


CSI - Swine

Case Studies of Iowa Swine Diseases


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Outline

- Introduction & background
 - Investigative techniques/tools
 - Sampling exercise
- Case scenarios



Introduction

- Objective:
 - Fun → Crime Scene Investigation TV series




CBS Broadcasting, Inc. CBS Broadcasting, Inc.



Crime Scene Response Unit Veterinarian's Truck




Iowa Dept. of Public Safety





Bowie International




Why?

- Objective is to solve a problem
- Pigs can not speak to us
- Need to identify the problem
 - Stop it
 - Prevent it from happening again
- Objectives
 - Help the pigs
 - Help the producer
 - Help the industry



Objectives:


Correct diagnosis
AND
What to do next!



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Techniques

Comparing CSI to Veterinary Medicine



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We have a problem!




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History

- Questioning witnesses
- May feel like an interrogation
- Objective is to gather pertinent information
- You will only get answers to questions you ask
- Rephrasing questions to clarify information
 - Remember we were not there
 - We are working together
 - Never ASSUME anything!



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What questions would you ask?




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Collect data

- May need to quantify
 - I have some thin sows ?
 - Does it matter whether it is 5% or 50%?
 - Do a quick count
 - Look at every 10th sow and record BCS
 - Does parity matter?
 - Diagnosis – Maybe/Maybe not
 - Cause - Absolutely
- Collecting data is critical



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Things are not 100%

- Thin animals

	Thin	Not Thin
Gilts	45	21
Sows	327	32




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Things are not 100%

- Thin animals

	Thin	Not Thin
Gilts	45	21
Sows	327	32


- Odds ratio for gilts = $(45 \times 327) / (32 \times 21) = 21.9$
 - Gilts are almost 22 times more likely to be thin than sows



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Profiling

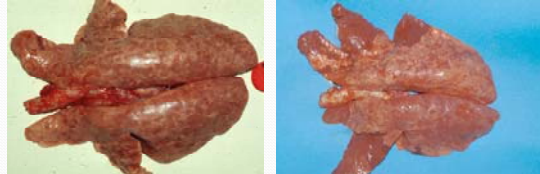
- “Offender profiling is a method of identifying the perpetrator of a **crime** based on an analysis of the nature of the offence and the manner in which it was committed. Various aspects of the criminal's personality makeup are determined from his or her choices before, during, and after the crime. This information is combined with other relevant details and **physical evidence**, and then compared with the characteristics of known personality types and mental abnormalities to develop a practical working description of the offender.” from Wikipedia



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Veterinary profiling

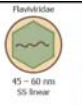
- Pattern of behavior and evidenced
- Pneumonia example: Viruses vs. bacteria




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Veterinary profiling

- Viruses → Gangs (families)
 - Pattern to their behavior
 - Not all members of a gang behave the same
 - There are a few outliers



Flavivirus	Bovine disease virus	D
Bovine viral diarrhoea (BVD) viruses 1, 2		B
Classical swine fever virus (Classical swine fever)		F
Dengue virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Hepatitis C virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Japanese encephalitis virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Langkat encephalitis virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Marburg valley encephalitis virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Swine vesicular disease virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
SS virus encephalitis virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Tek-1000 encephalitis virus (Lentivirus subgenus)		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Yellow fever virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Zoonotic encephalitis virus		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z
Zoonotic virus (Zoonotic virus)		H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z


Center for Food Security and Public Health at ISU



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Veterinary profiling

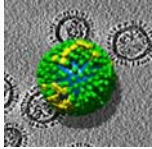
- Viruses
 - RNA vs. DNA
 - RNA - Unstable
 - High mutation rate → many strains → vaccine problem
 - DNA - Much more stable
 - Enveloped vs. Non-enveloped
 - Enveloped - Environmentally susceptible
 - Non-enveloped - More stable




