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Mycoplasma Update

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Efforts in the United States to control *Mycoplasma gallisepticum* (MG) began in the 1960's, primarily as a response to high condemnations from airsacculitis after the initiation of USDA post mortem inspection of poultry. Somewhat later, MS and MM were added to the program. Since then, significant progress has been made in controlling Mycoplasma infections in turkey and chicken breeding stocks. Voluntary MG control programs in the U.S. are administered under the National Poultry Improvement Plan; testing provisions and protocols are provided in their official publication. The majority of poultry production in the U.S. is mycoplasma-free; however, MG and MS infection are common in commercial egg production flocks. Unfortunately, in spite of increased efforts

at control, outbreaks continue to occur.

There have been changes which have resulted in an evolving situation in MG control, both in the United States and world-wide. These include changes in the poultry industry itself, improved detection methods, better understanding of the agent and its pathogenesis, and improved control methods.

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Broiler Performance Data (Region) Live Production Cost					
	SW	Midwest	Southeast	Mid-Atlantic	S-Central
Feed cost/ton w/o color (\$)	120.18	114.89	125.28	126.38	124.61
Feed cost/lb meat (¢)	10.85	10.58	11.80	12.33	11.52
Days to 4.6 lbs	46	45	45	44	45
Med. cost/ton (¢)	2.73	1.82	2.99	2.57	3.13
Chick cost/lb (¢)	4.27	3.86	3.95	3.66	3.83
Vac-Med cost/lb (¢)	0.05	0.03	0.13	0.05	0.11
WB & 1/2 parts condemn. cost/lb	0.20	0.18	0.18	0.20	0.23
% mortality	4.12	3.20	3.46	4.37	4.08
Sq. Ft. @ placement	0.80	0.78	0.81	0.81	0.84
Lbs./Sq. Ft.	5.78	6.48	6.42	7.10	6.38
Down time (days)	15	13	16	14	15

Data for week ending 9/30/00

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Mycoplasma Update

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Changes in the Poultry Industry Which Affect Mycoplasma Control

In most modern poultry producing areas of the world, the emphasis on the control of Mycoplasma infections has been centered around maintenance of Mycoplasma-free breeding stock and keeping parent and production flocks free of infection by utilizing single-age, all-in all-out farms with good biosecurity. In many parts of the world, this has been very successful, and the majority of broiler, turkey and egg production is free of infection. In contrast, areas with less-developed poultry industries tend to have high levels of contamination with MG and MS; this poses special problems for companies attempting to institute modern production methods.

With the rapid growth of poultry production world-wide, there has been concentration of large numbers of birds into small areas, leading to increased risk of exposure to pathogenic Mycoplasmas. In some areas, poultry production is so concentrated that from an epidemiological point of view, it is almost like a very large multi-age farm. Also, general improvements in disease control have sometimes resulted in decreased efforts in biosecurity, thus enhancing the possibilities for the spread of Mycoplasma infections.

There has been a tendency to drift away from all-in all-out production and to concentrate production on multi-age sites. This has been especially true for commercial egg production — the majority of egg production in the U.S. is now on multi-age sites, and this trend is developing around the world. Such multi-age production sites are mostly MS-positive, and many are also MG positive, even though grandparent and parent stocks are generally MG and MS-free.

In many locations, multi-age management of broiler breeders or broilers may occur. In turkey production, multi-stage production farms, on which 2 or even 3 different ages are maintained, are becoming quite common.

Therefore, in spite of sometimes heroic efforts at biosecurity and improved understanding of the survival of Mycoplasmas outside the host, Mycoplasma outbreaks continue to occur.

Improvements in Detection Methods

The basis for control programs has centered around serological methods such as agglutination and hemagglutination-inhibition, with reactors often confirmed by isolation of the organism. More recently, commercial ELISA kits have become available (IDEXX Laboratories, Westbrook, Main, USA; Kirkegaard and Perry Laboratories, Gaithersburg, Maryland, USA) and are becoming widely used. Such kits have excellent sensitivity and specificity, but not-specific reactions may still occur. Potential improvements in ELISA specificity may result from the utilization of highly purified antigens, or the use of a blocking ELISA utilizing a specific monoclonal antibody.

