

Assessment of the Likelihood of rate of *Mycoplasma hyopneumoniae* Lateral transmission



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Veterinary Consultants



SVC Research Team



Research Areas:

- Health
- Nutrition
- Genetics
- Facilities
- Management



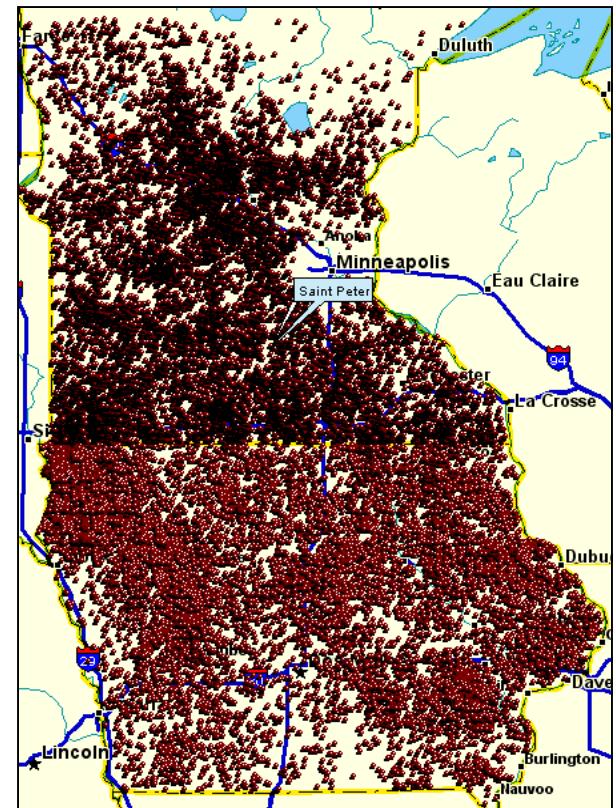
Overview

- Back ground of Mycoplasma in Finishing herds
- Objectives of study
 - Lateral transmission
- Preliminary data
- Conclusions
- Implications

Finish Sites PRRS Status

- 100 sites
- Southern MN and Northern IA
- All negative pigs at placement

Building Type (All)		
Count of Site	Total	Percent
PRRS+/-	52	54.2%
0	44	45.8%
Grand Total	96	100.0%



Yeske unpublished research, BI PRRS research grant

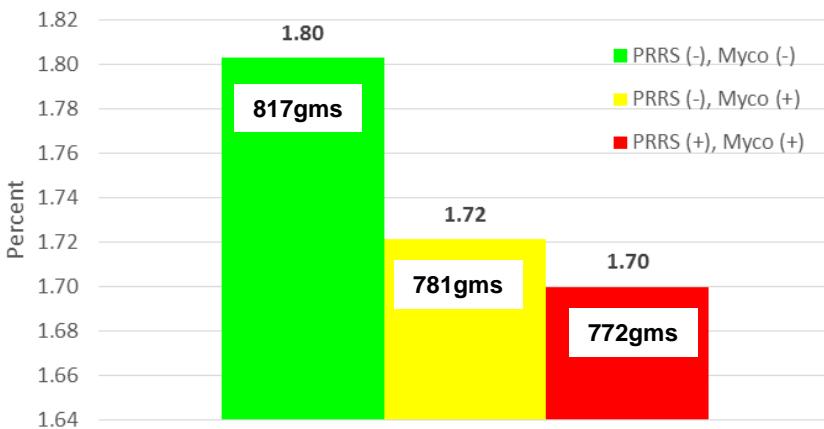
Background

- Economic losses are associated
 - Reduced average daily gain
 - Decreased feed efficiency
 - Increased medication costs.
 - Estimates
 - (7 years of closeout data over 7 million pigs)
 - \$3.61 per head
 - \$98.72 per sow