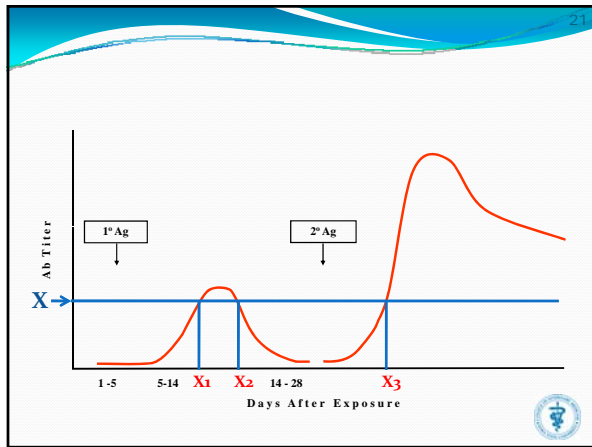
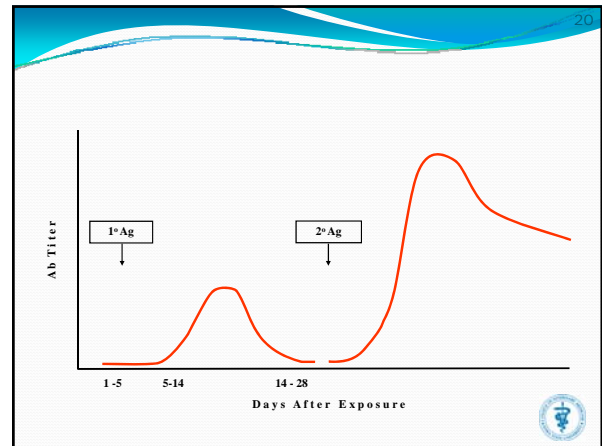
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Evidence

- Agent or Antibodies?
 - Agent = organism (bacteria, virus, etc.)
 - Antibodies = evidence left behind
- Are you looking for its presence?
- Are you looking to see if it has been there?




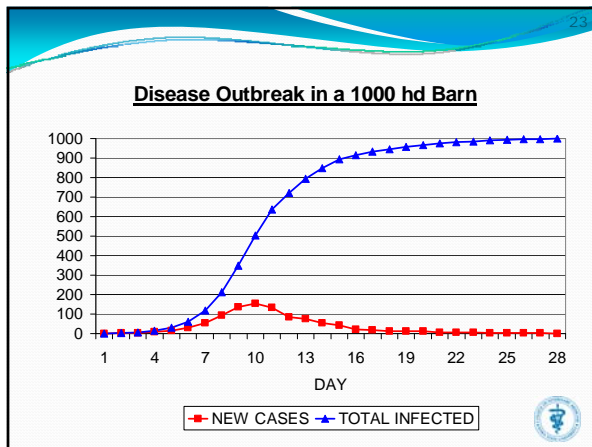
Science Daily

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Time


- In case of a crime:
 - The first 48 hours are critical
 - Need to collect evidence before it is lost
 - Need to follow trails before it goes cold
- In disease cases:
 - Time allows for increase chance of finding something
 - Time also can make it more complicated due to compounding problems

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Evidence - Testing


- How many?
- What is your goal?
 - Detect disease vs. identify prevalence
 - Finding the index case?
- Need to consider
 - Test sensitivity
 - Prevalence
 - Actual
 - Targeted
 - Confidence needed in results (risk willing to take)
 - Costs



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Insurance


- How much are you willing to pay
- How much risk are you willing to take
- Use statistics (probabilities) to help make the decision



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Exercise on sampling

- How many people are needed in a group to find 2 people with the same birth date?
- Answer:
 - 23 for a 50% chance
 - 48 for a 95% chance



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Oral Fluids – A Unique technique

- [Link to oral fluids video](#)





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Differential tests*

	Test 1	Test 2
Negative	Neg	Neg
Exposed	Pos	Pos
Vaccinated	Pos	Neg

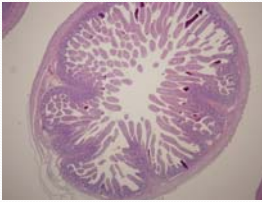
*Unfortunately only available for very few diseases



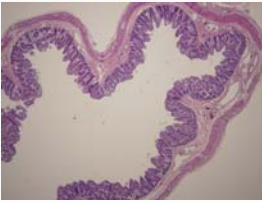
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Supporting evidence

