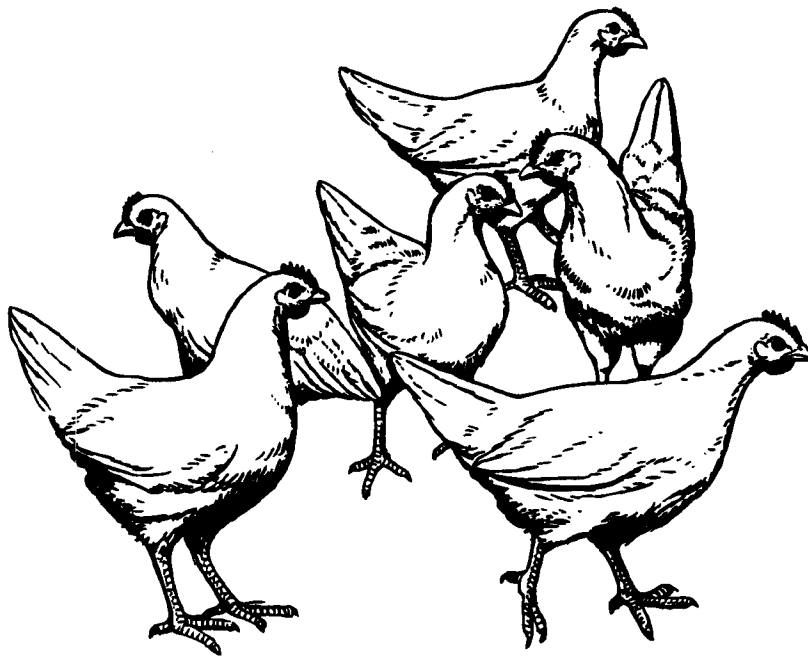


**Diagnostic Laboratory Data**  
**as a Measure of**  
**National Poultry Flock Health**



**Centers for Epidemiology and Animal Health**  
**USDA:APHIS:VS**

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# Diagnostic Laboratory Data as a Measure of National Poultry Flock Health

## Objective

The objective of this survey was to determine if diagnostic laboratory data can be used as an accurate measure of poultry health at a national level.

Questionnaires were mailed in November of 1995 to 205 diagnostic laboratories throughout the United States (U.S.). Sixty questionnaires were returned.<sup>1</sup> Of the sixty, ten reported that they do not provide poultry diagnostic services, and fifty completed parts or all of the questionnaire. Each questionnaire represented data from one to eight laboratories as some were reporting as part of a Diagnostic Laboratory system. Data were reported from 34 states.

## Record Keeping Systems

The first part of the survey dealt with record keeping systems utilized by the laboratories and the types of information routinely recorded for poultry accessions. Table 1 summarizes the types of information routinely recorded for poultry accessions and the number and percentage of laboratories recording this information.

**TABLE 1**

Type of Information Recorded	Number Recording	Percentage Recording
Grower name and address	43	90%
Company name and address	45	94%
State of origin of sample	44	94%
Name of person submitting sample	45	94%
Species of bird	47	98%
Type of bird (layer, broiler, etc.)	40	87%
Age of bird	47	100%
History of illness/reason for test	45	96%
Vaccine and/or treatment history	42	89%
Results of test performed	47	98%
Final laboratory diagnosis of case	45	96%
Accession number	45	96%

The three methods of capturing data were computer data base only, hard copy only, and both computer data base and hard copy. Greater than 50% of respondents utilized both computer data base and hard copy for all types of information recorded with the exceptions of "history of illness/reason for

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<sup>1</sup> Data did not reflect April 1996 changes to poultry disease reporting system. (See Appendix 1.)

test” and “vaccination and/or treatment history”. For “history of illness/reason for test” only 34% utilized both computer data base and hard copy, while 61% utilized hard copy only. For “vaccination and/or treatment history” 36% utilized both computer data base and hard copy, while 64% utilized hard copy only.

Ninety-six percent of laboratories responding reported that one type of information is used as a primary means of sample identification. Of these, 89% reported the accession number as the primary means of sample identification.

Forty-nine percent of the 47 laboratories responding reported that data are readily available from the data base by searching for a specific diagnosis or disease. Of those, 19 reported that the diagnosis is linked with other types of information, and 24 of 34 or 62% of those responding reported that acute and convalescent samples could be linked.

The availability of “history of illness/reason for test” for poultry accessions ranges from 0% to 100% with an average of 75% of accessions having this information. Of those, signs referable to the gastrointestinal tract ranged from 3% to 70% with an average of 30% presenting with clinical signs of gastrointestinal disease. Accessions with signs referable to the respiratory tract ranged from 5% to 95% with an average of 41%. Accessions presenting with clinical signs referable to other than the gastrointestinal or respiratory tracts ranged from 2% to 95% with an average of 32%.