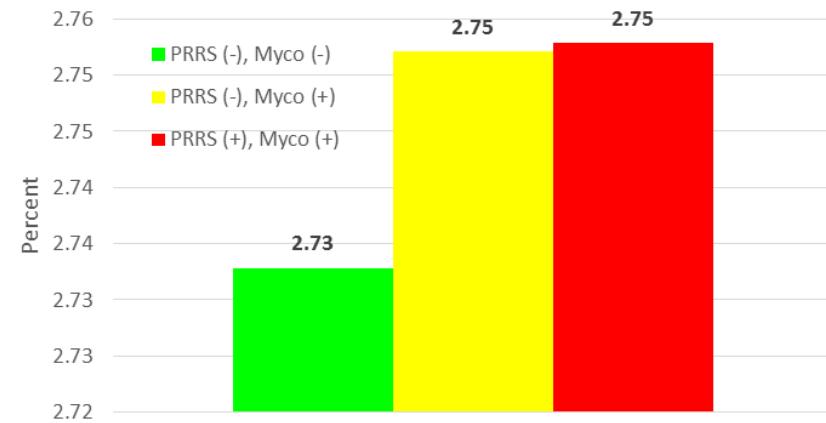
Performance By Health Status

Finishing Average Daily Gain

Average Daily Gain by Health Status



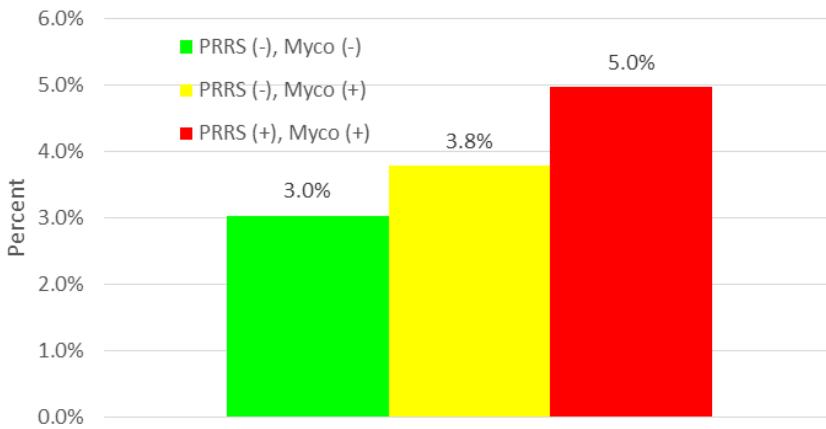
Feed Conversion by Health Status



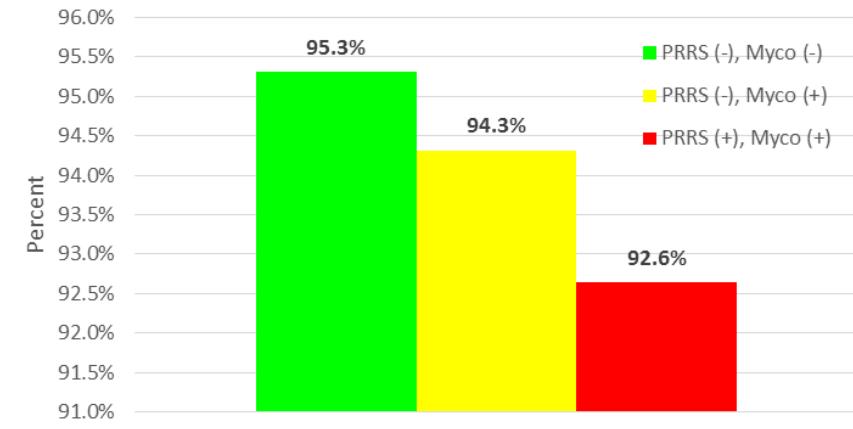
Performance By Health Status

Finishing Mortality

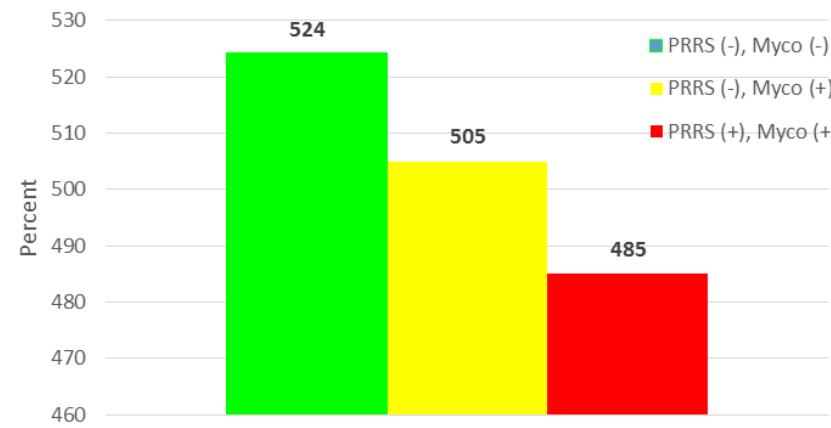
Mortality by Health Status



Percent Marketed by Health Status

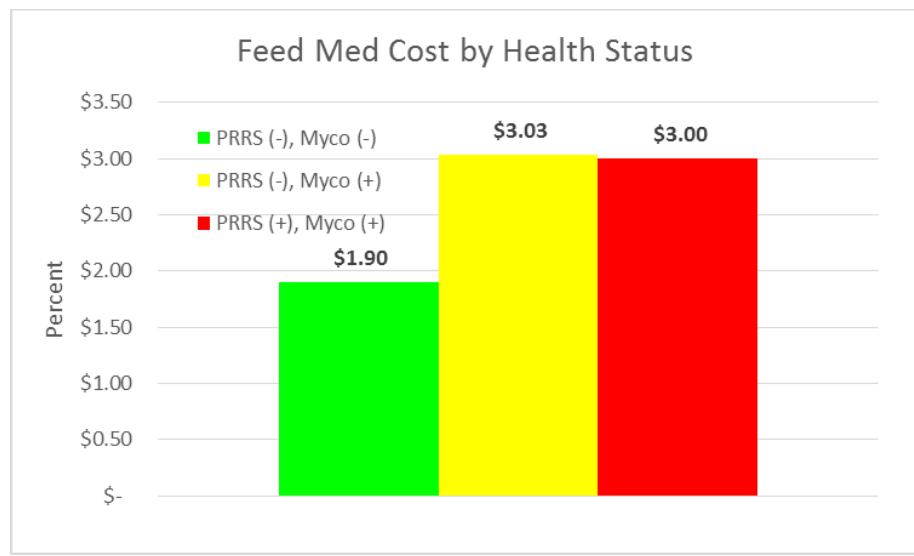
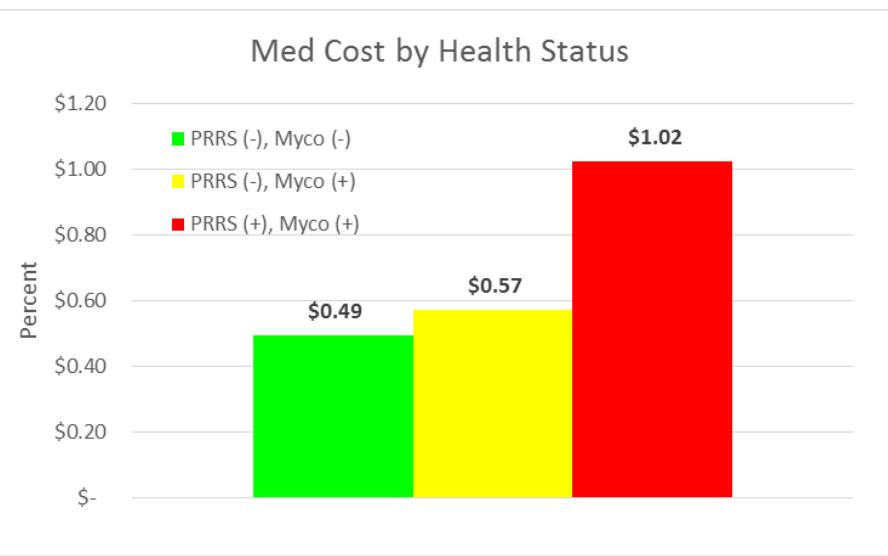


#'s per SqFt by Health Status



Performance By Health Status

Finishing Medication Cost



Cost of Mycoplasma in Finishing 2007- 2014

Grow Finish Performance Opportunity		Per Pig
Treatments savings / Total	\$ 14,750	\$ 0.54
Total Dead Pigs	236	
Cost of Mortality	\$ 36,993	\$ 1.35
Reduced number of culls (head)	54	
Cull opportunity \$	\$ 4,245	\$ 0.16
Cost of Performance		
Cost ADG	\$ 30,006	\$ 1.10
Cost F/G	\$ 12,728	\$ 0.46
	Total Finisher	\$ 98,722
Whole Herd Opportunity Cost Impact		
	Total (Finisher)	\$ 98,722
