



The Poultry Informed Professional



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Department of Avian Medicine, University of Georgia

Phone (706) 542-1904 Fax (706) 542-5630
e-mail: sclanton@arches.uga.edu

Following are excerpts from the United States Department of Agriculture
Foreign Animal Disease Report Summer 1998

Risk Analysis of Potential Control Options for the 1997 Nonpathogenic Avian Influenza Outbreak in Pennsylvania

In this short timeframe for this analysis, we (the APHIS personnel performing this analysis) consulted with the poultry industry, poultry researchers, and the USDA's Economic Research Service to obtain best available date. The results in this report apply to the situation as of August 1997.

Background

Pennsylvania has currently dealt with an outbreak of non-pathogenic (H7N2) avian influenza (AI) in commercial egg-layer flocks. Pennsylvania identified more than a dozen infected flocks in the Lancaster County area. In July 1997, the US management and the Pennsylvania Department of Agriculture (PDA) requested an analysis of potential control options. The objective of this report is to provide decisionmakers with information regarding the relative consequences and costs of various control options. This analysis may be useful in framing the problem and for suggesting areas for further exploration. In the

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**Broiler Performance Data (Region)
Live Production Cost**

	SW	Midwest	Southeast	Mid-Atlantic	S-Central
Feed cost/ton w/o color (\$)	128.84	123.02	133.40	137.20	130.05
Feed cost/lb meat (¢)	11.55	11.67	12.92	13.63	13.09
Days to 4.6 lbs	45	46	46	46	46
Med. cost/ton (¢)	2.39	1.69	2.98	2.68	2.38
Chick cost/lb (¢)	4.09	3.67	3.90	3.70	3.49
Vac-Med cost/lb (¢)	0.06	0.03	0.10	0.06	0.10
WB & 1/2 parts condemn. cost/lb	0.20	0.39	0.29	0.25	0.33
% mortality	3.30	4.28	4.41	4.41	5.17
Sq. Ft. @ placement	0.80	0.77	0.80	0.79	0.87
Lbs./Sq. Ft.	5.86	6.60	6.20	6.61	6.23
Down time (days)	17	12	11	13	11

Data for week ending 10/30/98

E-Mail Notice

We are currently organizing our system to enable us to e-mail the Poultry Informed Professional newsletter. If you would like to receive your newsletter via e-mail, please fax your name and e-mail address to Sue Clanton at (706) 542-5630.

Risk Analysis of Potential Control Options for the 1997 Nonpathogenic Avian Influenza Outbreak

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Methods

We used a state-transition disease model and economic welfare analysis to simulate the results of four different control options. These options are (1) voluntary controls or "do nothing," (2) depopulation-repopulation, (3) quarantine and containment, and (4) vaccination with quarantine. Also, we modeled several regionalization and export-restriction scenarios. Brief descriptions of the models are presented below.

Disease-Spread Model — The disease-spread model is an application of state-transition analysis. State-transition analysis involves defining mutually exclusive categories ("states") into which animals, herds, flocks, and plants can be divided. We used a basic three-state infection model: susceptible, infectious, recovered, or immune. In this analysis, the flock was the basic unit of concern. For purposes of the simulation, flocks in the susceptible state were defined as normal, healthy, and available to be infected with AI. Flocks in the infectious state have AI virus circulating among birds and are capable of infecting other flocks. After a flock is infected, it will be immune to reinfection or removed by depopulation, depending on the scenario being modeled. If repopulated, these flocks will return to the susceptible state.

Pathways ("transitions") between the states must also be defined. Pathways are represented mathematically as the probability of moving from one state to another. States and pathways serve as the basis for a series of simulations...

For this analysis, the area of risk was defined as all Pennsylvania counties affected by the final Federal quarantine in 1984. According to the 1982 census, 468 layer premises (>3,200 birds) were in this area. The model used this number, 468, as the starting number of susceptible flocks. Each hypothetical flock consisted of 70,000 egg-laying chickens. Each egg layer was assumed to produce 270 eggs per year (Pennsylvania Agriculture State Statistics 1996).