MG strains of low virulence typically produce a poor antibody response, and isolation from clinical specimens may be difficult. This may be especially true if the antigenic makeup of the MG strain involved is not a good match with the strains used to produce test antigens. Variability in strains and clinical responses have also been noted for MS. Recently, we have encountered situations where flocks have exhibited a low-level serological response with a low percentage of PCR reactions. Such flocks have been culture negative. It has been possible to transfer such reactivity by placing SPF chickens in contact with the principals. These observations suggest that there may be atypical strains which have been undetectable with traditional diagnostic methods.

Polymerase chain reaction represents a rapid and sensitive alternative to traditional culture methods, which require specialized media and reagents and are time consuming. At least one company (IDEXX Laboratories, Westbrook, Main, USA) produces commercial PCR kits, which are being widely used.

Such improvements in serological methods and rapid detection by PCR have done much to facilitate the rapid and accurate diagnosis of MG infection.

Variability Among and Within Strains of *M. gallisepticum* and *M. synoviae*

MG and MS strains are known to vary in pathogenicity and antigenicity. Variability in pathogenicity among strains of MG has been recognized for some time. **Significant antigenic variability among MG strains also exists, which could affect the sensitivity of serological tests, depending on the strain infecting the flock and the strain used to prepare antigen.** There are also significant differences in virulence among strains of MS. **Recently, a strain of MS was encountered in turkeys which did not induce an antibody response even though birds were culture positive in the upper respiratory tract.** Although this has not been well studied, this is also likely true for MM and *M. iowae* strains.

Restriction Length Polymorphism (RFLP) of whole-cell DNA has been shown to be useful for differentiating MG strains. However, the RFLP procedure is time-consuming and laborious, making identification of specific strains a tedious procedure. More recently, Random Amplified Polymorphic DNA (RAPD) has been developed for identifying specific strains. This procedure is very simple and rapid, and has provided a routine procedure for the rapid identification of MG strains. This has proven to be very useful for epidemiological studies and for identification of specific MG strains in field outbreaks. More recently, we have utilized a PCR for the PvpA gene, followed by RFLP of the PCR product to identify specific MG

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strains. The advantage of this method is that it is not necessary to first isolate the MG strain in pure culture — it can be done with a tracheal swab. Using this method, we have recently identified an MG strain in a commercial layer flock which is very closely related to the MG strain which infects wild house finches in the Eastern U.S.

Studies utilizing Western blots and monoclonal antibodies have shown a high degree of variability in expression of surface antigens among strains of MG; many of these proteins are variably expressed. This has led to a large effort in characterizing the variable expression of surface antigens have shown that phase variation also occurs *in vivo*. Similar variability of surface antigen expression has now also been shown to occur among strains of MS. For example, clones of MS which are hemagglutinin negative are less virulent than clones which are hemagglutinin positive. The significance of such variability in the expression of surface antigens is not well understood; however, it seems logical that it would play a role in pathogenesis, serological responses, and evasion of the immune system of the host.

***M. gallisepticum* Vaccination**

With the advent of multi-age commercial layer complexes, control by vaccination became desirable.

The first commercially available MG vaccines were oil-emulsion bacterins. Bacterins protect well against airsacculitis and egg production losses, but provide little protection against colonization by field strains of MG, thus providing little value in eradication programs. Major disadvantages of bacterins are the need for 2 doses for optimal protection and the cost of administration.

Live MG vaccines include F strain, which has been available for some time through several manufacturers, strain 6/85 from Intervet America, Millsboro, Delaware, and strain ts-11, developed and widely used in Australia and licensed in the U.S. by Select Laboratories, Gainesville, Georgia.