	Cost per Sow	\$ 98.72

ROI 2007-2014 Data

Cost of the program Herd Closure	\$	7,500
Savings per month for Myco Elimination per sow Closure	\$	10,149
Savings from Myco Elimination	\$	420,173
ROI (the first year to) 1		16
Savings from Myco Elimination	\$	420,173
ROI to 1		56
Cost of the program Herd Medication	\$	30,000
ROI (the first year to) 1		4
Savings from Myco Elimination	\$	182,887
ROI to 1		6

Longevity of Negative Herds

Removed Farms Contaminated with Positive Gilts

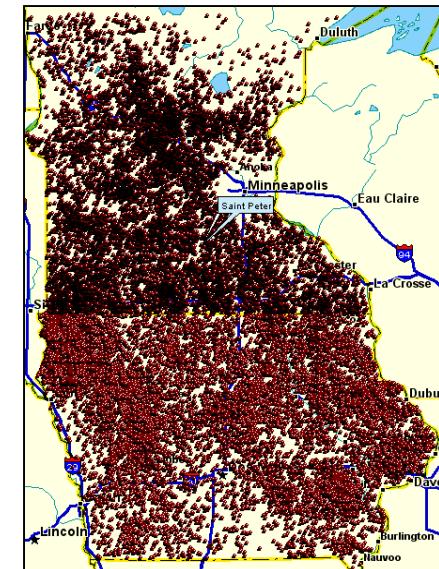
	Herd Closure	Medication	Total
Number of Sows	118388	47450	165938
Number of Herds	42	20	62
Percent Negative at 1 year	95%	58%	85%
Percent Negative to date	84%	53%	78%
Herds Negative	36	10	47
Average Months negative	55	38	52
Average herd Size	2819	2373	2676
Years Negative	4.6	3.2	4.3

Objectives

- Determine the incidence rate of lateral infections in finishing phase.
- Risk factors that increased their risk of site being laterally infected with *Mycoplasma hyopneumoniae*.