Flocks moved from susceptible to infected to immune and back to susceptible status based on incidence rates, proportion of flocks becoming immune, proportion of susceptible flocks vaccinated, and depopulation to repopulation rates. These proportions were derived by estimating the average waiting time a flock or premises would spend in the infectious or immune states under various control options...

Economic Model — The economic model is an application of economic welfare analysis. Economic welfare analysis evaluates how market prices and quantities adjust to changes in disease control measures. It also measures the effects of disease spread and how consumers and producers are affected by the adjustments in market prices and quantities...

For the purpose of this analysis, impact on domestic production was measured in terms of the number of eggs lost owing to disease or depopulation. The analysis examines economic impacts under high and nonpathogenic scenarios and the different control options. Output from the disease-spread model was used to help estimate the number of eggs lost.

Disease Control Scenarios — Several scenarios were developed to examine the costs and benefits of alternative control options. The scenarios were evaluated using computer simulation models....

1. Voluntary Control or "Do Nothing" Approach — After consulting with the PDA, we considered the do-nothing approach an infeasible option and we did not model its impacts....

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Broiler Performance Data (Company) Live Production Cost

	Average Co.	Top 25%	Top 5 Cos.
Feed cost/ton w/o color (\$)	132.45	126.00	124.72
Feed cost/lb meat (¢)	12.75	11.54	11.82
Days to 4.6 lbs	46	46	45
Med. cost/ton (¢)	2.59	1.82	2.29
Chick cost/lb (¢)	3.89	3.75	3.55
Vac-Med cost/lb (¢)	0.07	0.04	0.03
WB & 1/2 parts condemn. cost/lb	.026	0.20	0.25
% mortality	4.46	3.82	4.79
Sq. Ft. @ placement	0.80	0.79	0.77
Lbs./Sq. Ft.	6.28	6.08	6.54
Down time (days)	13	13	10

Data for week ending 10/30/98

Broiler Whole Bird Condemnation (Region)

	SW	Mid-West	S. East	Mid-Atlantic	S. Central
% Septox	0.281	0.771	0.216	0.311	0.340
% Airsac	0.064	0.076	0.266	0.127	0.232
% I.P.	0.069	0.134	0.223	0.216	0.265
% Leukosis	0.007	0.003	0.009	0.019	0.013
% Bruise	0.008	0.019	0.039	0.014	0.021
% Other	0.032	0.037	0.090	0.012	0.025
% Total	0.461	0.041	0.822	0.699	0.895
% 1/2 parts condemnations	0.340	0.526	0.336	0.292	0.417

Data for week ending 10/30/98

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- This scenario would assume that neither State nor Federal authorities will take any steps to contain or control the situation. Because of the traffic in feed, feed ingredients, service personnel, maintenance personnel, vaccination, placement, and catch crews, infection among flocks could be expected to spread rapidly within the State.

- Without local control, AI would likely be transported out of the State into surrounding areas. Large poultry-producing States nearest Pennsylvania — specifically the Delaware, Maryland, Virginia (Delmarva) region — would likely be the first areas affected...

2. Depopulation Scenario — For this scenario, flocks were moved from the infectious to the depopulated or removed state after 1 week. This assumption was based on experience in the 1983-84 outbreak, when active surveillance was devised to sample flocks on a weekly basis...

3. Quarantine and Containment of Infected Flocks — We assumed that positive commercial flocks are detected fairly quickly with the dead-bird pick up procedure discussed above. The average time the birds were infected and remained infectious was again assumed to be 1 week...

4. Vaccination with Quarantine — Research has shown that clinical signs and production losses can be mitigated by use of vaccine. However, research also shows that vaccinated birds can become infected with field strain virus. Vaccinated birds or flocks can be expected to shed less virus, to develop less severe clinical signs, and to experience fewer production losses than unvaccinated birds or flocks...

The vaccination scenario was simulated by vaccinating 80 flocks (assuming 70,000 birds per flock) over the initial 4-week period. This is approximately the number of flocks capable of being vaccinated once with the 4 million doses of vaccine ordered by PDA.

