulness, and usefulness of the specific inferences made from test scores (Standards for Educational and Psychological Testing, 1985). Face validity is a judgment that the items appear to be relevant and appealing to the eye, and that spelling, punctuation, and sentence structure are correct. Content validity establishes the relationship empirically to imply that the test domain is appropriate for the proposed use of the test. Construct validity is an interpretation or meaning that assesses a trait or theory that cannot be measured directly, such as measuring unobservable traits like attitude. Construct validity determines if the test item accurately reflects the idea that the test claims to measure (McMillan & Schumacher, 2001).

To ensure the validity of the test instrument and educational presentation, a pilot test was completed by a group of 4-H poultry club members who were not included in the study's results. In addition, a panel of experts reviewed the pre and posttests as well as the presentation for face, content, and construct validity. The experts included:

- Dr. Todd Applegate, Purdue University, Department of Animal Sciences
- Dr. Marianne Ash, Director of Emergency Preparedness, Indiana Board of Animal Health (BOAH)
- Dr. Mark Balschweid, Purdue University, Department of Youth Development & Agricultural Education

- Dr. Tom Bryan, Purdue University, Animal Disease Diagnostic Laboratory (ADDL)
- Mr. Paul Brennan, Executive Vice President, Indiana State Poultry Association (ISPA)
- Dr. Mike Kopp, Director of Avian Health, Indiana Board of Animal Health (BOAH)
- Dr. Rob Porter, Wisconsin University, Veterinary Diagnostic Laboratory

Information for the presentation was compiled from various professional organizations promoting animal health including the United States Department of Agriculture (USDA), the Indiana State Poultry Association (ISPA), Purdue University, and the Indiana State Board for Animal Health (BOAH). The video was developed by the Veterinary Services (VS) of the Animal & Plant Health Inspection Service (APHIS) within the USDA. The pictures and descriptions of poultry diseases were developed by USDA-APHIS-VS, who encourage promotion of the biosecurity for flock owners. The biosecurity practices were also promoted by the American Livestock Alliance. The researcher constructed the PowerPoint using these resources and the panel of experts.

Reliability

Reliability refers to consistency of measurement or the similarity of results with different forms of the same test or time of data collection and is necessary for validity (McMillan & Schumacher, 2001). Each participant was given the same directions and instructions. The participants were told the tests were being used in a research study and they may not know all the answers. The participants were asked to fill in their date of birth to use as their unique identifier as a means to match the pretest and posttest. The

participants were also asked to answer all questions to the best of their ability. The participants understood they were not allowed to discuss the answers until after the posttests were turned in at the end of the seminar. With the number of questions, there was no set time limit. All subjects were offered enough time to finish the tests, and the same person administered the tests and program. Using SPSS ©, Chronbach's alpha (a measure of reliability) was calculated for the attitudinal questions that utilized the Likert scale. Chronbach's alpha ranges from 0.00 (indicating no reliability) to 1.0 (indicating total reliability) (Moore, McCabe, & Craig, 2007). The reliability score of the attitudinal instrument on the pilot test of the program was 0.71.

Different individuals provided presentations for the various counties. To minimize differences among the presentation from county to county, the researcher held a training program for the presenters. In this case, the presenters included the researcher as well as four individuals working as summer interns for the Indiana State Board of Animal Health. The interns served as excellent candidates to present the program as their background was animal health and disease prevention. The researcher shared information on the biosecurity program and presented the program to the interns for them to see how the information should be presented. The PowerPoint presentation allowed for the presenters to read from the screen rather than add their own information which would vary from person to person. The presenters followed the same slides as well as showed the same video. This training of the interns decreased the possibility for variability from program to program and helped improve inter-presenter reliability.

Threat to Validity and Reliability

The most serious threat to validity for this research project was participant selection. The sample matched the target population. The participants were chosen by those who responded to the e-mail. The groups potentially differed in characteristics that affect the dependent variable. The threat was controlled by including all who participated in the program also participated in the research. Those who attended were affiliated with 4-H, owned birds, and expressed interest in the area of poultry. The participants represented the desired population of all Indiana small flock owners.

Another threat to validity was the attitudes of the subjects while participating in the program. Low motivation, fatigue, anxiety, or a misunderstanding of reasons for taking the test could skew the results. The participants may have responded in a way consistent with the desires of the researcher. An attempt to minimize this threat was done by emphasizing the reason for the research was to evaluate the program and not the intelligence of the students (Crooks & Kane, 1996). Poultry leaders also assisted the instructor in keeping the participants on task and ensuring no interruptions in testing occurred. If students were found talking, the leaders reminded them that the purpose of the program was to evaluate what each individual learned and not what the group knew.

The same questions were used in the pretest as the posttest, which led to a possible maturation of the participants' understanding. This could be viewed as a threat to validity, but the questions were important concepts the researcher wanted to portray. The order of questions was mixed from the pretest to the posttest to minimize the threat of maturation, although the questions read the same.

Misunderstandings from the wording of the questions can cause measurement error in reliability. This was minimized through the improvement of questions following the pilot test. The pilot test verified if the test questions could easily be understood.

Procedure

Before forming a final evaluation of the curriculum, a pilot test was completed with a smaller number of poultry representatives. The group chosen was St. Joseph County in northern Indiana as they were the first to respond to the e-mail sent by the researcher. The seminar was presented at their local county Cooperative Extension Service office. Participants in the pilot study ranged from ages 13 to 51 years old. All seven participants were told it was the first time presenting the material to a group. The pilot test verified if the test questions could easily be understood. For example, a high majority missed Question #3 because it used a positive statement with a correct answer of "False." By changing it to a negative statement and the correct response being "True," more individuals could understand the meaning. These changes were needed to improve the validity of the test. The face, content, and construct validity were evaluated in the pilot test to increase the meaningfulness of the test results. The purpose of the test was to determine what the participants knew about biosecurity and not whether they could understand a trick question.

Another addition from the pilot test was including "Adult 4-H Leader" to the list of demographics. The leaders at the St. Joseph County were interested in taking the test, and the researcher felt a need to determine how many participants in the group were leaders.

The six questions using the five-point Likert scale to determine their views of biosecurity were added after the pilot test as well. It was mentioned by an adult participant to have variety in the types of questions asked on the test.

Finally, more room on the test was given to list the participants' breeds of birds. The participants wanted to write down all their breeds as each expressed a high level of pride for their birds. Based on suggestions made in the pilot test, the curriculum and instruments were revised and used for the final study.

The final study consisted of 28 counties participating in 25 presentations over an eight-month period. The total number of participants was 215. Most of the presentations were given at the local 4-H poultry meeting in the evening at the county Extension office. Others were given at the local fairgrounds. A projector and laptop were used to give the presentation with a projector screen unless the county provided the equipment. With the long span of eight months, the use of the same PowerPoint presentation and video presentation allowed for consistency of the programs.

After the introduction of the speaker, each participant was given the same directions and instructions. They were informed that they may not know all the answers and they were to answer the questions to the best of their ability. The pretests were then distributed. As a unique identifier, participants were asked to fill in their date of birth to later match the pretest and posttest for data analysis. It was understood that the subjects were not expected to initially know all the answers. The participants understood they were not allowed to discuss the answers until after the posttests were turned in at the end of the seminar. All subjects were offered enough time to finish the tests. For each

program, the same person administered the tests as the one who gave the presentation. A copy of the pretest can be found in Appendix E.

Following the completion of the pretests, the presenter collected the tests. The presenter then continued on to the PowerPoint presentation created by Paul Brennan and Kyle Kohlhagen both of the Indiana State Poultry Association, Dr. Michael Kopp of the Indiana Board of Animal Health, and the USDA's Backyard Biosecurity for the Birds campaign. The presentation had six objectives. By the end of the discussion, participants were expected to be able to:

1. Define biosecurity
2. Recognize vulnerabilities of poultry
3. Identify diseases and their causes
4. Utilize practical techniques in preventing the spread of disease
5. Recall the proper actions to take if birds become sick
6. Understand how biosecurity is everyone's responsibility

A few of the key points included:

1. When clinical signs of disease are noticed in the flock, it is important to contact a local veterinarian.
2. Poultry diseases have such similar symptoms, that many can only be diagnosed in the laboratory.
3. Disease has the potential of being devastating to all poultry.

Other areas of discussion included a list of simple biosecurity practices to follow on the premise, who to contact with sick birds, symptoms of Avian Influenza and Exotic Newcastle Disease, the importance of diagnosing birds in the early stages of showing

signs of illness, and how to prevent such diseases from entering the flock. A copy of the presentation can be found in Appendix G.

Following the PowerPoint presentation was a 16-minute video to tie all the information together. It gave an overview of biosecurity and how small flock owners can practice biosecurity on their home farm. The video entitled "Backyard Biosecurity: It's Everyone's Responsibility" was created by the United State Department of Agriculture's Animal and Plant Health Inspection Service. It discussed how bird owners are to look for signs of disease, report sick birds, and protect their birds from such diseases. It emphasized how everyone needs to work together to help prevent the spread of infection in birds. A few snapshots of the video can be found in Appendix H.

Lastly, the posttest was administered with the same participants. The posttest took roughly five to ten minutes since the questions matched the pretest. A copy of the posttest can be found in Appendix F.