Normal



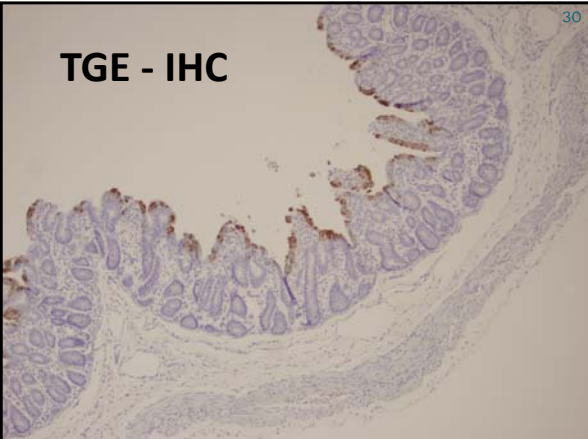
TGE

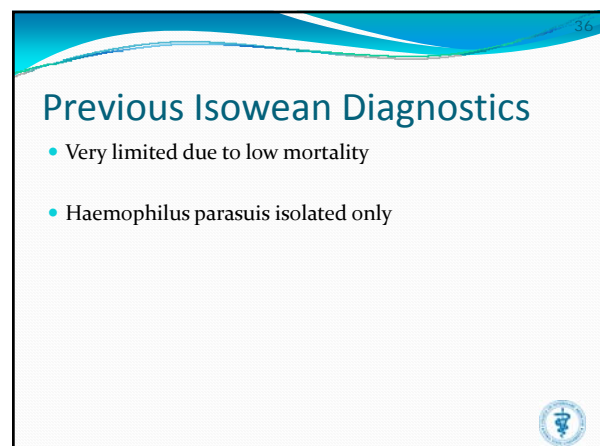
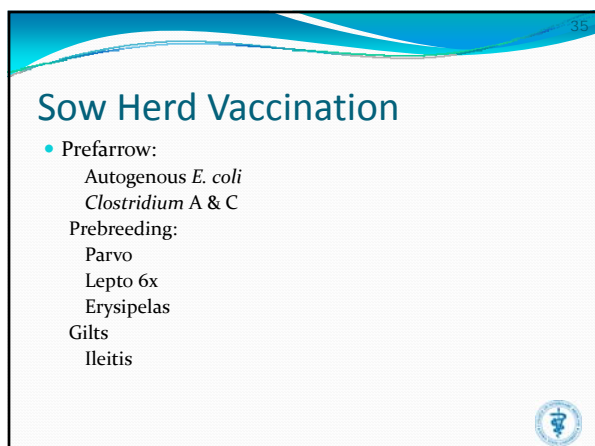
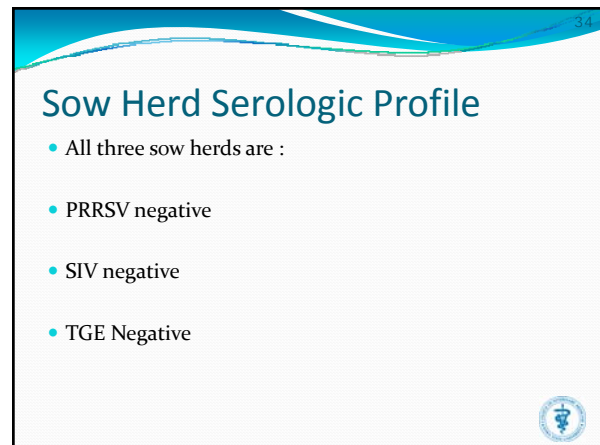
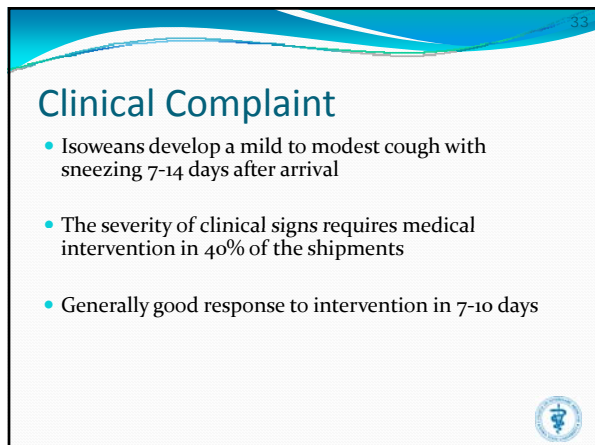
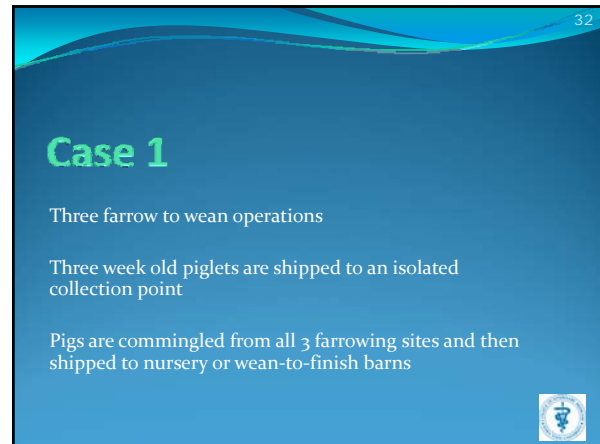