The key parameter for vaccine use is its efficacy in reducing flock-to-flock transmission of field virus. We are not aware of any research or data on this topic. In the absence of this information, and for example purposes, we simulated four levels of vaccine efficacy: 0 percent, 25 percent, 50 percent, and 75 percent. These levels were implemented in the model by starting with varying numbers of flocks in the immune state, assuming that 1 million birds per week will be vaccinated. For example, the 75 percent effective scenario starts with 45 (60 x 0.75) flocks in the immune state during the first 4 weeks of the simulation.

Results — The simulated number of infected flocks and economic impact of "quarantine only" compared with "quarantine with depopulation" are shown in table 1 for highly pathogenic and nonpathogenic AI. Figure 1 shows the course of the simulated epidemics compared with the actual for 1983-84. The morbidity and mortality (M&M) impacts for the nonpathogenic scenarios are based on data provided by PDA for the current outbreak. For nonpathogenic AI, the economic losses are shown with and without total loss of table and pasteurization egg markets. For the quarantine and vaccination scenarios, any morbidity and mortality occurring during the time of flock quarantine were included in the market loss calculation.

The simulated number of infected flocks and economic impact of vaccine for hypothetical efficacy is shown in table 2. Economic losses are reported with and without total loss of all egg markets. Table 3 shows the projected annual export losses if Pennsylvania vaccinates

Table 1 — Simulated number of AI-infected flocks and economic impact of quarantine and depopulation control options in Pennsylvania layer flocks

(N = 468 at-risk flocks (>3,200 birds) in the 1983-84 quarantine zone)^a

	Quarantine only	Depopulation and quarantine
Time in infectious state	1 week ^{b,c}	1 week ^{b,c}
Time in immune state	52 weeks	7 weeks, 10% exit each week after
Number of infected flocks	262	281
Losses for highly pathogenic AI (\$ million)		
Producer loss	\$17.2 plus export impacts ^d	\$27.2 plus ^d export impacts
Consumer loss	\$55.6 plus export impacts ^d	\$89.6 plus export impacts ^d
Net loss	\$72.8 ^e plus export impacts ^d	\$117.4 ^e plus export impacts ^d
Losses for nonpathogenic AI (\$ million) M&M / M&M plus Market Loss		
Producer loss	\$4.0 / \$17.2	\$27.2 ^h
Consumer loss	\$13.1 / \$55.6	\$89.6
Net loss	\$17.1 / \$72.8 ^e	\$117.4 ^c

^a Under the depopulation option, incidence rate and number of flocks infected were based on the 1983-84 Pennsylvania outbreak.

^b Assumes early detection procedures.

^c Assumes 100-percent effectiveness of flock quarantine in reducing virus spread.

^d Expected export losses result from conversion to highly pathogenic AI. See impacts in Table 3 for various regionalization scenarios.

^e Government costs were not included because they are similar for both scenarios with the exception of indemnity, which is a transfer cost from Government to industry. Detailed data are available from the authors.

¹ M&M = morbidity and mortality, which are based on mortality and egg losses for the 1997 virus reported by the Pennsylvania Department of Agriculture.

^c Market loss due to infection with field virus and loss of table and pasteurization egg market if pasteurization market is saturated. Under current conditions, it is estimated that approximately \$3.4 million of the market losses shown could be salvaged or regained in the pasteurization market.

^h Figures in this column do not include export-related impacts because nonpathogenic AI does not usually influence poultry exports.

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for AI or the virus converts to highly pathogenic form. Four different potential regionalization scenarios are shown. For the purpose of this evaluation, the estimated impacts of these scenarios were based on the total impact to the United States due to a complete loss of poultry meat exports weighted by the proportion of broiler production occurring in each region. Note that these losses are on an annual basis, and export restrictions are expected to last more than 1 year.

Discussion

This analysis focused on the disease production impacts in commercial layer operation, as well as potential impacts in the export markets for U.S. poultry meat. We looked for benefit of vaccine use in three areas: (1) reducing producer losses, (2) decreasing the likelihood of conversion to highly pathogenic virus, and (3) decreasing the number of number of infected flocks. Compared with the high cost of potential export market loss, the benefits appear minimal.