Data Analysis

Responses to the pre and posttest questions were hand-scored and compiled in a Microsoft Excel spreadsheet. The data was statistically analyzed using Statistical Package for the Social Sciences (Statistical Package for the Social Sciences © Version 12.0 for Windows, 2003). After organization and summarization, data were analyzed using descriptive statistics for frequencies, means, and standard deviations.

The effectiveness of the curriculum was determined by the change in knowledge and attitude. A t-test compared the means of the pretest and posttest to find the difference in the mean scores. The responses for the participants were averaged to calculate any changes in knowledge and attitude.

CHAPTER 4 RESULTS

This research project intended to obtain the following information:

1. Determine Indiana poultry representatives' knowledge of the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
2. Determine Indiana poultry representatives' attitudes concerning the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
3. Determine demographic information of participants, including years in 4-H, gender, county, and size of flock.
4. Determine if selected demographic variables influenced the knowledge and/or attitude of participants after an educational presentation concerning poultry biosecurity.

Results

The focus of this study was to determine if a poultry biosecurity education program would influence the knowledge and attitude on the importance of biosecurity and proper testing for disease prior to and after participating in an educational curriculum. Including both youth and adults, participants were asked to complete a written test before and after the program to examine its effectiveness.

The first part of this chapter evaluates the demographic information of participants in the poultry biosecurity program. Section two covers the overall findings of the study and a breakdown of student results. The third portion discusses the results of the knowledge section of the pretest and posttests, including aggregate scores on participants' tests and significant trends. Finally, the last part compares the answers of the attitudinal section of the pretest and posttests, including aggregate scores on the participants' tests and significant trends.

A total of 430 participant tests (215 pretests and 215 posttests) were analyzed in this research study. Four pretests were not included in this study as the participant did not submit a posttest. Since the participants did not fully complete the program (take pretest, listen to the program, and take the posttest), these four pretests were discarded.

Demographic Results of the Study

Of the 215 participants, just over half of the participants were female and nearly half were adolescents. Two-thirds were involved with the 4-H poultry project, 10% were adult 4-H leaders, and one-fourth were parents of 4-H members. Only 7% were involved with FFA and 20% indicated they were poultry producers. Those who were none of the above checked the "other" category. These participants indicated they were a veterinarian, just visiting to consider taking the 4-H poultry project, or an Extension Educator. When asked if they had any previous experience in biosecurity training, nearly 90% of the 215 participants reported they had none. Other places of training included other similar workshops put on by the Indiana State Poultry Association, Purdue University, National FFA Organization, and organizations involving other species. Table

4.1 gives specific demographic information for the participants involved in the study along with the frequency and percentage.

Table 4.1 Demographic Information of Respondents (n = 215)

Demographics	Frequency	Percentage
4-H poultry member		
Yes	109	50.70
No	106	49.30
FFA member		
Yes	15	6.98
No	200	93.02
Adult 4-H leader		
Yes	23	10.70
No	192	89.30
4-H parent		
Yes	58	26.98
No	157	73.02
Poultry producer		
Yes	45	20.93
No	170	79.07
Previous biosecurity training		
Yes	24	11.16
No	191	88.84
Gender		
Female	115	53.49
Male	100	46.51

(Table continues)

(Table 4.1 continued)

Age		
0 - 10 years	32	14.88
11 - 20 years	91	42.33
21 - 30 years	9	4.19
31 - 40 years	20	9.30
41 - 50 years	39	18.14
51 and over	24	11.16

Of those involved in the 4-H poultry project, the average number of years enrolled in the project was four years. The maximum number of years for a 4-H project was 10 years. For the number of birds in the participants' flocks, the average number was 37 birds. Number of birds ranged from 350 to none. When asked the type of birds they own, the flock owners listed a variety of species of birds. The list of birds is shown in Table 4.2.

Table 4.2 List of Responses to Types of Birds in Participants' Flocks

Americana	Dutch	Racing homer
Andilusions	Gigrs	Red pyle
Archangel	Golden comet	Red star
Aurucana	Golden creole	Rhode Island red
Bairdrock	Golden sebright	S.L. Wyandotte
Baldhead	Indian runner	Salmon favorelles
Bantams	Japanese bantam	Sawmuchs
Barred rock	Jersey giants	Sebrites
Black australope	Lahore	Silkie
Black frizzles	Leghorn	Silver speckled hamin
Black rosecomb	Mammoth bronze	Spangled hamburg
Blackstare	Millie Fleur	Sumatra
Brahma	Mottled houtans	Sussex yellow

(Table continues)

(Table 4.2 continued)

Brown red	New hampshires	Sweedish blue
Buff orpington	Old English	Transylvia naked neck
Cherry reds	Old German	Wheaton avail bantams
Chukars	Ostrolorb	White crested
Cochin	Patridge rock	White japs
Cocku maroon	Phoenix	White pekin
Cornish	Plymouth	White rock
Dominique	Polish	

The participants in the biosecurity program came from 28 various counties throughout Indiana. The three counties with the most participants were Delaware, Warren, Adams, and Tippecanoe County. Table 4.3 lists the frequency of participants from each county.

Table 4.3 Number of Respondents Listed by County

County	Frequency	County	Frequency
Adams	19	Madison	*
Benton	4	Marshall	12
Blackford	12	Noble	9
Clark	3	Pulaski	8
Decatur	4	Randolph	4
Delaware	28	Scott	*
Dubois	6	Shelby	*
Fountain	*	Starke	4
Gibson	*	Steuben	8
Harrison	6	Tippecanoe	17
Hendricks	17	Vermillion	5
Henry	8	Warren	21
Jasper	*	Warrick	3
Johnson	*	Wayne	6

* = < 3 subjects. Data not presented to maintain confidentiality of study participants.

Overall Findings of the Study

A statistically significant difference was found in both knowledge and attitude scores from the pretest to the posttest ($p < 0.05$). The posttest scores for knowledge were higher than the pretest scores and posttest scores for attitude were not the same as pretest scores. Therefore, the poultry biosecurity education program improved participants' knowledge on biosecurity and disease prevention methods and changed participants' attitudes about poultry biosecurity and its importance. Table 4.4 justifies this claim.

Table 4.4 Overall Participants' Test Scores: Pre vs. Posttests for Poultry Biosecurity Education Program (n = 215)

	Average pretest score	Average posttest score	Difference of mean	Standard Deviation	p-value
Knowledge †	63.30	84.95	21.65	0.49	0.000*
Attitude	1.79	1.48	0.31	0.60	0.000*

† Knowledge – Used a scale from 0-100%

Attitude – Used a 5-point Likert scale: 1 = Strongly Agree
2 = Agree
3 = Undecided
4 = Disagree
5 = Strongly Disagree

* Statistically significant at the $p < 0.05$ level

Knowledge Test Results

Overall student knowledge scores on the 12 item pretest came to an average of 63.30 percent compared with 84.95 percent for the posttest. On the pretest, students scored highest on items 4, 6, 7 and 9. Test item #4 pertained to the next step after suspecting Exotic Newcastle Disease in birds. Test item #6 determined who contributes to the success of a disease prevention program. Question #7 asked if wildlife and pests can pass disease to poultry. Item #9 pertained to a list of choices on the priority for poultry. Participants scored the lowest on items 2, 11, and 12c. These questions asked what disease cost $170 million in the California outbreak of 2002-03. They also asked the participants to list individuals to contact if a disease problem is found in their flock. A majority missed this question since they were left blank and unknown. The third lowest scoring question asked whether visitors should be allowed without wearing clean, protective clothing and footwear.

On the posttest, participants scored highest on items 1, 9, and 12e. These questions dealt with the definition of biosecurity, priorities of poultry, and whether it is necessary to isolate birds for at least three weeks. The lowest scores were found on items 11, 12c, and 12d. Participants scored low when asked to list who to contact if a disease problem is found in their flock and whether visitors should be allowed without proper clothing and footwear, although they both had one of the largest increases in score from the pretest. Another low-scoring question involved whether it is easy to tell sick birds from healthy ones. Table 4.5 demonstrates these findings.