Materials and Methods

- Identify Finishing sites in Pig Dense areas
 - Flows of *M. hyopneumoniae* negative pigs
 - Test sow farms to verify status
 - 30 sows IDEXX ELISA in the last 6 months
 - » If not testing the herds
- Sites run on all in all out basis
 - Completely emptied
 - Washed and disinfected prior to refilling site
- 50 sites



Materials and Methods

- 2 Seasons (50 sites each)
 - Pigs Marketed in Summer / Fall
 - Born in winter / Spring months
 - Pigs Marketed in Winter / Spring
 - Born in Summer / Fall months

Materials and Methods

- Determine the Mycoplasma hyopneumoniae status of site just prior to marketing the site
 - Randomly select pigs from each air space
 - 30 total samples per site
 - Mycoplasma IDEXX test used for initial screen
 - » If S/P ratios greater than 1.5 site is positive
 - » If S/P ratios less than 1.5 further testing
 - » More than 3 positives
 - » Retest the site using Laryngeal swabs and Mycoplasma PCR
- Questionnaire for risk factors
- Performance data



Mycoplasma Risk Assessment (Finishing sites)

How many pigs are on this finishing site? _____

How many barns are on this site? _____

What is the age range of the pigs on this site? _____

What is the layout of finisher or wean-to-finish buildings on site?

- a. All finisher buildings have a single room
- b. Combination of multiple room and single room buildings
- c. All finisher buildings have multiple rooms

Typical occurrence of respiratory disease (not associated with PRRS) in finisher phase at this site in last two years

- a. Occurs in 8-10 groups (greater than 80%)
- b. Occurs in 5-7 out of 10 groups (50-79%)
- c. Occurs in 2-4 out of 10 groups (20-49%)
- d. Occurs in 0-1 out of 10 groups (0-19%)

How far away is the closest site? < .5 miles 1-2 miles >2miles

How many sites are within 2 miles of this site? 1 or less 1-3 >3

Is the current clinical condition known for this site? Yes No

If yes, have tissue samples been taken for this site? Yes No

If yes, did tissue samples confirm Mycoplasma infection? Yes No

If no, is coughing present within the site? Yes No

Is the site positive for any other diseases? PRRS PCV2 IAV Other Unknown

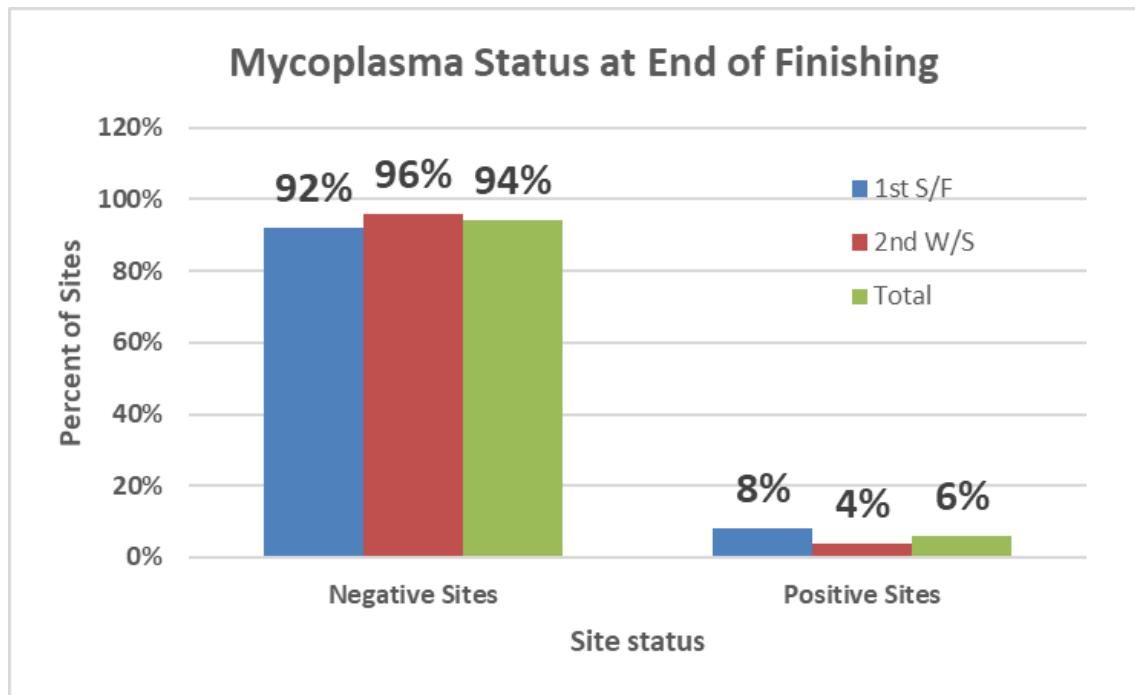
Preliminary Results

- 50 total sites for each season of study (100 total sites)
 - 105 total sites tested but 5 marketed before retests could be done, so were dropped from the study
- 5 different production systems for each season
 - Located in Minnesota and Iowa
 - 10 per each production company per Season
 - (20 Sites total)