The efficacy of vaccine at reducing flock-to-flock spread is the key variable affecting the outcome of this analysis. No data were available on this topic. However, there is agreement in the literature and expert opinion that vaccination will not prevent the circulation of field virus among flocks.

Vaccination will reduce the amount of virus shed from field-strain-infected birds. The impact of this reduction on the probability of flock-to-flock spread is expected to be slight because of the large amount of virus excreted by 70,000 vaccinated birds...

The time a flock spends in the infectious state is a critical variable because it affects the number of flocks that can spread disease at any one time. According to field experience and expert opinion, flocks stay infectious for an average of 4 weeks. However, the time flocks spend in the infectious state was set to 1 week for all scenarios. This assumption allows us to examine the impact of depopulation and vaccine efficacy without an added variable.

(Authors: Dr. H. Scott Hurd, analytical epidemiologist, USDA, APHIS, VS, Centers for Epidemiology and Animal Health (CEAH), Fort Collins, Co, (970) 490-7869; Ken Forsythe, agricultural economist, USDA, APHIS, VS, CEAH, Fort Collins, CO, (970) 490-7955; Dr. Susan C. Trock, regional epidemiologist, USDA, APHIS, VS, Northern Region, Albany, NY, (518) 453-0103)

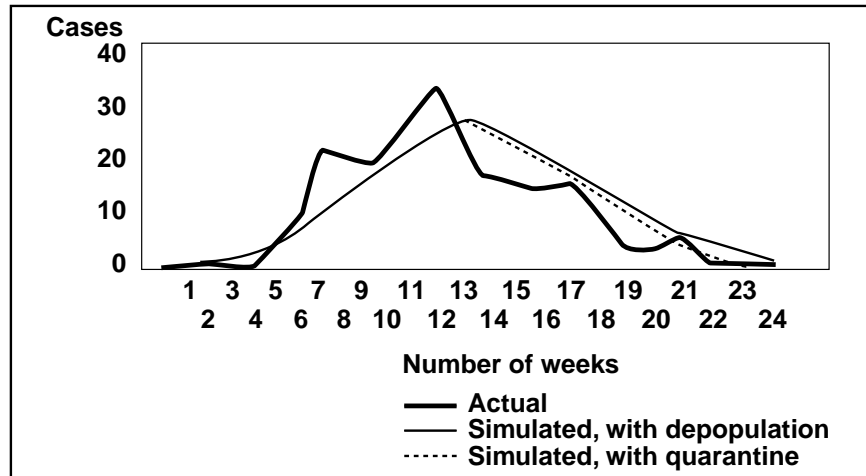


Figure 1 — Avian influenza. Simulated epidemic curves for quarantine and depopulation and 1983-84 outbreak.

The simulated number of infected flocks and economic impact of vaccine for hypothetical efficacy is shown in Table 2. Economic losses are reported with and without total loss of all egg markets. Table 3 shows the projected annual report losses.

Table 2 — Simulated number of infected flocks and economic impact (excluding export losses) of vaccine use with different assumed efficacies for reducing flock-to-flock spread.^x

Vaccine efficacy ^b	Zero	25%	50%	75%
Infected flocks	262	236	210	184
Losses (\$ million)	M&M^c / M&M including market loss^d			
Producer loss ^a	\$1.4/\$17.2	\$1.3/\$15.7	\$1.3/\$13.5	\$1.3/\$12.0
Consumer loss	\$1.2/\$55.6	\$1.1/\$50.8	\$1.0/\$43.6	\$0.8/\$38.7
Net loss	\$2.6/\$72.8	\$2.4/\$66.5	\$2.3/\$57.0	\$2.1/\$50.7

^a Export losses could result from use of vaccine and must be added to all scenarios. See impacts in Table 3 for various regionalization scenarios.

^b Assumes 60 flocks (70,000 birds/flock) started in immune state during first 4 weeks of outbreak. Efficacy refers to reducing flock-to-flock spread, not clinical signs.

^c M&M = morbidity and mortality, which are based on mortality and egg losses for the 1997 virus reported by the Pennsylvania Department of Agriculture.