Table 4.5 Percentages of Correct Responses and p-values on Knowledge Items on the Pretest and Posttest for Poultry Biosecurity Education Program (n = 215)

	% of students that responded correctly †		Paired comparisons of pretests and posttests			
Item	Pretest	Posttest	Mean % Change	Standard Deviation	T	p-value
1. What is biosecurity?	51.63	93.02	41.39	0.50	12.07	0.000*
2. What disease cost California poultry producers losses exceeding $170 million in 2002-03 outbreak?	37.85	88.79	50.94	0.56	13.24	0.000*
3. Vaccinations are a good practice for your health program, but cannot guarantee your birds will be free from disease infections.	82.79	89.77	6.98	0.31	3.35	0.001*
4. What should Hoosier poultry owners do if they suspect Exotic Newcastle Disease (END) in their flock?	83.72	87.91	4.19	0.41	1.48	0.139
5. Which of the following is a warning sign of Highly Pathogenic Avian Influenza (HPAI)?	65.58	83.26	17.68	0.54	4.84	0.000*
6. Which element contributes to the success of a disease control program?	83.26	86.05	2.79	0.43	0.95	0.344
7. Wildlife and pests cannot pass disease to your birds.	86.51	89.77	3.26	0.48	1.00	0.318
8. Poultry disease can be so virulent that many birds die without showing any clinical signs.	82.79	88.84	6.05	0.46	1.91	0.058

(Table continues)

(Table 4.5 continued)

9. What is your number one priority for your birds?	88.84	95.35	6.51	0.31	3.04	0.003*
10. List 3 biosecurity practices you can do on your farm to prevent disease.	57.21	89.30	32.09	0.47	10.06	0.000*
11. Which professionals do you contact when you have a disease problem in your flock?	22.33	73.02	50.69	0.50	14.83	0.000*
12c. Visitors to your flock should not be allowed without wearing clean, protective clothing and footwear.	37.50	78.65	41.15	0.49	12.86	0.000*
12d. It is easy to tell sick birds from healthy ones.	42.61	52.88	10.27	0.38	5.27	0.009*
12e. It is necessary to isolate returning birds to your farm from an exhibition show for at least 3 weeks.	63.58	92.75	29.17	0.45	9.95	0.000*

† Knowledge – Used a scale from 0-100%

* Statistically significant at the $p < 0.05$ level

Five items recorded at least a 30% increase in knowledge after participating in the Indiana Poultry Biosecurity Education Program. These questions included items 1, 2, 10, 11, and 12c. These questions involved the definition of biosecurity, listing biosecurity practices for disease prevention, and listing professionals to contact when the flock is sick. It also included the question on which disease cost California poultry producers losses exceeding $170 million in 2002-03 outbreak and whether visitors should be

allowed without wearing clean, protective clothing and footwear. The question with the highest score on both the pretest and posttest involved the number one priority for the poultry owners' birds.

Three questions had a 4% or lower increase in knowledge following the biosecurity education program, including items 4, 6, and 7. These items pertained to what poultry owners should do when Exotic Newcastle Disease is suspected in their flock. Other questions dealt with what contributes to the success of a disease control program and whether wildlife and pests can pass disease to poultry. The lowest scoring question on the pretest asked the participants to list the professionals to contact when they have sick birds. The lowest scoring question on the posttest asked whether it was easy to tell sick birds from healthy ones.

For the pretest, the top five scoring items were either multiple choice or true/false questions. The top five scoring items for the posttest were also multiple choice or true/false questions as well as one 5-point Likert scale question. The lowest scoring items for both the pretest and posttest were either fill-in questions or Likert scale questions with the exception of one multiple choice question on the pretest.

Three of the five highest changes in the mean score from the pretest to the posttest were the three fill-in questions. The other two were multiple choice and Likert scale questions. The items with the lowest changes in the mean score were either true/false or multiple choice questions.

Attitude Test Results

Overall participant attitude scores (Questions 12a, 12b, and 12c) on the pretest came to an average of 1.79 compared with 1.48 for the posttest (Table 4.4). These items

asked participants to rank their agreement level for each statement according to a Likert scale (1 = strongly agree to 5 = strongly agree.) On the pretest, students agreed the most on item 12a, which involved poultry biosecurity as being important in controlling and preventing disease. Students agreed the least with question 12b. This question pertained to whether disease outbreaks are minor issues.

On the posttest, participants agreed the most on items 12a and 12f, which dealt with the importance of poultry biosecurity and whether rodents, wild birds, and insects are considered a threat to poultry. Those who took the test agreed the least on item 12b, which covered whether disease outbreaks were considered minor issues. Table 4.6 compares the pretest and posttest scores and their standard deviation with p-value.

Table 4.6 Paired Comparisons on the Attitude Items on the Pretest and Posttest for Poultry Biosecurity Education Program (n = 215)

	Mean score		Paired comparisons of pretests & posttests			
Item †	Pretest	Posttest	Mean % Change	Standard Deviation	T	p-value
12a. Poultry biosecurity is important in controlling and spreading of diseases.	1.60	1.26	0.34	0.79	-6.29	0.000*
12b. Disease outbreaks in the United States are minor issues.	4.03	4.19	0.16	1.19	2.06	0.041*
12f. Rodents, wild birds, and insects are a threat to my birds.	1.81	1.37	0.44	1.00	-6.53	0.000*

(Table continues)

(Table 4.6 continued)

† Used a 5-point Likert scale: 1 = Strongly Agree
2 = Agree
3 = Undecided
4 = Disagree
5 = Strongly Disagree

* Statistically significant at the $p < 0.05$ level

On average, the participants agreed or strongly agreed with the first and last attitude items on both the pretest and posttest. The students also disagreed or strongly disagreed with Question 12b on both the pretest and posttest. The study showed that Questions 12a and 12f both expressed a level of strongly agree for the posttest.

One item showed a decrease in agreement after taking part in the poultry biosecurity training with a p-value of 0.041. This question stated that disease outbreaks are minor issues. The other two items indicated a more significant change in attitude following the poultry education program. These questions dealt with the level of importance in controlling and spreading of disease and whether rodents, wild birds, and insects are a threat to birds.

Paired Comparisons of Demographic Variables

As samples were compared by gender, it was determined that males scored 2.97% higher on the knowledge portion of the pretest than females. On the knowledge portion of the posttest, males scored 0.64% higher than females. The average score of the females increased slightly more (2.33% more) than the average score of the males from pretest to posttest. No statistically significant difference was found among the scores of

the knowledge portion of the pretests and posttests between females and males. Table 4.7 illustrates these comparisons.

Table 4.7 Mean Comparison of the Knowledge Items for Female Scores (n=115) and Male Scores (n=100)

	Female	Male	Difference in Female to Male	Paired comparisons of Female & Male p-value
Pretest Mean Score †	62.24	65.21	-2.97	0.272
Posttest Mean Score †	84.29	84.93	-0.64	0.733
Change from Pre to Post	22.05	19.72	2.33	0.337

† Knowledge – Used a scale from 0-100%

On the attitude portion of the test, the females had a 0.10 difference on their average score compared to males on the pretest. The males agreed 0.09 more on the posttest compared to females. In this evaluation study, no statistically significant difference occurred between males and females. Table 4.8 demonstrates the comparison of gender for the attitude questions.

Table 4.8 Mean Comparison of the Attitude Items for Female Scores (n=115) and Male Scores (n=100)

	Female	Male	Difference in Female to Male	Paired comparisons of Female & Male p-value
Pretest Mean Score †	1.84	1.74	0.10	0.316
Posttest Mean Score †	1.52	1.43	0.09	0.238
Change from Pre to Post	0.32	0.31	0.01	0.979

(Table continues)

(Table 4.8 continued)

† Used a 5-point Likert scale: 1 = Strongly Agree
2 = Agree
3 = Undecided
4 = Disagree
5 = Strongly Disagree

When comparing 4-H members to those not participating in 4-H, the non- 4-H members scored an average of 9.55% higher on the knowledge portion of the pretest. The non- 4-H members also scored 8.34% higher on the posttest. Both the 4-H members and non-members had a statistically significant increase in score from the pretest to the posttest. It was determined that 81.30% of youth (20 years and younger) considered themselves 4-H members, and 100.00% of adults considered themselves non- 4-H members. Of all non- 4-H members, 80.00% were adults (21 years and older.) A statistically significant difference occurred for both the pretest and posttest when comparing the average scores of the 4-H to the non- 4-H groups. Table 4.9 demonstrates these outcomes.

Table 4.9 Mean Comparison of the Knowledge Items for 4-H Member Scores (n=109) and Non- 4-H Member Scores (n=106)

	4-H	Non 4-H	Difference in 4-H to Non 4-H	Paired comparisons of 4-H & Non- 4-H p-value
Pretest Mean Score †	58.91	68.46	-9.55	0.000*
Posttest Mean Score †	80.47	88.81	-8.34	0.000*
Change from Pre to Post	21.56	20.35	1.21	0.619

(Table continues)

(Table 4.9 continued)

† Knowledge – Used a scale from 0-100%

* Statistically significant at the $p < 0.05$ level

On average, the comparison of 4-H members and non- 4-H members for the attitude portion of the pretest had no statistically significant difference on the pretest. The posttest scores changed 0.18 units when comparing 4-H members and non- 4-H members and had no statistically significant difference. Both the 4-H members and the non- 4-H members however showed a statistically significant change in scores from the pretest to the posttest. Table 4.10 below shows these results.

Table 4.10 Mean Comparison of the Attitude Items for 4-H Member Scores (n=109) and Non- 4-H Member Scores (n=106)

	4-H	Non 4-H	Difference in 4-H to Non 4-H	Paired comparisons of 4-H & Non- 4-H p-value
Pretest Mean Score †	1.87	1.72	0.15	0.125
Posttest Mean Score †	1.57	1.39	0.18	0.026*
Change from Pre to Post	0.30	0.33	-0.03	0.714

† Used a 5-point Likert scale: 1 = Strongly Agree
2 = Agree
3 = Undecided
4 = Disagree
5 = Strongly Disagree

* Statistically significant at the $p < 0.05$ level

CHAPTER 5 CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to develop and evaluate a poultry biosecurity curriculum and determine if it influenced knowledge and attitudes on the importance of poultry disease prevention and proper testing methods. A secondary purpose was to collect selected demographic variables for poultry producers participating in the poultry biosecurity curriculum. Specific objectives of the research study included:

1. Determine Indiana poultry representatives' knowledge of the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
2. Determine Indiana poultry representatives' attitudes concerning the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.
3. Determine demographic information of participants, including 4-H and FFA involvement, date of birth, residing county, previous biosecurity training experience, gender, years in the 4-H poultry project, and size of flock.
4. Determine if selected demographic variables influenced the knowledge and/or attitude of participants after an educational presentation concerning poultry biosecurity.

