

THE PENNSYLVANIA/VIRGINIA EXPERIENCE IN
ERADICATION OF AVIAN INFLUENZA (H₅N₂)

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Avian influenza was identified in 448 flocks with over 17 million birds destroyed in Pennsylvania and Virginia in 1983-1984. The outbreak involved primarily chickens and turkeys in commercial flocks. Several small noncommercial flocks were also identified but did not significantly affect the dynamics of the epidemic. Avian influenza subtype H₅N₂ was isolated from the majority of flocks but was characterized as low-pathogenic in the Virginia flocks and one-third of the Pennsylvania flocks. Virus isolates were highly pathogenic in two-thirds of the Pennsylvania flocks. Over \$63 million of Federal funds were required to eradicate the disease. Multiple methods of disease spread were observed. Primary eradication procedures included strict quarantine, total population surveillance with immediate destruction of all flocks with evidence of avian influenza, environmental decontamination, and intensive educational programs toward biosecurity enhancement.

Should similar outbreaks of fowl plague-like avian influenza occur in the United States or any other country with a concentrated poultry industry, many of the experiences and problems encountered in the Pennsylvania/Virginia epidemic are likely to be repeated. The purpose of this report is to outline the major activities in this eradication campaign with some comment on possible solutions to significant problems that occurred.

Program Objectives - The initial Federal objective of the Pennsylvania/Virginia eradication campaign was to eliminate "Highly Pathogenic" avian influenza as defined at the First International Symposium on Avian Influenza. This objective was later amended to include all forms of avian influenza when field diagnostic experience demonstrated it was impossible to distinguish the clinical "high path" syndrome in the poultry house from that disease associated with "low path". A final amendment to the eradication objective included declaration of seropositive flocks as infected without isolation of virus.

A second objective of the campaign was to contain avian influenza within the original quarantined areas. Because of inadequate preliminary information regarding the extent of the outbreak, multiple methods of spread of influenza

viruses, and lack of industry biosecurity practices, it was necessary to extend area quarantines in Pennsylvania five times and to quarantine portions of Maryland and New Jersey due to single cases in these States. The initial Virginia quarantine did not require expansion. The most significant problem in the eradication program was changing the program objectives. Such changes required amending policies and procedures at the field level, reeducation of the industry, and acquisition of additional State and Federal resources. Future eradication campaigns in any country could be conducted more efficiently if such changes could be avoided.

Resources - Basic resources include authority, personnel, capital, and knowledge. In the 1983-1984 avian influenza epidemic, resources were acquired from Federal, State, and industry on an as-needed basis.

1. State and Federal authority to regulate government and to conduct eradication activities were amended three times--each amendment resulted in some delay and reeducation.
2. Personnel were available from a variety of sources and were generally familiar with task force operations. Continuous training regarding the nature of avian influenza was needed.
3. State and Federal funds financed most program activities. It is impossible to forecast total program cost at the onset of such a campaign. Repeated request for capital resulted in some interruption of program activity.
4. Knowledge of this AI virus and the nature of the disease in the various host species was limited. Such knowledge was also confused by the infection of the population with AI viruses with differing pathogenicities. Field studies were conducted to determine needed program additions, deletions, and changes. Due to rotation of personnel, inadequate technical background, lack of research funds, and the need to concentrate on higher priority eradication activities, these studies were not as productive as desired. Independent scientists working in concert with disease eradication personnel, would have been more productive in obtaining

knowledge of the virus, the hosts, and the interaction of host and agent.

It seems impossible to predict the type and volume of resources needed in such outbreaks of exotic disease. State, Federal, and industry responsibilities should be predetermined to the extent possible to avoid delays in program operations.

Surveillance - This is the subject of a separate report at this symposium and will not be discussed in this paper. Experience during the 1983-1984 avian influenza outbreak demonstrated the importance of reporting clinical symptoms by industry as the most essential method of early detection of flocks with presumptive evidence of disease. Because all clinical disease is not necessarily reported for a variety of reasons, epidemiologic studies and serologic population surveillance are necessary and effective in determining additional flocks with presumptive evidence of viral activity.

Diagnosis - A standard diagnostic protocol was developed for avian influenza based on clinical, epidemiologic, and/or laboratory evidence of disease and was nearly 100 percent effective in determining influenza cases, regardless of species affected. However, major problems occur when we attempt to differentiate pathogenicity based on either observed clinical syndromes in the poultry house or inoculation of chickens in the laboratory. In Pennsylvania, 101 of 249 isolates from flocks with similar clinical disease failed to kill 75 percent of the test birds in the laboratory. Continued research is needed to determine whether flocks become infected with mixed populations of AI virus. From our experience, it appears impossible to eradicate avian influenza in a concentrated population, if diagnosis is dependent upon meeting a laboratory criterion of 75 percent death rate in inoculated birds.

The persistence of high antibody levels in recovered flocks is also a diagnostic problem which needs immediate research effort.