^d Market loss due to infection with field virus and loss of table and pasteurization egg market if pasteurization market becomes saturated. Under current conditions, it is estimated that approximately \$3.4 million of the market losses shown could be salvaged or regained in the pasteurization market.

^x Includes production losses due to handling of birds and costs of vaccine administration (4 million birds vaccinated twice at \$0.12 each = \$1 million) plus about 2 days of low-level production losses under the nonpathogenic scenario.

Table 3 — Projected annual^a export losses if Pennsylvania (PA) uses AI vaccination or the virus converts to Highly Pathogenic under four potential regionalization scenarios (in millions of dollars).

	PA only	PA+ Delmarva	PA+Delmarva +SE USA	Rest of USA
Producer loss ^b	\$21.5	\$166.5	\$863.5	\$1,300.0
Consumer loss ^c	\$19.4	\$154.0	\$799.0	\$1,200.0
Net loss	\$1.6	\$12.4	\$64.4	\$96.7

^a Annual export losses shown above should be multiplied by the number of years trade sanctions would remain in place (probably between 2 and 3 years).

^b These losses were based on proportion of all poultry meat production that comes from respective regions. It is likely that, should Pennsylvania be embargoed, production from other States can be shifted to fill that market, decreasing the loss.

^c Restrictions on exports of poultry in a highly pathogenic AI situation yield consumer gains because the supply of domestic poultry in the marketplace goes up drastically, causing retail prices for chicken to fall.

Excerpts from the latest National Agricultural Statistics Service USDA Reports

“Chicken and Eggs” and “Broiler Hatchery” (NASS)

Broiler Eggs Set in 15 Selected States Up 5 Percent

The National Agricultural Statistics Service (NASS) “Broiler Hatchery” report states that commercial hatcheries in the 15-State weekly program set in incubators 167 million eggs during the week ending October 17, 1998. This was up 5 percent from the eggs set the corresponding week a year earlier. Average hatchability for chicks hatched during the week was 80 percent.

Broiler Chicks Placed Up 1 Percent

Broiler growers in the 15-State weekly program placed 131 million chicks for meat production during the week ending October 17, 1998. Placements were up 1 per-

cent from the comparable week in 1997. Cumulative placements from January 4, 1998, through October 17, 1998 were 5.70 billion, up slightly from the same period a year earlier.

September Egg Production Up 2 Percent

According to the NASS “Chicken and Eggs” report released October 23, 1998, U.S. egg production totaled 6.46 billion during September 1998, up 2 percent from the 6.35 billion produced in 1997. Production included 5.46 billion table eggs and 998 million hatching eggs, of which 940 million were broiler-type and 58.0 million were egg-type. The total number of layers during September 1998 averaged 310 million, up 2 percent from the total average number of layers during September 1997. September egg production per 100 layers was 2,081 eggs, down 1 percent from 2,096 eggs in September 1997.

All layers in the U.S. on October 1, 1998, totaled 312 million, up 2 percent from a year ago. The 312 million layers consisted of 255 million layers producing table or commercial type eggs, 53.9 million layers producing broiler-type hatching eggs, and 2.51 million layers producing egg-type hatching eggs. Rate of lay per day on October 1, 1998, averaged 69.3 eggs per 100 layers, down 1 percent from the 69.8 a year ago.

Laying flocks in the 30 major egg production States produced 6.10 billion eggs during September, up 1 percent from September 1997. The average number of layers during September, at 293 million, was up 2 percent from a year earlier.

Egg-Type Chicks Hatched Up 4 Percent

Egg-type chicks hatched during September totaled 38.6 million, up 4 percent from September 1997. Eggs in incubators totaled 33.1 million on October 1, 1998, up 6 percent from a year ago.

Domestic placements of egg-type pullet chicks for future hatchery supply flocks by leading breeders totaled 324,000 during September 1998, down 19 percent from the relatively large figure of 402,000 for September 1997.

Broiler Hatch Up 1 Percent

The September 1998 hatch of broiler-type chicks, at 693 million, was up 1 percent from September of the previous year. There were 582 million eggs in incubators on October 1, 1998, up 3 percent from a year earlier.