The increase in the mean knowledge posttest scores was statistically significant when compared to the mean pretest scores. The mean attitude posttest scores changed from the pretest scores.

Overall Conclusions, Implications, and Recommendations

Conclusions of this study are similar to findings of research conducted on other short-term education programs (Young, Mancuso, Faherty, Dorman, & Umbrell, 2008; Shirley, 2006; Broussard & Bliss, 2007; Lilja, Wilhelmsen, Larsson, & Hamilton, 2003; Winter, 2008). Short-term education programs can increase knowledge and influence attitudes. The program developed for this study potentially provides future poultry leaders a good start for a biosecurity curriculum to improve awareness of disease prevention practices. Increased knowledge and a change in attitudes overall regarding poultry biosecurity was observed. A program to improve knowledge of biosecurity needs to exist for flock owners to work together in preventing the spread of disease (Morishita, 2004).

This educational poultry biosecurity program was important based on the percentages of 4-H members, poultry producers, and those with previous biosecurity training. The seminar was presented to a group of people who did not have significant 4-H experience or prior training. Half of the participants were not 4-H members, 20% considered themselves poultry producers, and nearly 90% had no previous biosecurity training. The gain in knowledge and change in attitudes were considered statistically significant for the training program presented in this study. With only 10% of the students having any type of previous biosecurity training, the participants overall were not predisposed to scoring high on both the knowledge and attitude portion of the test.

The pretest showed a low score (63%) on average for the knowledge portion and indicated a lower level of knowledge of biosecurity prior to the training. The program was effective in increasing knowledge and changing students' attitudes overall. Therefore, people with and without a previous understanding of poultry biosecurity can become aware of the importance of biosecurity and practices when exposed to an effective poultry biosecurity education program. Participants can form positive attitudes toward the need for biosecurity, and therefore can positively change behavior on the farm (Penfold, 2007).

Objective #1: Determine Indiana poultry representatives' knowledge of the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.

Knowledge test scores improved from the pretest, given prior to the poultry biosecurity education program, to the posttest, given after the program, and indicated a statistically significant change. This illustrates a more informed group of participants than before the program was administered. From the pretest to the posttest, student knowledge increased the most on "defining biosecurity," "identifying the disease outbreak in 2002-03," "listing three biosecurity practices," "listing three professionals to contact with sick birds," and "whether visitors should be allowed to enter without wearing clean, protective clothing and footwear." Three out of these five questions utilized a fill-in-the-blank format as opposed to a multiple choice or true/false format. The results may indicate that these questions were difficult to answer on the pretest without any choices. During the program, the participants listened closely for those answers and could more easily complete the fill-in-the-blank questions. It can be

assumed that students were more likely to guess on questions with choices (either multiple choice or true/false) compared to fill-in-the-blank.

Four of the five questions with the highest increase in knowledge were also among the lowest scoring questions on the pretest. With the pretest score so low, it allowed for the answers to these questions to have a greater increase in change from pretest to posttest score. The multiple choice question on "identifying the disease outbreak in 2002-03" was missed often before the poultry biosecurity education program, but participants answered correctly after the program. The five-point Likert scale question about "visitors without proper, protective clothing" was also often missed on the pretest. According to the data, participants felt no concern toward people visiting their flock without a change of clothing prior to the program. This question had an overall increase in score of 41%.

On the pretest, participants could more easily grasp the concept of "vaccinations not guaranteeing birds to be free from infection," "what to do if suspecting Exotic Newcastle Disease," "what contributes to controlling disease," "wildlife and pests potentially passing disease to the birds," "poultry diseases sometimes being so virulent and not showing clinical signs," and "priorities of birds." The high scores on the pretest (82.79% or higher) allowed little chance for a large increase in scores on the posttest. This ceiling effect lowered the possibility for a significant difference in the scores. However, two of these six questions still had a significant increase in knowledge. The items dealing with "vaccinations not guaranteeing birds to be free from infection," and "priorities of birds," both had a significant increase in overall mean score. The question on "poultry diseases sometimes being so virulent and not showing clinical signs" had a p-

value of 0.058, when comparing the pretest to the posttest. Although not statistically significant at the <0.05 level, it appears there was a significant change worth noting. The other three questions also did not reach the threshold of statistically significant change and included "what to do if suspecting Exotic Newcastle Disease," "what contributes to controlling disease," and "wildlife and pests potentially passing disease to the birds." This may indicate the participants did not feel the relevance in learning the material or simply did not hear or understand it when the instructor discussed the topic. It is recommended that the instructor, in future presentations, emphasize these topics more.

On the posttest, students had difficulty in correctly answering three questions. These three questions were among the four lowest scoring pretest questions. These three questions, however, did have a statistically significant increase in knowledge from the pretest to the posttest. The question answered incorrectly most often on the posttest was the five-point Likert scale item stating "whether it was easy to tell sick birds from healthy ones." During the poultry biosecurity education program presentation, the video segment distinctly states that it is often difficult to distinguish sick birds from healthy ones. This implies that the question was not clear. Students may have only dealt with birds that show obvious signs and were not exposed to diseases where symptoms are only evident shortly before the bird dies. The other two low-scoring questions were "listing professionals to contact when a disease problem exists" and "whether visitors should be allowed near the flock without clean, protective clothing and footwear." It is concluded that participants, even after the program, still had difficulty naming the three professionals to call in the case of a disease problem. It is recommended that more time in the poultry biosecurity education program be devoted to this topic. Also, the item on

"visitors wearing proper clothing" was a five-point Likert scale where a majority disagreed on the pretest. After the program, however, more than three out of four students agreed that visitors to the flock should not be allowed without wearing clean, protective clothing and footwear. The posttest responses were still low compared to other questions, but participants did have a significant increase in knowledge. It is recommended to further discuss these three questions in future poultry biosecurity programs. It may be helpful to tie these concepts to public health or other contexts that participants can associate with to create better understanding.

Overall, the results of the knowledge gain for participants of the poultry biosecurity education program from pretest to posttest were statistically significant. This implies the program met its objective for influencing participants' knowledge of sound poultry biosecurity practices. It is recommended that this program continue throughout Indiana with thorough explanation of biosecurity to promote small flock health. The knowledge questions should be more clear, including "whether it was easy to tell sick birds from healthy ones." Also, for future presentations, the topics with questions that had a low average score on the posttest should be covered more in-depth, including the list of professionals to contact if a bird is sick and how visitors should not be allowed without clean, protective clothing and footwear. The presenter could associate public health with the importance of flock health for an improved appreciation for biosecurity. This program should be used with these modifications in other states to educate flock owners and lower the possibility of the spread of potentially devastating diseases.

Objective #2: Determine Indiana poultry representatives' attitudes concerning the importance of biosecurity and proper testing for diseases prior to and after participating in an educational curriculum.

The testing instrument used in this poultry biosecurity education program included three attitudinal statements. The researcher understands this to be insufficient for drawing conclusions.

After exposure to the poultry biosecurity education program, participants' attitudes improved from the pretest score to the posttest score overall. The statement that "poultry biosecurity is important in controlling and spreading disease" had a significant increase in agreement following the program. The statement that "rodents, wild birds, and insects are a threat to poultry" also had a statistically significant increase. Although the statement that "disease outbreaks are minor issues" had a statistically significant change in attitude score, the average score from pretest to posttest did not change as much as the other two attitude questions. This could be influenced by the participant's interpretation of the word "minor." It may have been difficult for the participant to decide the severity of the word "minor" or "major." The other questions have a more definitive answer.

The difference in the results for the attitude questions may also imply that participants did not feel disease outbreaks to be relevant to everyday living and placed a low priority on learning the material. A high majority of participants did not consider themselves poultry producers. Therefore, they may not have felt to be at risk for disease outbreaks. This also implies that the poultry biosecurity education program did not cover the topic of disease outbreaks as major issues. For future programs, it is recommended to

discuss the concerns of disease outbreaks and their ramifications in detail. How fast disease can spread and how deadly it can be should be discussed. It may help to cite more specific examples of the devastating financial losses and the potential destruction of both large and small flocks from such disease problems.

It is recommended in future evaluations that the testing instrument use more questions to determine attitude change. More questions will help determine a change in attitude. For further studies, the program should also investigate a change in behavior for each participant. The participant should be evaluated for proper use of biosecurity practices used with his or her flock, and then six months later be evaluated for a change in behavior. The evaluation should include such concepts as proper cleaning and disinfecting, changing of clothes, utilizing a barrier to separate the clean area with birds from other areas, and using footbaths.

Objective #3: Determine demographic information of participants, including 4-H and FFA involvement, date of birth, residing county, previous biosecurity training experience, gender, years in the 4-H poultry project, and size of flock.