In Pennsylvania, virus could not be isolated from samples collected from birds in 51 such seropositive flocks, nor from limited birds stressed with steroids after having been determined to be seropositive to AI antigens.

Appraisal - All flocks were individually appraised with indemnity paid on all live birds at the time of initial visit to the premises. Indemnity values were reviewed and adjusted based on market price fluctuations with no consideration given for downtime. Over \$41 million of Federal indemnity was authorized. Industry was satisfied with indemnity rates and consistently chose depopulation with indemnity as opposed to controlled marketing of seropositive flocks. Although the payment of indemnity for infected and exposed flocks had the net effect of reducing the time required for eradication, recovered flocks with low-pathogenic virus isolates could be marketed to slaughter under controlled conditions without a significant risk of disease spread.

Depopulation - The destruction of 17 million infected birds within a restricted time period caused severe problems due to environmental and logistic constraints both in Pennsylvania and Virginia. Renderers would not accept these birds for fear of spreading the disease and inability to develop a marketable product. An attempt was made to burn flocks in Virginia but this proved slow and expensive. The majority of flocks were buried in either a sanitary landfill or in on-farm burial sites. Repeated attempts to isolate AI virus from burial sites were negative. The remaining problems with depopulation involved the catching and euthanizing of birds in large commercial refuse containers. Because of continuing public opinion regarding environmental contamination, alternatives to burial need to be investigated.

Cleaning and Disinfection - Disposition of manure and disinfection of premises was an owner responsibility. A major problem involved alternative methods of safely disposing of virus-contaminated manure. Alternative procedures included:

1. Composting, if the manure was not too wet. Some producers used this option but virus was demonstrated at the edges of compost piles.
2. Digging a shallow trench, lining with plastic, filling with manure, and covering with plastic, was an alternative that was seldom used.
3. Chisel-drill high moisture manure into the soil was possible but more manure did not have moisture content high enough to employ this

option.

4. Spread manure on fields and plow under the same day.

In reality, many owners spread the manure on the fields and plowed it under as soon as climatic conditions permitted. Virus was isolated from wet manure in a barn up to 105 days following depopulation. Spring warmth and the sun's rays probably inactivated more virus than any other method of environmental decontamination. A second cleaning and disinfection problem involved the definition of clean, prior to disinfection. Traditional industry standards were initially in conflict with the task force definition of "clean". Rotation of task force personnel further confused the standard. Assignment of one person to interpret the regulatory standard throughout the campaign combined with a reeducation of the industry resolved this problem. Following disinfection, virus was found through extensive biased sampling in two of over 400 poultry houses--an indication that C&D standards were generally successful.

Repopulation - Extensive protocols were developed to assure that replacement flocks would not become infected following an initial depopulation. To reduce this risk, it was necessary to demonstrate that:

1. The contaminated environment was free of virus. This required a 30-day minimum down-time following C&D and testing the poultry house environment for evidence of AI virus.
2. Negative epidemiologic factors existing within the immediate neighborhood.
3. A serologic sampling of replacement birds for AI antibody must prove to be negative.
4. The conveyances and personnel used to transport and place new birds within the poultry house were required to be biosecure.

Although repopulation procedures were severe, industry generally concurred with the protocol and did not request short-cuts in the repopulation regiment.

Epidemiology and Biosecurity - Investigations regarding diseases transmission were conducted both on-farm and through special field studies. AI virus transmission was possible and occurred through movements of live and dead birds, contaminated equipment and vehicles, contaminated eggs, feed, water, insect vectors, and human vectors. In fact, any fomite that had contact with contaminated manure was capable of transmitting the virus. It was remarkably easy to isolate AI virus anywhere or from any inanimate object associated with an infected poultry flock. Because the task forces were 15-30 days behind the spread of the disease, this meant that numerous potential methods of spread placed each flock at risk. The use of common services and suppliers and common marketing patterns occurs in integrated operations. This situation emphasized the need for reeducation of the entire industry in biosecurity procedures. One of the most productive activities during the eradication campaign was the delivery of disease prevention lectures and educational materials to owners and service representatives. Regulatory restrictions, although severe and generally well enforced, were dramatically effective in reducing the spread of the disease. The most significant deficiency in the eradication campaign was that the biosecurity effort should have had high priority within the industry early in the epidemic. It must be recognized that biosecurity laxity exists throughout the industry and that any fowl plague-like virus can be spread with relative ease.

Conclusion - The AI eradication campaign in Pennsylvania/Virginia in 1983-1984 was complicated because of the existence of viruses of differing pathogenicity affecting a variety of poultry hosts being managed using a variety of husbandry techniques. Program procedures, however, were developed and implemented using a worst-case scenario philosophy. Because both the industry and animal health agencies wanted to remove all evidence of avian influenza within the shortest possible time frame, activities to detect, eliminate, and prevent spread of the disease were eventually directed toward a fowl plague-like disease. It is hoped that additional knowledge gained from this experience, research findings, and exchange of information at meetings such as this, will identify other alternatives for AI control and/or eradication programs for the future.