F strain exhibits moderate virulence in chickens (it is virulent for turkeys), colonizes the upper respiratory tract efficiently, spreads relatively slowly from flock to flock, and offers protection against losses in egg production. It provides excellent protection against colonization by challenge strains, and displaces the wild-type field strains present in multi-age commercial egg operations. Unfortunately, F strain has been implicated in field infections in commercial turkeys.

Strains 6/85 and ts-11 offer significant advantages over F strain. They both offer protection against challenge, but are avirulent and have very limited potential to spread from bird to bird, thus presenting very little danger to neighboring poultry flocks. F strain has better ability to displace challenge strains in pen trial studies than does 6/85 or ts-11, but field experience in a commercial layer operation suggests that strain ts-11 may be able to displace F strain in multi-age commercial layers. After ts-11 vaccination was discontinued, the flock has remained MG-free. Similar data with the 6/85 strain is not available, but there are complexes which have used 6/85 which now are seronegative, suggesting that displacement of wild type strains is also possible with 6/85. If the wild-type strains are highly virulent, it may be necessary to vaccinate with F strain for 1 or more production cycles and then switch over to either 6/85 or ts-11.

One major concern about live MG vaccines is safety. There have been numerous instances of clinical respiratory disease caused by "escaped" F strain vaccine; this strain should probably not be used if there is potential danger of spread to turkeys, even though it is the most efficacious strain in chickens. The 6/85 strain has been shown to be very safe in chickens, and has never been detected in unvaccinated chicken flocks, to the knowledge of this author. However, there have been several instances of isolation of 6/85-like MG strains from turkeys showing clinical disease. In most cases there was a history of vaccination of nearby chickens. The ts-11 strain has been detected on at least two occasions in unvaccinated chicken flocks. In both instances there is a history of possible inadvertent vaccination and in one of the instances, subsequent spread to neighboring broiler breeders. **These experiences suggest that even though the newer vaccines are very safe, they do have the potential for spread, and their safety should be very carefully evaluated before a decision is made to vaccinate.** An important rule for consideration in the use of these vaccines, is that high titered vaccine should be used and administered properly in order to give the vaccine strain little opportunity to spread from bird to bird. Table 1 summarizes the authors experience with the characteristics of the various vaccine strains.

MG vaccines have had less use in turkeys. The F strain is too pathogenic for consideration in turkeys, but 6/85 or ts-11 strains may have potential use under very limited circumstances. In one vaccination trial conducted by us, administration of 6/85 or ts-11 did not result in respiratory signs or lesions in turkeys. There was little or no measurable resistance against airsacculitis after heavy aerosol challenge, but there was some protection detected against lesions in the upper respiratory tract. The ts-11 strain appears to have limited ability to infect turkeys.

Field experiences utilizing live vaccines have been very favorable in commercial layers, and field experiences in multi-age broiler breeders has also been favorable. **These experiences suggest that live vaccines may be valuable tools for the eradication of MG infection on multi-age commercial poultry farms.**

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There has been relatively little work on MS vaccines. There has been one MS bacterin licensed in the U.S., but it apparently has had little field use. A temperature sensitive MS strain has been licensed for use in Australia, and is widely used there. It has been licensed in Mexico and some other countries, but is not available in the U.S.

Table 1. Comparison of live MG vaccine strains.			
	F Strain	6/85	Ts-11
Form	Lyophilized	Lyophilized	Frozen
Route	Various	Spray	Eye Drop
Virulence	Moderate	None	None
Persistence	Excellent	???	Good
Antibody	Moderate	None	Weak
Transmission	Moderate	Poor	Poor
Displacement	Excellent	???	Good

Broiler Whole Bird Condemnation (Company)

	Average Co.	Top 25%	Top 5 Co.'s
% Septox	0.242	0.258	0.276
% Airsac	0.096	0.059	0.046
% I.P.	0.069	0.042	0.026
% Leukosis	0.003	0.002	0.002
% Bruise	0.010	0.007	0.009
% Other	0.013	0.008	0.002
% Total	0.433	0.377	0.360
% 1/2 parts condemnations	0.376	0.329	0.346