The findings of this research study indicated a group consisting of 53% female and 47% male. This aligns similarly to the overall gender breakdown of the National 4-H Youth Program with 52% of the members female and 48% male (National 4-H Organization, 2008). Although only half of the participants considered themselves 4-H members, it is assumed that the method used to recruit participation in this program was successful in sampling 4-H overall. An unintended audience for this program was adults. Although it was structured to reach young people, adults also need training in poultry biosecurity. Over 10% of the subjects considered themselves 4-H leaders and over a

quarter of the participants were 4-H parents. The researcher found a higher rate of participation from adults in the program than anticipated. It may imply that adults are interested in their child's education and have a desire to participate. Future programs should be adapted to adult audiences and include higher level material. A poultry biosecurity curriculum could be specifically developed for adult audiences.

Even with adult experience and only 11% of the subjects previously exposed to biosecurity training, the program was still successful in improving knowledge and attitudes in the area of poultry biosecurity. It was surprising to the researcher that only 20% of the participants considered themselves poultry producers since the 4-H meeting was for those who exhibit poultry. Participants filling out the pretest may have thought in order to be considered a poultry producer, one must own a large number of birds and/or breed their own birds. For future studies, it is recommended that demographic questions be reworded for clarification on what is meant by a poultry producer and to list other categories such as breeder, commercial, or exhibitor.

To help spread the word about poultry biosecurity beyond 4-H, it is recommended that similar programs be offered to other poultry groups at venues such as poultry shows, fairs, or other gatherings. Poultry biosecurity education programs should also not be limited to those individuals who raise poultry. Other livestock owners or even those without animals can benefit from listening to a poultry biosecurity education program. The curriculum can be modified to fit the groups' areas of interest. Instructors can further discuss the benefits to a safe and secure food supply. All individuals should be aware how everyone must work together for the improvement of overall animal health. It is more than just the producer who is responsible for preventing the spread of disease.

Objective #4: Determine if selected demographic variables influenced the knowledge and/or attitude of participants after an educational presentation concerning poultry biosecurity.

Although males scored slightly higher on the pretest (2.97%) and posttest (0.64%) than females on average, the females had a slightly higher increase in overall knowledge than the males (2.34% difference). These slight differences may have been influenced by the ceiling effect of scores being too high on the pretest to have much change to the posttest. When females were compared to males, no statistically significant difference existed between their scores on the pretest or the posttest on average. Their change in knowledge from pretest to posttest also indicated no difference when comparing the average scores for female and male. The males agreed slightly more than females in the attitude portion of the test. However, both females and males had a similar improvement in their attitude score (over 0.31). The attitude score was based on a 5-point Likert-scale with 1 being strongly agree and 5 being strongly disagree. No statistically significant difference was found on attitude scores between female and male. This implies that the testing instrument was not predisposed toward any particular gender and can be used for a broad range of audiences.

On average, those participants not involved in 4-H scored statistically significantly higher on both the pretest (9.55%) and posttest (8.34%) knowledge scores than the 4-H members. The attitudes for both tests were also better for non- 4-H members compared to the 4-H members. However, it was only considered a statistically significant difference on the posttest attitude average scores. When comparing 4-H members and non- 4-H members, the difference in scores on the pretest did not reach the

threshold (of <0.05) determined by the researcher. These findings can possibly be attributed to a significant number of the non- 4-H group, made up of adults, and performing better than the 4-H members, who were mostly youth. It was determined that 81.30% of youth (20 years and younger) considered themselves 4-H members, and 100.00% of adults considered themselves non- 4-H members. Of all non- 4-H members, 80.00% were adults (21 years and older.) This may reflect that the adults' experience and knowledge base was higher than the youth. The increase in knowledge and attitude scores from the pretest to the posttest had similar improvements for both the non- 4-H members and 4-H members (over 20.00% for knowledge and 0.30 for attitude). The attitude score was based on a 5-point Likert-scale with 1 being strongly agree and 5 being strongly disagree. The increase in scores for the non- 4-H members and 4-H members implies that the poultry biosecurity education program was successful in teaching a diverse group of individuals. It is recommended to expand the program to others outside of 4-H and agriculture, and to make modifications to the programming to increase relevance. The program could discuss the relationship between human biosecurity and flock biosecurity to relate to the general public.

The difficulty in a descriptive study such as this is determining the similarity of group participants prior to the program (beyond finding out whether they are involved in 4-H or not.) The study can be improved if the participants are asked more background information including the individual's own education, parental education, occupation, income, etc. (Lilja, Wilhelmsen, Larsson, & Hamilton, 2003). The researcher had no way of telling if participants had a learning disability or personal barriers preventing them from performing their best. The results may not be an indication of all participants'

highest potential. Some participants may have required extra aid for taking the tests. The other disadvantage to administering pretests is that they can force people into thinking their behavior is being observed and thereby lead to pretest-treatment communication bias. The participants may have answered the attitude question in a way they felt it was supposed to be answered and not how they really felt. Additional information through interviews with teachers, parents, or others who know the participants in the study may assist in decreasing or removing the bias (Lilja, Wilhelmsen, Larsson, & Hamilton, 2003). The researcher would have to consider the differences in learning abilities and make the results reflect those differences. It is also possible for higher achieving participants to be more motivated or confident in their answers. This causes the change in knowledge and attitude to reflect more of their motivation or confidence rather than their ability to choose the right answer (Broussard & Bliss, 2007). The results could be skewed if the participants were more or less motivated at the beginning or end of the program. Since all groups responded similarly in improving knowledge and changing attitude, no need to address this concern appears necessary.

It is recommended this poultry biosecurity education program be continued and used to help improve overall health of poultry through the use of biosecurity and disease prevention in Indiana and adapted for other states as well. Topics for further discussion for future programs include visitors' proper clothing and footwear and who to contact with sick birds. The presenter could also provide more examples of the destructive effects of a poultry disease outbreak and give illustrations on public health to relate to the audience. The questions on the testing instrument should be clearer including what is meant by a poultry producer and whether it is easy to tell sick birds from healthy ones. A

separate curriculum could be developed with advanced material on poultry biosecurity and poultry diseases for adults.

The funding provided for this study was valuable in making a positive and significant difference in those who participated in the program. This research project, however, only evaluated the influence of a poultry biosecurity education program on knowledge and attitude. For future studies, it is recommended that researchers collect data on the improvement of behavior on the participants' farm. A similar instrument could be developed to measure a positive change in behavior regarding biosecurity practices. The participant could be evaluated before the program and then six months after the program to see what has been implemented. The instrument may include areas such as how the flock owner cleans the cages, quarantines new birds, uses disinfectant, keeps out wild birds, uses clean and protective clothing and footwear, and contacts the appropriate people for sick birds. Additional study could measure the improvement of overall flock health in the individuals' birds. This program could also be modified and used in other areas beyond poultry, including swine, beef, and dairy. The overall idea of disease control and prevention methods can be transferred and made specific for other species. These areas in animal agriculture can benefit from similar programs.

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APPENDICES

Appendix A

Copy of E-mail Sent to County Extension Educators

From: Robertson, Jane E. [robertsonje@purdue.edu]
Sent: Tuesday, May 22, 2007 9:48 AM
To: youth_in_mg@agad.purdue.edu; ag_in_mg@agad.purdue.edu
Cc: Kohlhagen, Kyle R
Subject: 4-H Poultry Biosecurity Seminar Coming to You

Attachments: 4-H Poultry Biosecurity Seminar Coming to You 05-21-07.doc; Poultry Seminar Flyer.ppt

Sending message on behalf of Renee McKee:

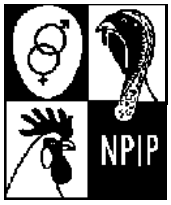
The Indiana State Poultry Association in conjunction with the Indiana State Board of Animal Health, Purdue University, and USDA-APHIS is offering an educational poultry biosecurity seminar on the road! Please encourage your local 4-H poultry members to take advantage of this FREE program to increase biosecurity awareness and help prevent the spread of poultry disease.

Kyle Kohlhagen, a current graduate student in Agricultural Education & Extension, is developing a curriculum for Indiana backyard flock owners in collaboration with ISPA, BOAH, Purdue, USDA-APHIS, and other poultry groups. Please note the attached information and flyer regarding the opportunity to schedule a seminar.

Jane Robertson
Administrative Assistant
Purdue University
Department of Youth Development & Ag. Education
Ag. Administration Building, Room 214
615 W State Street
West Lafayette, IN 47907-2053
phone: 765-494-8422
fax: 765-496-1152

Appendix B

Copy of Attached Letter on E-mail Sent to County Extension Educators



National Poultry Improvement Plan

Indiana State Poultry Association

Indiana State Board of Animal Health

Dear County Extension Educators,

Greetings from Purdue! The Indiana State Poultry Association in conjunction with the Indiana State Board of Animal Health, Purdue University, and USDA-APHIS is offering an educational poultry biosecurity seminar on the road! **Please encourage your local 4-H poultry members to take advantage of this FREE program to increase biosecurity awareness and help prevent the spread of poultry disease**.

I am a current graduate student in Agricultural Education & Extension developing a curriculum for Indiana backyard flock owners in collaboration with ISPA, BOAH, Purdue, USDA-APHIS, and other poultry groups. A team of Purdue Veterinary students will hold a 1-2 hour seminar with the flock owners, particularly 4-H exhibitors, at a convenient location and stress the importance of disease prevention. The program will involve the following:

- A pre-test issued at the beginning to determine prior knowledge of biosecurity.
- A presentation in CD and video format. Material covered will include common poultry diseases, ways to prevent disease, proper steps to take if you have sick birds, and the importance of working together to ensure the continuation of exhibition as a hobby.
- A post-test completed at the end to ensure the lessons were learned.