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TGE - IHC






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Intervention Strategy


- One previous occasion pigs were treated for 3 days post-arrival with tetracycline in the drinking water
- This was done in anticipation of the cough
- No coughing was noted in this group



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Diagnostic Plan

- What do you think?
- What would you do?




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Farm 1 PRRS ELISA S:P

Farm 1 PRRS Elisa S:P Ratios

4 weeks	8 weeks	12 weeks	16 weeks	20 weeks	24 weeks
0.006	0	0.087	0.802	1.551	0.696
0.02	0.027	0.068	0.026	1.306	1.102
0.031	0.043	0.032	0.179	1.366	1.74
0.029	0.029	0.055	0.043	0.86	0.96
0.023	0.045	0.109	0.049	0.777	0.726
0.035	0.027	0.049	0.04	0.674	0.366
0.021	0.033	0.006	0.051	1.732	1.783
0	0.008	0.019	0.04	0	0.853
0	0.016	0.072	0.009	0.545	2.345
0	0.013	0.028	0.051	1.762	0.911




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Farm 1 Mycoplasma ELISA

Farm 1 M. hyo S:P Ratios

4 weeks	8 weeks	12 weeks	16 weeks	20 weeks	24 weeks
0	0	0	0.029	0.138	0.25
0.314	0	0.006	0.038	0.125	0.317
0.085	0	0	0.07	0.112	0.199
0.035	0.059	0.053	0.003	0.308	0.272
0	0	0.021	0.076	0.16	0.147
0.17	0.082	0.065	0.114	0.176	0.301
0.106	0.126	0.021	0.015	0.051	0.103
0.059	0	0.038	0.176	0	0.138
0.214	0	0	0.065	0.747	0.41
0.273	0.018	0	0	0.138	0.516




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Farm 1 SIV H₁N₁ HI

Farm 1 SIV H₁N₁ Titers

4 weeks	8 weeks	12 weeks	16 weeks	20 weeks	24 weeks
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	<10	<10




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Farm 1 SIV H₃N₂ HI

Farm 1 SIV H₃N₂ Titers


4 weeks	8 weeks	12 weeks	16 weeks	20 weeks	24 weeks
<10	<10	<10	<10	<10	<10
<10	<10	<10	<10	10	<10
20	<10	<10	<10	<10	<10
10	<10	<10	<10	<10	<10
<10	10	<10	<10	<10	<10
<10	10	<10	<10	<10	<10
10	20	<10	<10	<10	<10
<10	<10	10	<10	<10	<10
<10	<10	10	<10	<10	<10
<10	<10	20	<10	<10	<10



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After Cross Sectional Serology


- Now What?