Leading breeders placed 7.31 million broiler-type pullet chicks for future domestic hatchery supply flocks during September 1998, up 12 percent from September 1997.

Broiler Whole Bird Condemnation (Company)

	Average Co.	Top 25%	Top 5 Co.'s
% Septox	0.309	0.252	0.216
% Airsac	0.139	0.065	0.058
% I.P.	0.168	0.107	0.248
% Leukosis	0.010	0.006	0.006
% Bruise	0.025	0.020	0.005
% Other	0.041	0.022	0.006
% Total	0.681	0.461	0.539
% 1/2 parts condemnations	0.366	0.327	0.368

Data for week ending 10/30/98



Meetings, Seminars and Conventions

1998 November

November 6-11: *Developing and Implementing HACCP in Small and Medium-Sized Plants*, Sheraton Uptown, Albuquerque, N.M. Contact: American Association of Meat Processors. Phone (717) 367-1168.

November 9-11: *American Feed Industry Association (AFIA) Nutrition Council/Symposium*, Clarion Plaza Hotel, Clayton, MO. Contact: Dorann Towery, AFIA, 1501 Wilson Blvd., Suite 1100, Arlington, VA 22209.

November 9-11: *1998 Animal Health Institute Joint Meeting*, Coronado Island Marriott Resort, San Diego, CA. Contact: Ellen Galant, Animal Health Institute, Alexandria, VA. Phone (703) 684-0011; Fax (703) 684-0125.

November 9: *International Poultry Health Conference on Respiratory Diseases*, Hannover, Germany. Contact: Elain Robson, PAC Conferences Ltd., P.O. Box 4, Drifffield, East Yorkshire, England YO25 9DJ. Phone 44(0)-1377-2563316.

November 9-11: *American Feed Industry Association Nutrition Council/Symposium*, Ritz-Carlton Hotel, Clayton, Mo. Contact: Dorann Towery, American Feed Industry Assn., 1501 Wilson Blvd., Suite 1100, Arlington, VA 22209. Phone (703) 524-0810.

November 10: *Poultry Health Conference*, Bingemans Conference Center, Kitchener, Ontario. Contact: Poultry Industry Council, R.R. No. 2, Guelph, Ontario N1H 6H8. Phone (519) 837-0284.

November 10-11: *Alabama Breeder/Hatchery Workshop*, Auburn University Hotel & Conf. Center, Auburn, AL. Contact: Alabama Poultry & Egg Assn., P.O. Box 240, Montgomery, AL 36101. Phone (334) 265-2732.

November 10-13: *EuroTier '98*, Hannover Toruismus Center, Hannover, Germany. Contact: Deutsche Landwirtschafts-Gesellschaft, Eschborner Landstrasse 122, D-60489 Frankfurt am Main, Germany.

November 19-20: *Biotechnology in Agriculture Conference*, Clifford Hardin Nebraska Center for Continuing Education, University of Nebraska-Lincoln. Contact: University of Nebraska Center for Biotechnology. Phone (402) 472-2635.

1998 December

December 5: *HACCP Briefing*, Sacramento, Calif., and Dallas, Texas. Contact: American Meat Institute

Foundation, P.O. Box 3556, Washington, D.C. 20007. Phone (703) 841-2400.

December 8: *HACCP Briefing*, Honolulu, Hawaii. Contact: American Meat Institute Foundation, P.O. Box 3556, Washington, D.C. 20007. Phone (703) 841-2400.

December 8-10: *52nd Annual North Dakota Poultry Industries Convention*; Holiday Inn, Fargo, ND. Contact: Dave Muehler, Chairman; 16450 Hwy. 11, Hankinson, ND. 58041-9706. Phone (701) 242-8209.

1999 January

January 10-12: *National Turkey Federation Annual Meeting*, Pointe Hilton at Squaw Creek, Phoenix, AZ. Contact NTF. Phone (202) 898-0100.

January 18-19: *Southern Poultry Science Society Annual Meeting*, World Congress Center, Atlanta, GA 30602. Phone (706) 542-1371.