Preliminary Results

- Total number of positive sites
 - 6 sites
 - (3) different production systems
 - (1) Serology (Antibody) 1%
 - (5) Laryngeal swabs (Antigen) 5%



Preliminary Results

- Vaccinated pigs are not real clean on IDEXX test
 - Exception to this is the MycoFLEX vaccine
 - One system used the 1 dose product and no unexpected positives

Sample	1	2	3	4	5	6	7	8	9	10
	CF	CF								
1	-0.036	0 neg	-0.004	0 neg	-0.014	0 neg	-0.07	0 neg	-0.057	0 neg
2	0.018	0 neg	-0.028	0 neg	-0.04	0 neg	-0.002	0 neg	0.031	0 neg
3	-0.054	0 neg	0.109	0 neg	-0.033	0 neg	-0.075	0 neg	-0.051	0 neg
4	-0.054	0 neg	-0.032	0 neg	0.046	0 neg	-0.048	0 neg	0.073	0 neg
5	0.011	0 neg	-0.047	0 neg	-0.042	0 neg	-0.057	0 neg	-0.013	0 neg
6	-0.063	0 neg	-0.011	0 neg	-0.024	0 neg	-0.05	0 neg	0.007	0 neg
7	-0.013	0 neg	0.011	0 neg	-0.042	0 neg	-0.045	0 neg	0.042	0 neg
8	-0.002	0 neg	-0.036	0 neg	-0.044	0 neg	-0.059	0 neg	-0.015	0 neg
9	0.04	0 neg	0.002	0 neg	-0.022	0 neg	-0.018	0 neg	-0.064	0 neg
10	-0.045	0 neg	-0.006	0 neg	0.02	0 neg	-0.057	0 neg	0.07	0 neg
11	-0.078	0 neg	0.034	0 neg	0	0 neg	-0.032	0 neg	-0.013	0 neg
12	-0.038	0 neg	-0.034	0 neg	-0.031	0 neg	0	0 neg	-0.046	0 neg
13	-0.056	0 neg	-0.006	0 neg	0.081	0 neg	-0.075	0 neg	0.029	0 neg
14	-0.071	0 neg	0.006	0 neg	0.053	0 neg	-0.07	0 neg	0.033	0 neg
15	0.063	0 neg	0.072	0 neg	0.015	0 neg	-0.029	0 neg	-0.033	0 neg
16	0.004	0 neg	0	0 neg	0.022	0 neg	-0.036	0 neg	-0.051	0 neg
17	-0.036	0 neg	0.009	0 neg	-0.053	0 neg	-0.075	0 neg	-0.073	0 neg
18	-0.002	0 neg	0.058	0 neg	-0.002	0 neg	-0.072	0 neg	-0.048	0 neg
19	-0.007	0 neg	-0.032	0 neg	0.042	0 neg	-0.048	0 neg	-0.057	0 neg
20	-0.045	0 neg	0.021	0 neg	0	0 neg	-0.048	0 neg	-0.033	0 neg
21	-0.011	0 neg	0.102	0 neg	-0.062	0 neg	-0.027	0 neg	-0.031	0 neg
22	0.013	0 neg	0.038	0 neg	-0.031	0 neg	-0.032	0 neg	-0.059	0 neg
23	-0.031	0 neg	-0.034	0 neg	-0.04	0 neg	-0.048	0 neg	-0.051	0 neg
24	-0.074	0 neg	-0.028	0 neg	-0.042	0 neg	-0.048	0 neg	-0.04	0 neg
25	-0.058	0 neg	0.09	0 neg	0.013	0 neg	-0.025	0 neg	-0.042	0 neg
26	-0.056	0 neg	-0.028	0 neg	-0.046	0 neg	-0.057	0 neg	-0.079	0 neg
27	-0.025	0 neg	-0.058	0 neg	-0.024	0 neg	0.018	0 neg	-0.055	0 neg
28	-0.074	0 neg	0.098	0 neg	0.029	0 neg	0.023	0 neg	-0.064	0 neg
29	-0.056	0 neg	-0.062	0 neg	-0.055	0 neg	0.068	0 neg	0.09	0 neg
30	-0.049	0 neg	0.075	0 neg	-0.037	0 neg	-0.002	0 neg	-0.02	0 neg
	0.063	Max	0.109	Max	0.081	Max	0.068	Max	0.09	Max
	0	Sus								
	0	Pos								
	30	Neg								
	30	30	30	30	30	30	30	30	30	30
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Preliminary Results