Finally, we will be asking each participant to bring a dozen eggs from their flock for a **free flock health check**. The eggs will be later tested at Purdue's Animal Disease Diagnostic Lab. Those involved will also receive a free T-shirt.

Please forward this opportunity on to your county poultry superintendent and ask him/her to contact me on a possible date and location. It obviously would be beneficial to visit all 92 counties, but realistically we have hopes to reach over 300 poultry exhibitors in the next two months. Ideally, counties will team up to hold a "regional" 4-H poultry meeting to increase numbers. The sponsors, including Purdue Extension, strongly feel this program has real merit. The feedback we received from the blood testers at the Purdue Blood Testing School was extremely positive.

Thank you ahead of time for your consideration and response. More details will be provided to participants. I realize you are incredibly busy, but would appreciate your support of this program. We educators are all in this together. **Please ask your superintendent to contact us through e-mail or phone to schedule a date, and we hopefully can serve as a great addition to their meeting.**

Much appreciated,

Kyle Kohlhagen
Graduate Assistant, Purdue University
Indiana State Poultry Association
915 West State Street
West Lafayette, IN 47907-2054
Ph: 765-494-8517
Fx: 765-496-1600
kkohlhag@purdue.edu

Appendix C

Flyer Attached to E-mail Sent to County Extension Educators

Do you exhibit poultry?
Do you work with those who do?

Find out what *you* can do to improve biosecurity and prevent the spread of disease. FREE flock health check on a dozen eggs and FREE T-shirt!

Sponsored by: Indiana State Poultry Association, Board of Animal Health, Purdue University and USDA-APHIS

Attend the 4-H Poultry Biosecurity Program

Location: County Extension Office
Date: Summer 2007
(Date & times will vary)

This seminar has no cost and is voluntary

Please contact: Kyle Kohlhagen, kkohlhag@purdue.edu, 765-494-8517
To set your time and location (i.e. 4-H Poultry Meetings)

Appendix D

Copy of E-mail Verification Sent to Poultry Contact for Program

From: Kohlhagen, Kyle R [kkohlhag@purdue.edu]
Sent: Thursday, May 31, 2007 1:31 PM
To: Keenan, Douglas L.
Cc: Eickholtz, Thomas A.
Subject: RE: Poultry Seminar

Attachments: Poultry Seminar Flyer.ppt; 4-H Poultry Biosecurity Seminar Coming to You 05-21-07.doc

Hi Doug,

That is great that Noble County will be joining in on the seminar with Steuben County. I am attaching the general flyer for our program, but your date is set for June 21, 7pm. We will present a PowerPoint and show a short video on poultry biosecurity.

It is very important that you let your 4-Hers know to bring a full dozen eggs with them to the meeting. If they bring less, the statistics are not as strong, and we cannot give them an accurate test of their flock's health status.

Feel free to email me with any questions or concerns.

Thank you for your interest,

Kyle Kohlhagen
Graduate Assistant, Purdue University
Indiana State Poultry Association
915 West State Street
West Lafayette, IN 47907-2054
Ph: 765-494-8517
Fx: 765-496-1600
kkohlhag@purdue.edu

Appendix E

Testing Instrument for Poultry Biosecurity Education Program

Pretest

Pre-test

Score_____

Responding to the Call:
Biosecurity Awareness

Your unique number ____ ____ ____ ____ ____ ____ (six-digit date of birth)

The purpose of this examination is to test your general knowledge about poultry biosecurity and its importance.

1. What is biosecurity?

2. What disease cost California poultry producers losses exceeding $170 million in 2002-2003 outbreak?
   a. Exotic Newcastle Disease
   b. Salmonella gallinarum
   c. Avian Influenza
   d. Pullorum-Typhoid
   e. Mycoplasma gallisepticum

3. Vaccinations are a good practice for your health program, but cannot guarantee your birds will be free from disease infections.

   True False

4. What should Hoosier poultry owners do if they suspect Exotic Newcastle Disease (END) in their flock?
   a. Inform the nearest Indiana State Police Post
   b. Contact the Purdue University Animal Disease Diagnostic Laboratory (ADDL) to submit dead birds for testing
   c. Take your sick birds to the show and then directly to your local veterinarian
   d. Report to the Russian Embassy

5. Which of the following is a warning sign of Highly Pathogenic Avian Influenza (HPAI)?
   a. Swelling of tissues around eyes and in neck
   b. Purple discoloration of the wattles, combs, and legs
   c. Nasal discharge, coughing, and sneezing
   d. All of the above

6. Which element contributes to the success of a disease control program?
    a. Biosecurity
    b. Education
    c. Awareness
    d. You
    e. All of the above, but especially d

7. Wildlife and pests cannot pass diseases to your birds.

    True False

8. Poultry disease can be so virulent that many birds die without showing any clinical signs.

    True False

9. What is your number one priority for your birds?
    a. Health
    b. Behavior
    c. Production
    d. Interaction with other birds

10. List 3 biosecurity practices you can do on your farm to prevent disease.

    1)

    2)

    3)

11. Which professionals do you contact when you have a disease problem in your flock?

    1)

    2)

    3)

12. Please circle the number that shows how you feel about the statements on the left according to the scale below:

1 = Strongly Agree 2 = Agree 3 = Undecided 4 = Disagree 5 = Strongly disagree

Poultry biosecurity is important in controlling and spreading of diseases.	1 2 3 4 5
Disease outbreaks in the United States are minor issues.	1 2 3 4 5
Visitors to your flock should not be allowed without wearing clean, protective clothing and footwear.	1 2 3 4 5
It is easy to tell sick birds from healthy ones.	1 2 3 4 5
It is necessary to isolate returning birds to your farm from an exhibition show for at least 3 weeks.	1 2 3 4 5
Rodents, wild birds, and insects are a threat to my birds.	1 2 3 4 5

13. Are you a(n): _____ Member of 4-H in Poultry *(check all that apply)*
_____ Member of FFA
_____ Adult 4-H Leader
_____ 4-H Parent
_____ Producer
_____ Other _____

14. County: _____

15. Have you participated in a biosecurity training program in the past? Yes No
If yes, with who/where? _____

16. Gender: Male Female

17. Years in Poultry Project: _____

18. # of birds on your farm: _____

19. Types of breeds in your flock:

Appendix F

Testing Instrument for Poultry Biosecurity Education Program

Posttest

Post-test
Score_____

Responding to the Call:
Biosecurity Awareness

Your unique number ____ ____ ____ ____ ____ ____ (six-digit date of birth)

The purpose of this examination is to test your general knowledge about poultry biosecurity and its importance.

1. What is biosecurity?

2. What is your number one priority for your birds?
    a. Health
    b. Behavior
    c. Production
    d. Interaction with other birds

3. Which element contributes to the success of a disease control program?
    a. Biosecurity
    b. Education
    c. Awareness
    d. You
    e. All of the above, but especially d

4. Which of the following is a warning sign of Highly Pathogenic Avian Influenza (HPAI)?
    a. Swelling of tissues around eyes and in neck
    b. Purple discoloration of the wattles, combs, and legs
    c. Nasal discharge, coughing, and sneezing
    d. All of the above

5. What disease cost California poultry producers losses exceeding $170 million in 2002-2003 outbreak?
    a. Exotic Newcastle Disease
    b. Salmonella gallinarum
    c. Avian influenza
    d. Pullorum-Typhoid
    e. Mycoplasma gallisepticum

6. Wildlife and pests cannot pass diseases to your birds.

   True False

7. Vaccinations are a good practice for your health program, but cannot guarantee your birds will be free from disease infections.

   True False

8. Poultry disease can be so virulent that many birds die without showing any clinical signs.

   True False

9. What should Hoosier poultry owners do if they suspect Exotic Newcastle Disease (END) in their flock?
   a. Inform the nearest Indiana State Police Post
   b. Contact the Purdue University Animal Disease Diagnostic Laboratory (ADDL) to submit dead birds for testing
   c. Take your sick birds to the show and then directly to your local veterinarian
   d. Report to the Russian Embassy

10. List 3 biosecurity practices you can do on your farm to prevent disease.

    1)

    2)

    3)

11. Which professionals do you contact when you have a disease problem in your flock?

    1)

    2)

    3)

12. Please circle the number that shows how you feel about the statements on the left according to the scale below:

1 = Strongly Agree 2 = Agree 3 = Undecided 4 = Disagree 5 = Strongly disagree

Poultry biosecurity is important in controlling and spreading of diseases.	1 2 3 4 5
Disease outbreaks in the United States are minor issues.	1 2 3 4 5
Visitors to your flock should not be allowed without wearing clean, protective clothing and footwear.	1 2 3 4 5
It is easy to tell sick birds from healthy ones.	1 2 3 4 5
It is necessary to isolate returning birds to your farm from an exhibition show for at least 3 weeks.	1 2 3 4 5
Rodents, wild birds, and insects are a threat to my birds.	1 2 3 4 5

Appendix G

PowerPoint Slides for Poultry Biosecurity Education Program

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Responding to the Call:
Poultry Biosecurity Awareness

Photo by Stephen Ausmus, USDA, ARS Image Gallery

Indiana State Poultry Association
Purdue University, Animal Sciences

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Welcome...