January 19-22: *National Poultry & Food Distributors Association Annual Convention*, Hyatt Regency, Atlanta. New Member Reception, Jan. 20; Member of the Year breakfast, Jan. 21. Contact: Kristin. Phone (770) 535-9901; Fax (770) 535-7385.

January 20-22: *The International Poultry Exposition*, Georgia World Congress Center, Atlanta, GA. Contact: Southeastern Poultry & Egg Assn., 1530 Cooledge Road, Tucker, GA 30030. Fax (770) 493-9257.

1999 February

February 9-10: *Australian Poultry Science Symposium*, Sydney, New South Wales, Australia. Contact: Dr. D.J. Farrell, Queensland Poultry Research and Development Centre, Alexandra Hills, Queensland 4161, Australia. Fax +6173824 4316.

February 18: *Iowa Poultry Symposium*, Iowa, Iowa State University, Scheman Continuing Education Bldg., Ames, IA. Contact: Dr. Darrell Trampel, Iowa State University, 2270 College Veterinary Medicine, Ames, IA 50011.

February 22-23: *USDA Agricultural Outlook Forum*, Crystal Gateway Marriott Hotel, 1700 Jefferson Davis Hwy., Arlington, Va. Contact: Outlook Forum '99, Room 5143 South Bldg., USDA, Washington, D.C. 20250-3812. Phone (202) 720-3050.

February 22-26: *PEPA Convention*, Hilton Hotel, Palm Springs, Calif. Contact: Pacific Egg & Poultry Assn., 1521 1 St.,

Sacramento, Calif. 95814. Phone (916) 441-0801.

February 26-27: *APF Spring Meeting*, Arlington Hotel, Hot Springs, AR 72203. Phone (501) 375-8131.

1999 March

March 16-18: *Midwest Poultry Federation Convention*, RiverCentre, St. Paul, MN. Contact: Midwest Poultry Federation, 2380 Wycliff St., St. Paul, MN 55114-1257. Phone (612) 646-4553.

March 18-20: *VIV-Asia, International Trade Fair on Intensive Animal Production*, Queen Sirkit Centre, Bangkok, Thailand. Contact: Royal Dutch Jaarbeurs, P.O. Box 8500, 3505 RM Utrecht, Holland. Phone +31 30 295 59 11; Fax: + 31 30 29 40379.

March 24-25: *48th Annual New England Poultry Health Conference*, Sheraton Hotel, Portsmouth, NH. Contact: New England Grain & Feed Council, P.O. Box G, Augusta, MA 04330.

March 23-25: *Canadian Turkey Marketing Agency*, Executive Committees Meeting 23rd, CTMA 25th Annual Meeting 24, CTMA Meeting 24-25, Chateau Laurier Hotel, Ottawa. Contact: CTMA. Phone (905) 564-9356.

1999 April

April 9-13: *North Carolina/South Carolina Joint Turkey Federations Spring Meeting*, Embassy Suites Hotel, Myrtle Beach, S.C. Contact: North Carolina Turkey Federation, 4020 Barrett Dr., Suite 102, Raleigh, N.C. 27609. Phone (919) 783-8218.

April 13-14: *Arkansas Poultry Symposium*, Holiday Inn, Springdale, AR. Contact: Judy Kimbrell at Arkansas Poultry Federation. Phone (501) 375-8131.

April 14-15: *Poultry Industry Conference & Exhibition*, Western Fairgrounds, London, ON. Sponsored by the Ontario Poultry Council. Contact: Box 4550, Stn "D", London, ON. N5W 5K3. Phone (519) 438-7203; Fax (519) 679-3124.

April 15-18: *Georgia Poultry Federation Annual Spring Meeting*, Brasstown Valley Resort, Young Harris, GA. Contact: GFP. Phone (770) 532-0473.

April 24-27: *48th Western Poultry Disease Conference*, Landmark Hotel & Conference Centre, Vancouver, BC. Contact: Dr. R. Keith McMillan, 7727 127th Ave., Edmonton, AB. T5C 1R9. Phone (403) 472-4812; Fax (403) 476-7253; e-mail detlef.onderka@agric.gov.ab.ca