**Population Served by Laboratories**

Some laboratories received accessions exclusively from commercial flocks and some laboratories provided services exclusively for backyard flocks. When asked to estimate the breakout of accessions in terms of being from commercial flocks vs. backyard flocks, laboratories reported an average of 68% (0%-100%) of all accessions were from commercial flocks. The average percentage of accessions from backyard flocks was estimated at 34% (0%-100%). Three percent of accessions were from an unknown source (0%-10%).

Thirty-six laboratories reported that they provide services to flocks grown out of state. Of these, 30 laboratories reported that the accessions are identified as to state of origin.

Forty-eight laboratories answered whether or not they felt that the volume of accessions represented the true state of poultry health and disease in their state. Twenty-six laboratories felt that their data did not represent the perceived state of poultry health in their state, while 22 laboratories felt that their data were representative of poultry health in their state. Reasons believed to contribute to data not being representative of poultry health are summarized in Table 2. Ten laboratories identified sources of data other than diagnostic labs that they felt were more representative of poultry health in their states.

**TABLE 2**

<b>Reason for non-representative data</b>	<b>Number reporting</b>
Laboratory location	6
Company laboratory testing	18
Cost of services	4
Service limitations	5
Lack of expertise	4
Lack of contact with industry	7

## Services and Case Volume

Diagnostic laboratories were asked to report the average number of accessions processed annually for various services in 1992, 1993, and 1994 (Table 3). Thirty-six laboratories reported that the average number of necropsies performed annually ranged from zero for those laboratories that provide only bacteriologic and/or serologic services to 5,000 for full service laboratories. The average number of necropsies performed for all laboratories reporting was 615 per year.

**TABLE 3**

<b>Service</b>	<b>Number Reporting</b>	<b>Average Annual Accessions</b>	<b>Range of Annual Accessions</b>
Necropsy	36	615	0 to 5,000
Bacterial isolation	30	398	5 to 4,173
Virus isolation	27	105	0 to 1,472
Serology	30	10,927	0 to 250,000
Parasitology	24	71	0 to 500
Histology from field necropsies	26	202	0 to 1,500

Thirty laboratories reported that they provided bacteriologic services with an average of 398 cultures per year. The number of isolations ranged from 5 to 4,173 on an annual basis. Twenty-seven laboratories reported on numbers of virus isolations performed on an annual basis with numbers ranging from 0 to 1472. The average number for all labs reporting was 105 virus isolations.

Not all laboratories provided serologic services for the period 1992-1994. Of the 30 laboratories reporting, the numbers of samples processed for serology ranged from 0 to 250,000 with an average case load of 10,927 samples per year.

Parasitology accessions ranged from 0 to 500 per year for the 24 laboratories reporting these numbers. The average number of samples processed for parasitology was 71 per year.

Twenty-six laboratories reported numbers for histology performed for field necropsy cases. Numbers ranged from 0 to 1500 per year with an average number of 201 per year for all laboratories.

Additional services provided for the poultry industry are shown in Table 4. Twenty-nine laboratories provided toxicologic analyses, 16 provided clinical pathology, 15 provided immunologic tests, 13 provided mineral/vitamin analyses, 4 provided drug residue testing, and one laboratory reported providing endocrinology services.

**TABLE 4**

<b>Service</b>	<b>Number Reporting</b>	<b>Number Providing Service</b>
Clinical pathology	38	16
Toxicology	44	29
Endocrinology	38	1
Mineral/Vitamin analysis	39	13
Drug residue	38	4
Immunologic tests	43	15

**Service Costs**

Thirty-four laboratories reported that they charge for poultry necropsy services. The average cost for a necropsy was reported as \$28.00 with costs ranging from \$2.00 to \$70.00. Services included in the basic necropsy fee are shown in Table 5. These included bacteriology, virology, toxicology, and histology. Bacteriology and histology were most often reported as included in the basic fee followed by virus isolation and toxicologic analyses. Other services listed by some laboratories as included in the basic necropsy fee included: electron microscopy, serology, parasitology, and farm visits.

**TABLE 5**

<b>Service</b>	<b>Number Reporting</b>	<b>Number Including in Basic Fee</b>
Bacteriology	36	27
Virology	35	18
Toxicology	34	12
Histology	35	23

Charges for services provided for field necropsies and flock health monitoring are summarized in Table 6. Charges for bacteriology averaged \$11.58 and ranged from \$3.00 to \$24.00. Virus isolation charges averaged \$24.15 and ranged from \$10.00 to \$75.00. Not all laboratories charged for serology. The average cost for serology was \$5.46 with a range of \$0.00 to \$40.00. The cost of parasitology averaged \$6.67 and ranged from \$2.00 to \$15.00. Charges for histology averaged \$17.00 and ranged \$5.00 to \$36.00.