To the Level 1 Poultry Biosecurity Awareness training course. This program is designed to provide a basic understanding of biosecurity including:

- the vulnerabilities of poultry
- the importance and implications of biosecurity
- what you can do to prevent and control disease

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Course Objectives

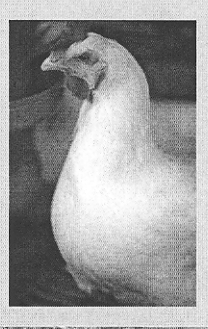
After completing this course, you should be able to:

- Define biosecurity
- Recognize vulnerabilities of poultry
- Identify diseases and their causes
- Utilize practical techniques in preventing the spread of disease
- Recall the proper actions to take if your birds become sick
- Understand how biosecurity is everyone's responsibility

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Healthy poultry

You are the best protection your birds have. Practicing backyard biosecurity will help keep your birds healthy.



PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Why should you help prevent disease?

Healthy birds:
- perform better
- reproduce more efficiently
- produce more economically valuable products

Unhealthy birds:
- more time managing the flock
- more money on health inputs and vet bills
- produce less or poor quality products

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Why should you help prevent disease?

- Everyone's responsibility
- Threat to birds
- Public health concern (rare)
- Find first incidence

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Key Points

- When you see clinical signs of disease in your birds, it is important to contact your local veterinarian.
- Poultry diseases have such similar symptoms, that many can only be diagnosed in the laboratory.
- Disease has the potential of being devastating to all poultry.

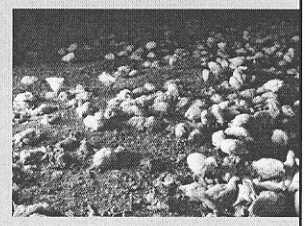
PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Poultry Diseases

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Birds with Exotic Newcastle Disease (END)

Exotic Newcastle disease can quickly overwhelm an entire flock. It is contagious, fatal, and affects all species of birds.



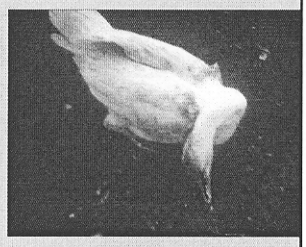
PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

END affects the respiratory, nervous and digestive systems.

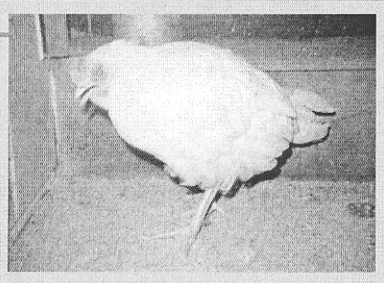
One of the clinical signs of the disease is **swelling of the tissues around the eyes and the neck** as shown in this photo.

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Twisting of the neck is one of the signs birds may show when **END** has affected their nervous system.



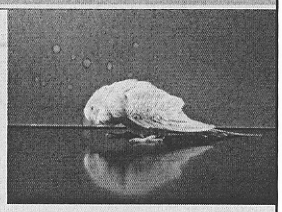
PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*



Chickens with **END** also exhibit signs of **depression** and **respiratory** distress.

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

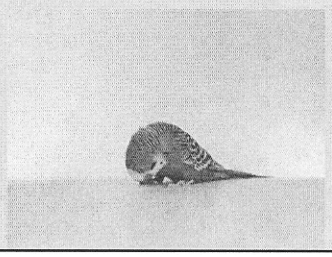
Exotic Newcastle disease is a threat for caged birds and poultry hobbyists.



Buy your pet birds from reliable sources and request certification that birds have been legally imported.

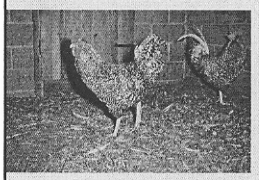
PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

END causes birds such as this parakeet to be **unable to perch or fly**.



PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

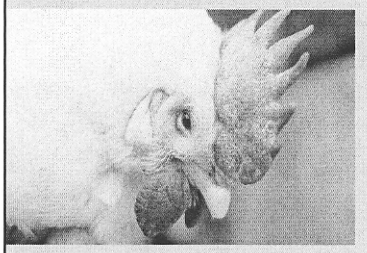
Birds with Avian Influenza



There are many strains of avian influenza that can cause varying amounts of clinical illness in poultry.

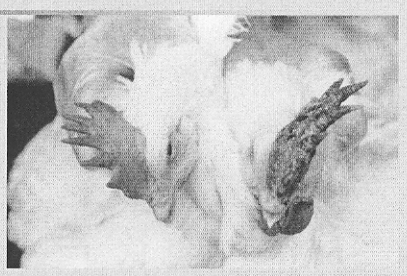
These strains are not the same strains that commonly cause illness in humans.

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*



Birds affected by **AI** may show **swelling of the head and face**.

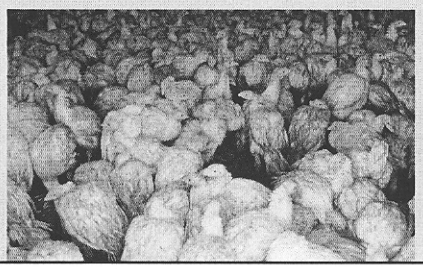
PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*



Purple discoloration of the comb may be an indicator of **avian influenza**.

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Turkeys may exhibit signs of **diarrhea and depression** due to **AI**.



PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Basic Biosecurity For Your Flock

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

What is biosecurity?

"Bio" refers to life, "security" indicates protection

Biosecurity is a set of actions designed to prevent the introduction of disease agents.

- Controlling bird to bird exposure
- Restricting traffic on your property
- Cleaning and disinfecting
- Managing pests

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Controlling bird to bird exposure

☑ Avoid contact with livestock and birds on other farms

☑ Quarantine all new and returning birds for a minimum of 3 weeks

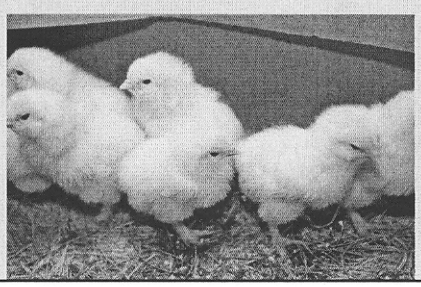
☑ Isolate, and if necessary, cull any sick birds

☑ Properly dispose of birds

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Controlling bird to bird exposure

Protect your birds by isolating new birds from the rest of your flock.



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Restricting traffic on your property

☑ Limit visitors to your flock

☑ If allowing visitors, provide or require that they wear clean, protective clothing and footwear

☑ Use a footbath or plastic boot covers for visitors

☑ Clean vehicles and trailers exposed to outside poultry

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Cleaning/disinfecting boots, clothing, hands, and equipment

☑ Do not borrow or lend crates or equipment

☑ Wash your hands after handling birds

☑ Clean water and feed troughs frequently

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Cleaning/disinfecting boots, clothing, hands, and equipment

☑ Regularly clean and disinfect buildings, pens, and equipment

☑ Clothing and footwear worn in poultry areas should not be used for other purposes

☑ Clean and disinfect boots

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Managing Pests

☑ Control rodents, insects, and other pests on your farm

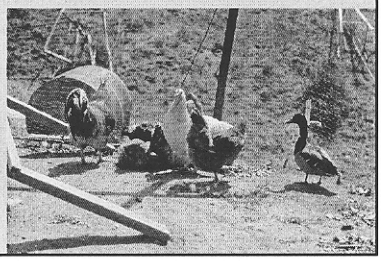
☑ Install perimeter fencing to isolate your birds

☑ Restrict access to game birds and migratory waterfowl

PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

Managing pests

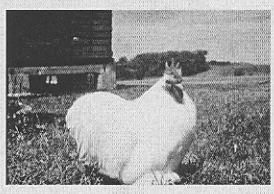
Practice backyard biosecurity and do not mix species of birds together. Allowing a backyard flock to mix with wild waterfowl poses the risk of introducing AI into poultry.



PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

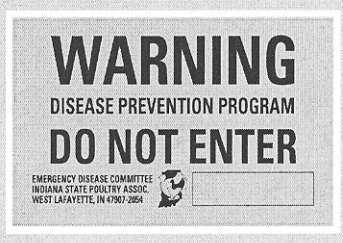
The threat of contagious disease can be reduced or prevented by removing the possibility of contact between the disease and the bird.

Disease transmission can be controlled!