- Vaccinated pigs are not real clean on IDEXX test
 - 2 dose Vaccine
 - One system used this with a lot more unexpected Positives

Sample	1		2		3		4		5		6		7		8		9		10					
	WPI Jurgens	WPI Va Juregns	WPI Vlotho	WPI Resu	WPI Vlotho	WPI Bosma	WPI resu	WPI Bosma	WPI Westhoff	WPI Westhoff	WPI Westhoff	WPI Dunn	WPI Resu	WPI Rieke	WPI Weckwort	WPI Weckwo	WPI Dickens	WPI Dicken	WPI Riley 2	WPI Riley 2	WPI Vlotho #2	WPI Vlotho #2	WPI Vlotho #2	
1	0.371	0 Suspect	0.414	1 Positive	0.038	0 neg	-0.002	0 neg	0.393	0 Suspect	0.043	0 neg	-0.019	0 neg	0.143	0 neg	-0.022	0 neg	0.206	0 neg	0.206	0 neg	0 neg	
2	0.779	1 Positive	0.328	0 Suspect	0.139	0 neg	0.009	0 neg	0.348	0 Suspect	0.166	0 neg	-0.03	0 neg	0.005	0 neg	0	0 neg	0.721	1 Positive	0 neg	0 neg	0 neg	
3	0.029	0 neg	0.292	0 neg	0.03	0 neg	0.029	0 neg	0.107	0 neg	0.239	0 neg	0.194	0 neg	0.136	0 neg	0.11	0 neg	0.782	1 Positive	0 neg	0 neg	0 neg	
4	0.367	0 Suspect	0.068	0 neg	0.062	0 neg	0.022	0 neg	0.094	0 neg	0.424	1 Positive	0.043	0 neg	0.14	0 neg	-0.028	0 neg	0.631	1 Positive	0 neg	0 neg	0 neg	
5	0.002	0 neg	0.22	0 neg	0.102	0 neg	-0.004	0 neg	0	0 neg	0.023	0 neg	0.079	0 neg	0.103	0 neg	0.09	0 neg	0.625	1 Positive	0 neg	0 neg	0 neg	
6	0.369	0 Suspect	0.239	0 neg	0.049	0 neg	0	0 neg	-0.002	0 neg	0.023	0 neg	-0.019	0 neg	0.145	0 neg	0.097	0 neg	0.04	0 neg	0 neg	0 neg	0 neg	
7	0.307	0 Suspect	0.561	1 Positive	0.143	0 neg	0.487	1 Positive	0.085	0 neg	0.179	0 neg	0.072	0 neg	0.46	1 Positive	0.105	0 neg	0.09	0 neg	0 neg	0 neg	0 neg	
8	0.098	0 neg	0.149	0 neg	0.009	0 neg	0.429	1 Positive	0.098	0 neg	0.188	0 neg	0.126	0 neg	0.593	1 Positive	-0.028	0 neg	0.03	0 neg	0 neg	0 neg	0 neg	
9	0.069	0 neg	0.525	1 Positive	0.117	0 neg	0.246	0 neg	0.266	0 neg	0.058	0 neg	0.147	0 neg	0.425	1 Positive	0.035	0 neg	0.044	0 neg	0 neg	0 neg	0 neg	
10	0.174	0 neg	0.207	0 neg	0.213	0 neg	0.234	0 neg	0.241	0 neg	0.294	0 neg	0.055	0 neg	0.472	1 Positive	0.125	0 neg	0.074	0 neg	0 neg	0 neg	0 neg	
11	0.462	1 Positive	0.215	0 neg	0.049	0 neg	0.277	0 neg	-0.022	0 neg	0.021	0 neg	0.145	0 neg	0.199	0 neg	0.05	0 neg	0.06	0 neg	0 neg	0 neg	0 neg	
12	0.264	0 neg	0.203	0 neg	0.143	0 neg	0.272	0 neg	0.031	0 neg	0.006	0 neg	0.115	0 neg	0.199	0 neg	0.142	0 neg	0.002	0 neg	0 neg	0 neg	0 neg	
13	-0.007	0 neg	0.269	0 neg	0.029	0 neg	0.02	0 neg	0.074	0 neg	0.032	0 neg	0.394	0 Suspect	0.227	0 neg	0.154	0 neg	0.034	0 neg	0 neg	0 neg	0 neg	
14	0.255	0 neg	0.139	0 neg	0.013	0 neg	0.029	0 neg	-0.025	0 neg	0.341	0 Suspect	0.002	0 neg	0.1	0 neg	0.055	0 neg	0.092	0 neg	0 neg	0 neg	0 neg	
15	0.136	0 neg	0.038	0 neg	0.054	0 neg	-0.016	0 neg	0.045	0 neg	0.154	0 neg	0.26	0 neg	0.056	0 neg	0.173	0 neg	0.078	0 neg	0 neg	0 neg	0 neg	
16	0.043	0 neg	0.166	0 neg	0.013	0 neg	0.009	0 neg	-0.027	0 neg	0.06	0 neg	0.143	0 neg	0.43	1 Positive	0.07	0 neg	0.162	0 neg	0 neg	0 neg	0 neg	