Data for week ending 9/30/00

Excerpts from the latest USDA National Agricultural Statistics Service (NASS) "Broiler Hatchery," "Chicken and Eggs" and "Turkey Hatchery" Reports and Economic Research Service (ERS) "Livestock, Dairy and Poultry Situation and Outlook" Reports

Slowing Production, Higher Exports, Strengthen Broiler Prices

According to the most recent Economic Research Service (ERS) reports, by the end of third-quarter 2000, slower growth in domestic production and an expanding export market had combined to strengthen broiler parts prices. During the third quarter, the prices of most broiler parts had increased. Prices for leg quarters in the Northeast market had risen to 28.5 cents by the middle of September, up approximately 15 percent from the end of June. The outlook for broiler parts prices during fourth-quarter 2000 and into 2001 will hinge on whether production increases remain moderate, as the export market is expected to remain strong.

After relatively strong production increases in most of the 1990's, the U.S. broiler industry in 2000 is slowing its rate of expansion. U.S. broiler production over the first 7 months of 2000 totaled 17.8 billion pounds, 2 percent higher than the previous year. The forecast for 2000's total production is for a 3-percent increase from 1999. Adding to upward pressure on prices is smaller stocks in cold storage. Cold storage holdings of broiler parts, as of

August 31, were down 5 percent from the previous year.

In 2000, the export picture again became a bright spot for the broiler industry, with shipments forecast to increase 7 percent. Broiler export growth had outpaced production growth between 1990 and 1997, strengthening domestic prices. After two years of slow or little growth in exports due to economic upheavals in a number of importing countries, most major broiler markets will import considerably more in 2000. The major markets are Russia, Mexico, and China/Hong Kong, which together accounted for 69 percent of U.S. broiler exports over the first 7 months of 2000.

Russia and Mexico have both benefited from the rise in world oil prices. Broiler shipments to Russia have also benefited from changes in import tariffs. Tariff rates on poultry products were equalized, with the broiler tariffs being lowered slightly, while tariff rates for turkey and other poultry products were increased. Total shipments to Russia totaled 994 million pounds from January through July 2000, an 18 percent increase. This figure includes those broiler exports going through Latvia and Estonia, as almost all of these products eventually end up in Russia.

This year, along with higher oil prices, the Mexican economy benefited from a smooth transition of power after an unprecedented change in political leadership. As the economy continues to improve, imports have increased 20 percent during first 7 months of 2000.

U.S. broiler exports to China/Hong Kong totaled 1.383 billion pounds in 1999, an increase of 26 percent from the previous year. Through July, shipments have totaled 929 million pounds, an increase of 16 percent and for the year exports are expected to be near 1.5 billion pounds.

With strong exports to our three largest markets plus a number of the smaller markets, broiler exports have surged to 3.2 billion pounds, up 24 percent from the previous year. While the pace of export growth is expected to slow somewhat in the second half of 2000, the total for the year is expected to be a record 5.2 billion pounds. Slower export growth is expected in 2001 as shipments, especially to Russia, level out.

Turkey Stocks Lower, Prices Little Changed

Federally inspected turkey production totaled 3.102 billion pounds over the first 7 months of 2000, up 4 percent from the previous year. Turkey production growth is expected to slow during the remainder of 2000. While the number of poults placed compared with the previous year has varied widely from month to month, the cumulative number of poults placed from September 1999 through August was up less than 1 percent from the previous year.

At the beginning of September, stocks of whole birds were down 17 percent from the previous year and stocks of all turkey products were down 10 percent. The slower growth in production and lower stocks has had little impact on prices. In August, the three-region price for whole birds was 71.8 cents a pound, down 1 percent from the previous year, but stronger prices are expected for the fourth quarter holidays.

Over the first 7 months of 2000, turkey exports totaled 239 million pounds, up 22 percent from the previous year. Most of the increase has come from the same three markets that have pushed up broiler exports. Shipments to Mexico, Russia, and China/Hong Kong have accounted for 76 percent of total turkey exports. Export growth during the remainder of 2000 is expected to be lower. Export growth to Russia is expected to slow as the tariffs on turkey products were recently raised.