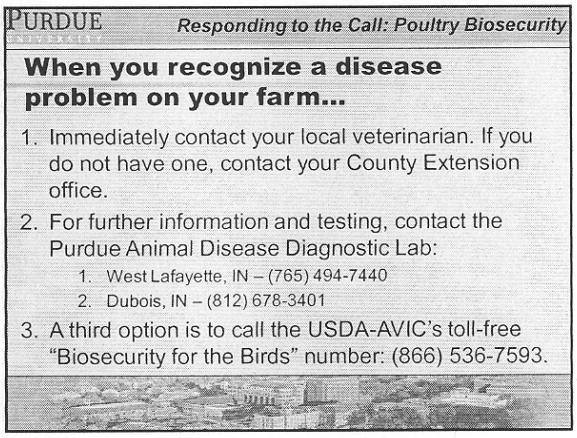
PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

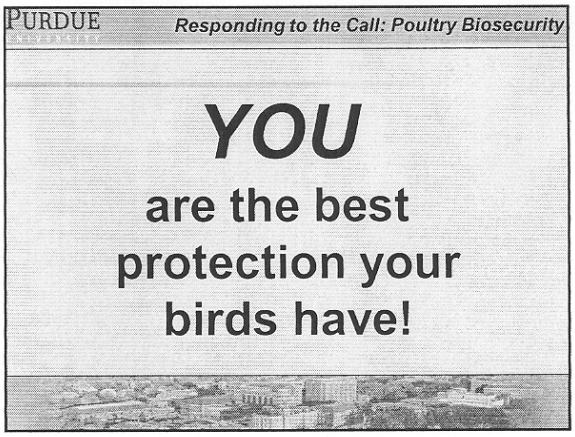
Biosecurity is common sense, and it isn't hard.

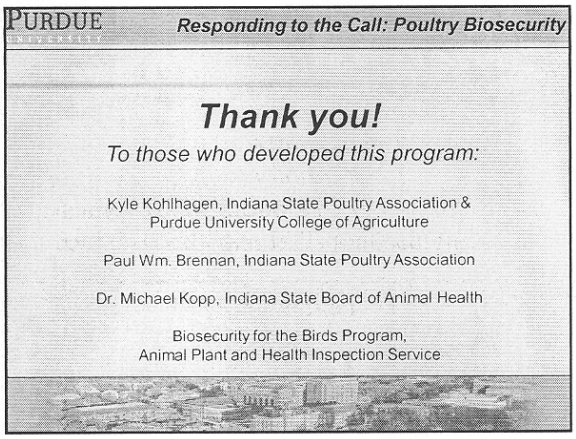


PURDUE UNIVERSITY *Responding to the Call: Poultry Biosecurity*

When and who do you call for help?

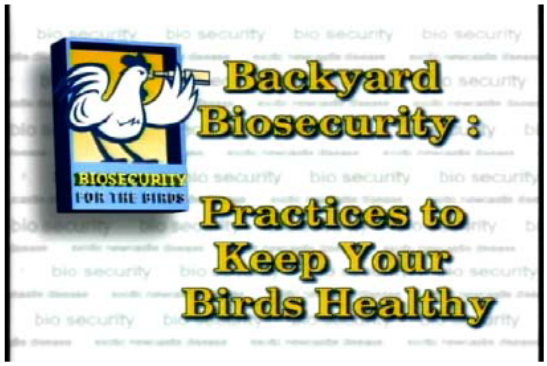

PURDUE
Responding to the Call: Poultry Biosecurity
When you recognize a disease problem on your farm...
1. Immediately contact your local veterinarian. If you do not have one, contact your County Extension office.
2. For further information and testing, contact the Purdue Animal Disease Diagnostic Lab:
1. West Lafayette, IN – (765) 494-7440
2. Dubois, IN – (812) 678-3401
3. A third option is to call the USDA-AVIC's toll-free "Biosecurity for the Birds" number: (866) 536-7593.

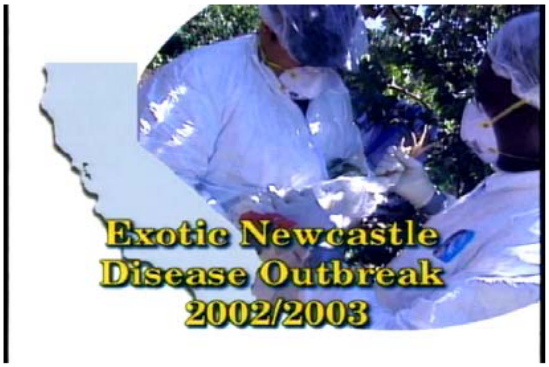

PURDUE
Responding to the Call: Poultry Biosecurity
YOU
are the best protection your birds have!


PURDUE
Responding to the Call: Poultry Biosecurity
Thank you!
To those who developed this program:
Kyle Kohlhagen, Indiana State Poultry Association & Purdue University College of Agriculture
Paul Wm. Brennan, Indiana State Poultry Association
Dr. Michael Kopp, Indiana State Board of Animal Health
Biosecurity for the Birds Program, Animal Plant and Health Inspection Service

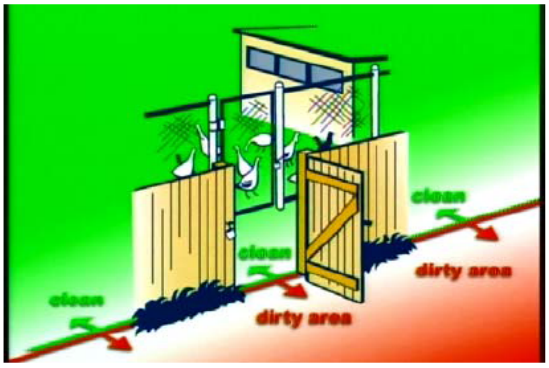
Appendix H

Snapshots from Video


BIOSECURITY
FOR THE BIRDS
Backyard
Biosecurity :
Practices to
Keep Your
Birds Healthy


Exotic Newcastle
Disease Outbreak
2002/2003


BIOSECURITY
FOR THE BIRDS


clean
clean
clean
dirty area
dirty area


DON'T HAUL DISEASE
HOME


KNOW THE WARNING
SIGNS

Appendix I

Panel of Experts

Todd J. Applegate
Associate Professor
Department of Animal Sciences, Purdue University
Lilly Hall of Life Sciences, Room 2-114
915 West State Street
West Lafayette, IN 47907
(765) 496-7769

Marianne Y. Ash
Director of Biosecurity & Emergency Planning
Indiana State Board of Animal Health
805 Beachway Drive, Suite 50
Indianapolis, IN 46224
(317) 227-0347

Mark A. Balschweid
Professor and Head
Department of Agricultural Leadership, Education, and Communication
Institute of Agriculture and Natural Resources
300 Agricultural Hall
Lincoln, NE 68583
(402) 472-8738

Paul W. Brennan
Executive Vice President
Indiana State Poultry Association
Lilly Hall of Life Sciences, Room G-117
915 West State Street
West Lafayette, IN 47907
(765) 494-8517

Michael D. Kopp
Director of Avian Health Division
Indiana State Board of Animal Health
805 Beachway Drive, Suite 50
Indianapolis, IN 46224
(317) 227-0324

Appendix J

Research Exemption Request

Revised 6/06

RESEARCH EXEMPTION REQUEST

Ref. # _____

Purdue University

Committee On The Use of Human Research Subjects

1. Project Title: **Analysis and Evaluation of the Effectiveness of Poultry Biosecurity Curriculum**
2. Anticipated Funding Source: **USDA-APHIS-VS Cooperative Agreement**
3. Principal Investigator *[See Policy on Eligibility to serve as a Principal Investigator for Research Involving Human Subjects]*:
   Name and Title **Dr. Mark Balschweid** — Department, Building, Phone, FAX, E-mail address
   Associate Professor, Agricultural Education — **YDAE, AGAD, 4-7439, 496-1622, markb@purdue.edu**
4. Co-investigators and key personnel *[See Education Policy for Conducting Human Subjects Research]*:
   Name and Title **Kyle Kohlhagen** — Department, Building, Phone, FAX, E-mail address
   Graduate student — **ANSC, LILY, 4-8517, 496-1600, kkohlhag@purdue.edu**
5. Non-key personnel *[See Education Policy for Conducting Human Subjects Research]*:
   Name and Title — Department, Building, Phone, FAX, E-mail address
6. Consultants *[See Education Policy for Conducting Human Subjects Research]*:
   Name and Title — Department, Building, Phone, FAX, E-mail address
7. Anticipated Duration of Study: Please be aware that you cannot begin the project until you have received notification that the exemption has been granted.

   Sept 2007 (From) — May 2008 (To)
8. Specific procedures to be followed. Include a copy of questionnaires, interview questions, etc., if applicable. If using specimens or previously collected data, please describe what, if any, identifiers are associated with the specimens/data. **This two-hour educational program will be offered to Indiana 4-H poultry enthusiasts with a focus on biosecurity and disease prevention. Each participant will complete a pre-test and post-test with a purpose of attaining change in knowledge. [See attached.] With a goal of 200 participants, the program will be available to all counties and/or regions of the state.**
9. Will subject's data be gathered anonymously? YES ☐ NO X If not, please describe what identifiers will be used and how confidentiality will be maintained. **The subjects will use a unique six-digit number (instead of their name) to match their pre-test with their post-test. The tests will be kept together after each presentation for easier sorting and data collection.**
10. Describe the subjects to be included in the study and give a detailed account of the recruitment procedures to be used: **The program is directed toward 4-H poultry members and adults who have a background in small poultry flocks. A flier will be sent to the 4-H poultry superintendents encouraging their members to participate in this voluntary educational seminar.**

I have read the Human Subjects *"Research Exemption Request Guidelines"*.

Principal Investigator Signature — Date: 9/24/07

Submit the original request to: Institutional Review Board (IRB), 610 Purdue Mall, Hovde Hall, Room 300