17	0.488	1 Positive	0.072	0 neg	1.045	1 Positive	-0.036	0 neg	0.007	0 neg	-0.036	0 neg	0.028	0 neg	-0.026	0 neg	0.077	0 neg	0.086	0 neg	0 neg	0 neg	0 neg	
18	0.352	0 Suspect	0.373	0 Suspect	0.007	0 neg	-0.033	0 neg	0.018	0 neg	0.196	0 neg	0.124	0 neg	0.453	1 Positive	-0.04	0 neg	0	0 neg	0 neg	0 neg	0 neg	
19	0.524	1 Positive	0.066	0 neg	0.103	0 neg	0.069	0 neg	0.047	0 neg	0.002	0 neg	-0.036	0 neg	0.57	1 Positive	0.119	0 neg	0.094	0 neg	0 neg	0 neg	0 neg	
20	0.486	1 Positive	0.522	1 Positive	1.022	1 Positive	0.076	0 neg	0.051	0 neg	0.034	0 neg	0.309	0 Suspect	0.477	1 Positive	-0.009	0 neg	0.092	0 neg	0 neg	0 neg	0 neg	
21	0.49	1 Positive	0.079	0 neg	0.04	0 neg	0.138	0 neg	-0.025	0 neg	0.343	0 Suspect	0.017	0 neg	0.243	0 neg	-0.029	0 neg	-0.022	0 neg	0 neg	0 neg	0 neg	
22	0.267	0 neg	0.066	0 neg	0.065	0 neg	0.116	0 neg	0.013	0 neg	0.149	0 neg	0.107	0 neg	0.234	0 neg	0.191	0 neg	0.02	0 neg	0 neg	0 neg	0 neg	
23	0.607	1 Positive	0.443	1 Positive	0.049	0 neg	0.556	1 Positive	0.007	0 neg	0.06	0 neg	0.002	0 neg	-0.005	0 neg	0.081	0 neg	0.068	0 neg	0 neg	0 neg	0 neg	
24	0.029	0 neg	0.382	0 Suspect	0.056	0 neg	0.569	1 Positive	-0.004	0 neg	-0.03	0 neg	0.045	0 neg	0.199	0 neg	-0.018	0 neg	0.052	0 neg	0 neg	0 neg	0 neg	
25	-0.002	0 neg	0.156	0 neg	0.321	0 Suspect	0.379	0 Suspect	0.151	0 neg	0.307	0 Suspect	0.081	0 neg	0.002	0 neg	0.068	0 neg	0.006	0 neg	0 neg	0 neg	0 neg	
26	0.181	0 neg	0.232	0 neg	0.316	0 Suspect	-0.011	0 neg	0.023	0 neg	0.068	0 neg	0.117	0 neg	0	0 neg	-0.031	0 neg	0.038	0 neg	0 neg	0 neg	0 neg	
27	0.414	1 Positive	-0.03	0 neg	0.213	0 neg	0.074	0 neg	0.017	0 neg	0.113	0 neg	-0.021	0 neg	0.054	0 neg	0.099	0 neg	0.395	0 Suspect	0 neg	0 neg	0 neg	
28	0.002	0 neg	-0.032	0 neg	0.11	0 neg	0.056	0 neg	0.145	0 neg	0.162	0 neg	0.085	0 neg	-0.021	0 neg	0.075	0 neg	0.315	0 Suspect	0 neg	0 neg	0 neg	
29	0.167	0 neg	0.431	1 Positive	0.137	0 neg	0.297	0 neg	0.055	0 neg	0.096	0 neg	0.183	0 neg	0.014	0 neg	0.16	0 neg	-0.006	0 neg	0 neg	0 neg	0 neg	
30	0.381	0 Suspect	0.333	0 Suspect	0.112	0 neg	0.007	0 neg	0.011	0 neg	-0.002	0 neg	0.362	0 Suspect	-0.016	0 neg	0.112	0 neg	0 neg	0 neg	0 neg	0 neg	0 neg	
	0.779	Max	0.561	Max	1.045	Max	0.569	Max	0.393	Max	0.424	Max	0.394	Max	0.593	Max	0.191	Max	0.782	Max	0 neg	0 neg	0 neg	
6	Sus	5	Sus	2	Sus	1	Sus	2	Sus	3	Sus	0	Sus	0	Sus	0	Sus	2	Sus	4	Sus	0 neg	0 neg	
9	Pos	7	Pos	3	Pos	4	Pos	0	Pos	1	Pos	0	Pos	8	Pos	0	Pos	4	Pos	0 neg	0 neg	0 neg	0 neg	
20	Neg	23	Neg	30	Neg	30	Neg	33	Neg	26	Neg	27	Neg	22	Neg	29	Neg	24	Neg	0 neg	0 neg	0 neg	0 neg	
35		35		35		35		35		30		30		30		29		30		30		30		
57%		66%		86%		86%		94%		87%		90%		73%		100%		80%						
Laryngeal	50	Neg	49	Neg	50	Neg	50	Neg																
			1	Pos																	0	Neg		
			50																		50	Pos		
			6/21/2016																					
			44																					
			8	Pos																				
			52																					