**TABLE 6**

Service	Number Reporting	Cost Range
Bacteriology	29	\$3.00-\$24.00
Virology	20	\$10.00-\$75.00
Serology	27	\$0.00-\$40.00
Parasitology	27	\$2.00-\$15.00
Histology	27	\$5.00-\$36.00

### Carcass Disposal

Forty-seven laboratories reported on carcass disposal methods. Twenty-seven laboratories reported that 71.8% (0%-100%) of carcasses were picked up by renderers. Fifteen laboratories reported that 30% (0%-100%) of carcasses were disposed of in a landfill. Thirty-one laboratories reported that 70% (0%-100%) of carcasses were incinerated. One laboratory reported that 20% of their carcasses were composted.

Of the forty-four laboratories reporting on regulations governing carcass disposal methods, 35 reported that there were state regulations in place.

### Reports of OIE List Diseases

The Office International Des Epizooties (OIE) has established guidelines for disease reporting in order to facilitate international trade in animals and animal products. The OIE International Health Code divides animal diseases into list A and list B, and list C diseases. List A diseases are those which have potential for very serious and rapid spread, irrespective of national borders, which are of serious socio-economic or public health consequence and which are of major importance in the international trade of animals and animal products. List A diseases are reported to the OIE as often as diagnosed. List B diseases are those which are considered to be of socio-economic and/or public health importance within countries and which are significant in the international trade of animals and animal products. List C diseases are communicable diseases with important socio-economic and/or sanitary influence at the local level. Reports of lists B and C diseases are normally submitted once a year.

Table 7 reports OIE list A diseases for poultry with number of laboratories reporting, the tests most often used for diagnosis, and number of tests performed in 1994. NOTE: All OIE list A diseases are reportable in all states.

**TABLE 7**

Disease	Number Reporting	Primary Tests	Range of Tests Performed
Avian influenza A	39	Agar Gel Precipitation	0 to 90,640
Velogenic Newcastle disease	26	Virus isolation	0 to 15,691

Table 8 reports OIE list B diseases for poultry with number of laboratories reporting, the tests most often used for diagnosis, and in how many states the disease is reportable.

**Table 8**

<b>Disease</b>	<b>Number Reporting</b>	<b>Primary Tests</b>	<b>Number of States Reportable</b>
Infectious bursal disease	31	Elisa/Histology	None
Marek's disease	31	Histology	None
Mycoplasmosis (MG)	38	Serum Plate Agglutination	14
Psittacosis-Ornithosis	28	Elisa	16
Avian infectious bronchitis	30	Elisa	None
Avian infectious laryngotracheitis	31	Histology	16
Avian tuberculosis	26	Histology	7
Duck virus hepatitis	18	Histology	1
Duck virus enteritis	20	Histology	5
Fowl cholera	34	Culture	None
<i>Salmonella enteritidis</i>	34	Culture	16
<i>Salmonella typhimurium</i>	35	Culture	8
Pullorum-typhoid disease	39	Culture	25

Table 9 reports OIE list C diseases for poultry with number of laboratories reporting, the tests most often used for diagnosis, and in how many states the disease is reportable.

**Table 9**

<b>Disease</b>	<b>Number Reporting</b>	<b>Primary Tests</b>	<b>Number States Reportable</b>
Infectious coryza	27	Culture	2
Avian encephalomyelitis	26	Histology	2
Avian spirochetosis	17	Smear/Histo/Culture	None
Avian salmonellosis (excluding typhoid and pullorum)	32	Culture	3
Avian leukosis	27	Histology	1

## **Conclusions**

This report demonstrates that utilization of diagnostic laboratory data as a measure of poultry flock health in the U.S. has limitations. Other resources for U.S. poultry flock health data are not discussed.

The first indication of diagnostic laboratory data limitations is the lack of response by many laboratories to this survey. Only 60 laboratories out of 205 returned the questionnaires, of these many were only partially completed. The bias associated with non-respondents could be significant. Another limitation to utilizing diagnostic laboratory data is that the data may not be representative of the true poultry health status in any given state or area. This situation could be due to several factors including poultry company laboratories performing their own diagnostic work especially with commonly diagnosed diseases. Other potential limitations include lack of standardization of testing methods, training of laboratory personnel, disease diagnosis, and disease reporting criteria.