Higher Exports, but Low Prices for Eggs

Total egg exports in July on a shell-egg equivalent basis were 13.3 million dozen, 7 percent higher than the previous year. So far in 2000, egg exports have totaled 92.2 million dozen, 3 percent higher than in 1999. Most of the strength in exports has come from increased shipments to Mexico and Japan.

Retail egg prices continue to be well below those from the same period a year earlier. Retail prices in August for Grade A large eggs were 89 cents a dozen, down from \$1.02 the previous year. Retail prices for eggs are expected to remain depressed through the rest of the third quarter, but strengthen slightly in the fourth quarter.

Broiler Eggs Set In 15 Selected States Down Slightly

According to the most recent National Agricultural Statistics Service (NASS) report commercial hatcheries in the 15-State weekly program set in incubators 175 million eggs during the week ending September 30, 2000. This was down slightly from the eggs set the corresponding week a year earlier. Average hatchability for chicks hatched during the week was 82 percent. Average hatchability is calculated by dividing chicks hatched during the week by eggs set three weeks earlier.

Broiler Chicks Placed Up 3 Percent

Broiler growers in the 15-State weekly program placed 137 million chicks for meat production during the week ending September 30, 2000. Placements were up 3 percent from the comparable week in 1999. Cumulative placements from January 2, 2000, through September 30, 2000, were 5.68 billion, up 1 percent from the same period a year earlier.

August Egg Production Up 2 Percent

U.S. egg production totaled 7.10 billion during August 2000, up 2 percent from the 6.97 billion produced in 1999. Production included 6.01 billion table eggs and 1.09 billion hatching eggs, of which 1.03 billion were broiler-type and 65.0 million were egg-type. The total number of layers during August 2000 averaged 325 million, up 2 percent from the total average number of layers during August 1999. August egg production per 100 layers was 2,181 eggs, up slightly from 2,177 eggs in August 1999.

All layers in the U.S. on September 1, 2000, totaled 325 million, up 1 percent from a year ago. The 325 million layers consisted of 268 million layers producing table or commercial type eggs, 54.3 million layers producing broiler-type hatching eggs, and 2.81 million layers producing egg-type hatching eggs. Rate of lay per day on September 1, 2000, averaged 70.2 eggs per 100 layers, down 1 percent from the 70.9 a year ago.

Laying flocks in the 30 major egg producing States produced 6.66 billion eggs during August, up 2 percent from August 1999. The average number of layers during August, at 305 million, was up 1 percent from a year earlier.

Egg-Type Chicks Hatched Down 3 Percent

Egg-type chicks hatched during August totaled 34.3 million, down 3 percent from August 1999. Eggs in incubators totaled 34 million on September 1, 2000, down 2 percent from a year ago.

Domestic placements of egg-type pullet chicks for future hatchery supply flocks by leading breeders totaled 275,000 during August 2000, down 14 percent from August 1999.

Broiler Hatch Down Slightly

The August 2000 hatch of broiler-type chicks, at 740 million, was down slightly from August of the previous year. There were 614 million eggs in incubators on September 1, 2000, down 1 percent from a year earlier.

Leading breeders placed 7.29 million broiler-type pullet chicks for future domestic hatchery supply flocks during August 2000, down 5 percent from August 1999.

Turkey Eggs in Incubators on September 1 Up 4 Percent From Last Year

Turkey eggs in incubators on September 1, 2000, in the United States totaled 29.9 million, up 4 percent from September 1 a year ago. Eggs in incubators were down 5 percent from the August 1 total of 31.4 million. Regional changes from the previous year were: East North Central, up 4 percent; West North Central, up 5 percent; North and South Atlantic, down 1 percent; South Central, up 1 percent; and West, up 22 percent.