Unexpected Positives

- Sites with more than (3) IDEXX positives and <1.5 S/P values
 - Were tested with Laryngeal swabs



Unexpected Positives

- Test result from sites with more than (3) IDEXX positives and <1.5 values

	1st S/F	2nd W/S	Total
Antibody	1	0	1
	50	50	100
Laryngeal Swabs			
Sites Sampled	12	5	17
total Sites	50	50	100
Positive	3	2	5
Negative	9	3	12

Percentage	1st S/F	2nd W/S	Total
Antibody	2%	0%	1%
Laryngeal Swabs			
Sites Sampled	12	5	17
total Sites	24%	10%	17%
Positive	25%	40%	29%
Negative	75%	60%	71%

Unexpected Positives

- One site had:
 - IDEXX values of 5 positives and 3 suspects but low values <1.5 S/P for all values
 - 1 out of 50 (2%) PCR positive on Laryngeal swabs following serologic test
 - Retest of the site an additional time
 - Thought it could be a false positive
 - 8 positive out of 52 (15%)

Unexpected Positives

- All positive sites had some clinical signs of cough



Preliminary Results

- Not enough positive sites to get much on risk factors
 - Data is not complete yet
- Not enough positive sites to get much on production numbers
 - Data is not complete yet

Conclusions

- Negative pigs placed in pig dense areas of the Midwest do get lateral transmission of *Mycoplasma hyopneumoniae*
 - Just doesn't occur very often
 - **6% of the time**
 - Much lower rate than PRRS approximately 50%
 - Most were late infections since not highly serologically positive
 - Not as much impact on performance



Conclusions

- Laryngeal swabs can be used if there are unexpected positive tests with IDEXX
 - Pigs will cough if really infected
- Vaccinated pigs can be used to monitor status of sites
 - Know how the vaccine responds on the test
- Clinical signs still a good method of detection of *Mycoplasma hyopneumoniae*

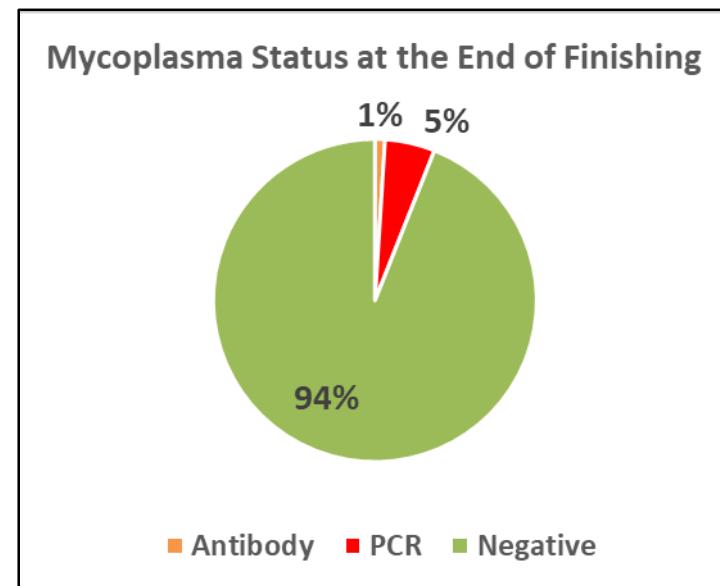


Implications

- With a relatively low rate (6%) of lateral transmission
 - This will encourage more producers to evaluate elimination
 - Biggest concerns by producers has been will the pigs stay negative in finishing to recapture the cost and get the value
 - **Should no longer be a hurdle to elimination**
- If you have Mycoplasma problems in finishing it is most likely from the source farm of the pigs not the neighborhood

Future Work

- Use this information in models to predict the probability of breaks to help with the decision for elimination and economic value to the herd or system



Acknowledgements

- Boehringer Ingelheim
 - Funding of the project
 - Sample collection
 - Diagnostic testing
 - Technical support
 - Jana Morgan DVM
 - Eduardo Fano DVM, PhD
- SVC
 - Clients
 - Allow testing of pigs and sites
 - Collecting samples
 - Vets
 - Recruiting herds for the study
 - Helping collect samples
 - Staff
 - Processing samples and paper work

Summary



It's Possible

Assessment of the Likelihood of rate of *Mycoplasma hyopneumoniae* Lateral transmission



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