Given the potential limitations of using diagnostic laboratory data, of the 39 respondents to the question "Do you think there should be a national monitoring system for quarterly compilation of poultry disease data bases on diagnostic laboratory records?", 23 felt that there should be such a system. Sixteen felt that there was no reason for such a system.

Given the above limitations, there is potential to utilize diagnostic laboratory data to monitor trends for certain diseases. Those diseases monitored should be relatively distinct in their clinical presentations to avoid misdiagnosis and should be diseases that are fairly common so as not to be overlooked by diagnosticians. Finally, level of participation in reporting should be monitored to account for non-response biases.



**Appendix 1.** List of OIE lists B and C reportable poultry diseases by state as of January 15, 1996.<sup>2</sup>  
 NOTE: All OIE list A diseases are reportable in every state.

State	Reportable Diseases
Alabama	Laryngotracheitis, S. enteritidis, S. typhimurium, Pullorum-typhoid
Arkansas	M. gallisepticum, Ornithosis, Laryngotracheitis, S. enteritidis, S. typhimurium, Coryza, Pullorum-typhoid
California	Ornithosis, Avian tuberculosis, S. enteritidis, Pullorum-typhoid from another laboratory (private)
Colorado	Ornithosis, Pullorum-typhoid
Connecticut	Ornithosis, Laryngotracheitis, Avian tuberculosis, S. enteritidis, S. typhimurium, Other Salmonella, Pullorum-typhoid
Delaware	
Florida	M. gallisepticum, Laryngotracheitis, S. enteritidis, Pullorum-typhoid
Georgia	Ornithosis, Laryngotracheitis, S. enteritidis, Pullorum-typhoid
Iowa	M. gallisepticum, Pullorum-typhoid
Illinois	M. gallisepticum, Ornithosis, S. enteritidis, S. typhimurium, Pullorum-typhoid
Indiana	Ornithosis, Laryngotracheitis, S. enteritidis, Pullorum-typhoid
Kansas	
Kentucky	Pullorum-typhoid, Avian encephalomyelitis
Maryland	Ornithosis, Laryngotracheitis, Avian tuberculosis, S. enteritidis, S. typhimurium, Pullorum-typhoid, Duck virus enteritis, Avian encephalomyelitis
Michigan	M. gallisepticum, Ornithosis, Laryngotracheitis, S. typhimurium, Pullorum-typhoid, Avian tuberculosis, Duck virus enteritis
Missouri	M. gallisepticum, Ornithosis, Laryngotracheitis, S. enteritidis, Pullorum-typhoid, Avian tuberculosis, Duck virus hepatitis

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<sup>2</sup> In April 1996, the USDA, through APHIS:Veterinary Services, led development and implementation of an official collaborative poultry disease reporting system, based on the cooperative efforts of state veterinary diagnostic departments with their respective state- and university-based diagnostic laboratories, and the poultry industry together with their associated laboratories, which aims to facilitate compliance with poultry disease export certification conditions of various countries (initially Russia's). An annual U.S. Epizootic Report based on collated monthly submissions from various state diagnostic laboratories is a key part of this system. As a result, states exporting poultry meat to Russia have modified their poultry disease reporting procedures to accommodate the redefined list of reportable poultry diseases.

**Appendix 1. (continued)**

<b>State</b>	<b>Reportable Diseases</b>
Mississippi	M. gallisepticum, Laryngotracheitis, Pullorum-typhoid
Montana	
North Carolina	M. gallisepticum, Ornithosis, Laryngotracheitis, Pullorum-typhoid, Coryza
North Dakota	
Nebraska	M. gallisepticum, Ornithosis, S. enteritidis, Pullorum-typhoid
New Hampshire	S. enteritidis, S. typhimurium
Nevada	
New York	Laryngotracheitis, Pullorum-typhoid, Duck virus enteritis
Oklahoma	M. gallisepticum, Ornithosis, Laryngotracheitis, S. enteritidis, Pullorum-typhoid
Oregon	S. enteritidis, Pullorum-typhoid
Pennsylvania	
South Carolina	M. gallisepticum, Ornithosis, Laryngotracheitis, S. enteritidis, Pullorum-typhoid
Tennessee	Ornithosis, Pullorum-typhoid
Texas	Laryngotracheitis, Pullorum-typhoid
Utah	M. gallisepticum, Avian tuberculosis, Pullorum-typhoid, Other Salmonella
Virginia	M. gallisepticum, Ornithosis, Laryngotracheitis, S. enteritidis, Pullorum-typhoid, Avian tuberculosis, Duck virus enteritis, Leukosis
Wisconsin	
West Virginia	

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