Poults Placed During August Up 3 Percent From Last Year

The 25.4 million poults placed during August 2000 in the United States were up 3 percent from the number placed during the same month a year ago. Placements were down 6 percent from the July total of 27.1 million. Regional changes from the previous year were: East North Central, down 3 percent; West North Central, down 4 percent; North and South Atlantic, up 9 percent; South Central, up 4 percent; and West, up 13 percent.

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

	Average Co.	Top 25%	Top 5 Cos.
Feed cost/ton w/o color (\$)	123.13	117.78	112.24
Feed cost/lb meat (¢)	11.45	10.63	10.21
Days to 4.6 lbs	45	45	47
Med. cost/ton (¢)	2.76	2.36	1.64
Chick cost/lb (¢)	4.03	3.89	3.54
Vac-Med cost/lb (¢)	0.09	0.03	0.04
WB & 1/2 parts condemn. cost/lb	0.20	0.18	0.18
% mortality	3.93	3.53	3.59
Sq. Ft. @ placement	0.81	0.79	0.80
Lbs./Sq. Ft.	6.29	6.10	6.24
Down time (days)	14	13	12

Data for week ending 9/30/00

Broiler Whole Bird Condemnation (Region)

	SW	Mid- West	S. East	Mid- Atlantic	S. Central
% Septox	0.246	0.305	0.155	0.288	0.275
% Airsac	0.064	0.051	0.128	0.106	0.089
% I.P.	0.064	0.044	0.066	0.048	0.095
% Leukosis	0.003	0.001	0.002	0.006	0.002
% Bruise	0.008	0.005	0.012	0.010	0.012
% Other	0.017	0.008	0.014	0.018	0.007
% Total	0.413	0.415	0.375	0.477	0.480
% 1/2 parts condemnations	0.380	0.298	0.333	0.332	0.438

Data for week ending 9/30/00



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Meetings, Seminars and Conventions

2000 October

Oct. 12-14: Layer Symposium, Lexington, KY. Contact: Carol Johnson, Alltech Inc., 3031 Catnip Hill Pike, Nicholasville, KY 40356. Phone: 606-887-3242

Oct. 13-14: Poultry Protein & Fat Seminar, DoubleTree Hotel, Nashville, TN. Contact: U.S. Poultry & Egg Association, 1530 Cooledge Road, Tucker, GA 30094. Phone: 770-493-9401.

Oct. 15-17: Broiler Symposium, Lexington, KY. Contact: Carol Johnson, Alltech Inc., 3031 Catnip Hill Pike, Nicholasville, KY 40356. Phone: 606-887-3242

Oct. 18-20: National Meeting on Poultry Health and Processing, Sheraton Ocean City, Ocean City, Maryland. Sponsored by Delmarva Poultry Industry, Inc. Contact: Sharon Webb. Phone: 302-856-9037; Fax: 302-856-1845; E-mail: dpi@ce.net

Oct. 25-27: Poultry Service Industry Workshop (PSIW), Annual Workshop, The Banff Centre, Banff, Alberta, Canada. Details from Sandy Clarke, PSIW, #905 O.S. Longman Building, 6909 - 116 Street Edmonton, Alberta, Canada; Phone: 780-422-0508; Fax: 780-427-1439.

2000 November

Nov. 7-10: Expoaviva, International Poultry & Livestock Technology Show, Montjuic Trade Fair Center, Fira de Barcelona, Spain. Contact: F. Xavier Castells, Manager, Expoaviva, Avda. Reina Mo. Cristina, s/n 08004 Barcelona, Spain. Fax: +34 93 23 32602.

Nov. 14-15: Breeder/Hatchery Workshop, Auburn University, Auburn, AL. Contact: Alabama Poultry & Egg Association, P.O. Box 240, Montgomery, AL 36101-0240. Phone: 334-265-2732.

Nov. 15-17: XVI Central America Poultry Congress, Hotel El Panama, Ciudad de Panama, Panama. Contact: Dr. Evelio Quiroz, Presendente APECA, Apartado No 6-3994, Estafeta El Dorado, Panama. Fax: +507 261 1352

Nov. 16: CFIA Poultry Nutrition Conference, Sheraton Imperial Hotel, Research Triangle Park, NC. Contact: Owen Robertson, Carolina Feed Industry

Association secretary-treasurer, 2116 N. Shoreline Drive, Sanford, NC 27330. Phone: 919-776-3054

Nov. 22-25: Mexican National Poultry Congress (UNA), Fiesta Americana Coral Beach Hotel. Contact: Leonard Viajes SA de CV, Cesar Gomez. Phone: (52) 5557-2744.

Nov. 27: Coccidiosis 2000, Hannover, Germany. Contact: Elaine Robson, Conference Organizer, Positive Action Conferences, P.O. Box 4, Drifffield, East Yorkshire YO25 9D1 England. Phone: +44 (0) 1377-256316; Fax: +44 (0) 1377-254663.

Nov. 8 - Dec. 1: EUROTIER International Exhibition for Livestock & Poultry Production, Hannover, Germany. Contact: Daniel M. Koning, DLG, Eschborner Landstrasse 122, D-60489 Frankfurt, Germany. Fax: +49 69 2478 8113.

2001 January

Jan. 17-19: 2001 International Poultry Exposition, Georgia World Congress Centre, Atlanta, Georgia, USA. Contact: US Poultry & Egg Association, 1530 Cooledge Road, Tucker, Georgia 30084, USA. Fax: +1 770-493-9257.

2001 February

Feb. 11-16: 2nd International Poultry Broiler Nutritionists Conference, Rutorua, New Zealand. Contact: Bob Diprose, Executive Director, Poultry Industry Association, 96D Carlton Gore Road, Auckland, New Zealand. Phone: +64 9 520 4300; Fax: +64 9 520 1533

2001 March

March 14-15: MPF Convention, Touchstone Energy@Place, RiverCentre, St. Paul, Minn. Contact: Midwest Poultry Federation, 2380 Wycliff St., St. Paul, Minn. 44114-1257. Phone: 651-464-4553.

March 14-16: VIV Asia, Queen Sirikit National Convention Center, Bangkok, Thailand. Contact: VIV Secretariat, Royal Netherlands Industries Fair, PO Box 8500 NL-3503 RM Utrecht, The Netherlands. Phone: +31 20 295 5662; Fax: +31 30 295 5709.

March 23-26: American College of Poultry Veterinarians Workshop and the 50th Western Poultry Disease Conference, University of California, Davis. Contact: Conferences & Event Services. Phone: 530-757-3331; Fax: 530-757-7943. Website: conferences.ucdavis.edu (click on Academic Conferences).

March 28-29: NPI Annual Convention, New World Inn, Hwy. 30 & 81 S., Columbus, Nebraska. contact: Nebraska Poultry Industries Inc., A103 Animal Sciences, University of Nebraska, P.O. Box 830908, Lincoln, Nebraska 68583-0908. Phone: 402-472-2051.

2001 April

April 24-26: Victam Europe 2001 "The Global Event Supplying the Feed & Food Chain" Utrecht Trade Fair, Utrecht, The Netherlands. Contact: Phone: +31 33 246 4404; Fax: +31 33246 4706 or Email expo@victam.com

April 24-26: Agro-Foodtech China 2001 International Exhibition for Agriculture, Animal Breeding and Food-Processing Industries in China, Contact: Florence Mouscadet. Phone: +33 149 685677; Fax: +33 149 685299.

April 25-27: 24th Technical Turkey Conference, Shrigley Hall Hotel near Macclesfield, UK. Contact: Fax: +44 1969 6637644 or Email: Turkeys@Compuserve.com

2001 September

Sept. 1-4: 6th European Symposium on Poultry Welfare, Zollikofen, Switzerland. Contact: Alois Mettler, WPSA Symposium 2001, Burgerweg 24, CH-3052 Zollikofen, Switzerland. Fax: +41 31 911 64 60.