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Tissue Submission


- Submit tissues from pigs acutely affected with clinical signs consistent with previous respiratory disease described
- Identify 20 pigs by ear tag and bleed on arrival



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Clinical Presentation


- Pigs display a modest cough on arrival
- 7-10 days post-arrival cough turns abruptly more severe
- Harsh coughing in 25-30 % of the pigs
- Rectal temperatures 105 or higher



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Lesions


- Multi-focal necrotizing bronchiolitis
- Mild lymphoid depletion noted



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Diagnosis


- IHC negative for PRRS and PCV2
- IHC positive for SIV
- PCR identifies SIV H₁N₂
- Virus isolation successful on nasal swabs for SIV



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Serology '73 HI H₁N₁

	Pig ID	6/29/2005	7/27/2005		6/29/2005	7/27/2005
1	14169	<10	10	11	14179	<10
2	14170	<10	<10	12	14180	<10
3	14171	<10	<10	13	14181	<10
4	14172	<10	<10	14	14182	<10
5	14173	<10	<10	15	14183	<10
6	14174	<10	<10	16	14184	<10
7	14175	<10	<10	17	14185	<10
8	14176	<10	<10	18	14186	<10
9	14177	<10	<10	19	14187	<10
10	14178	<10	<10	20	14188	<10



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Pfizer H₁N₁ HI


	Pig ID	6/29/2005	7/27/2005	Pig ID	6/29/2005	7/27/2005
1	14169	<10	20	11	14179	<10
2	14170	<10	20	12	14180	<10
3	14171	<10	10	13	14181	<10
4	14172	<10	10	14	14182	<10
5	14173	<10	10	15	14183	<10
6	14174	<10	<10	16	14184	<10
7	14175	<10	<10	17	14185	<10
8	14176	<10	80	18	14186	<10
9	14177	<10	<10	19	14187	<10
10	14178	<10	20	20	14188	<10



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ISU '99 HI H₁N₁


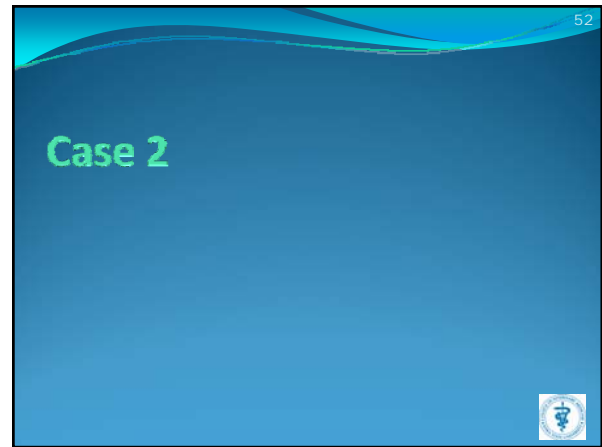
	Pig ID	6/29/2005	7/27/2005	Pig ID	6/29/2005	7/27/2005
1	14169	<10	40	11	14179	<10
2	14170	<10	160	12	14180	<10
3	14171	<10	20	13	14181	<10
4	14172	<10	40	14	14182	<10
5	14173	<10	40	15	14183	<10
6	14174	10	40	16	14184	<10
7	14175	<10	10	17	14185	<10
8	14176	<10	320	18	14186	<10
9	14177	<10	10	19	14187	<10
10	14178	<10	40	20	14188	<10




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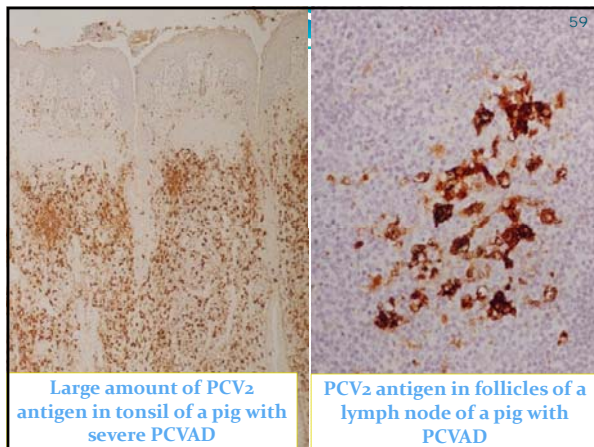
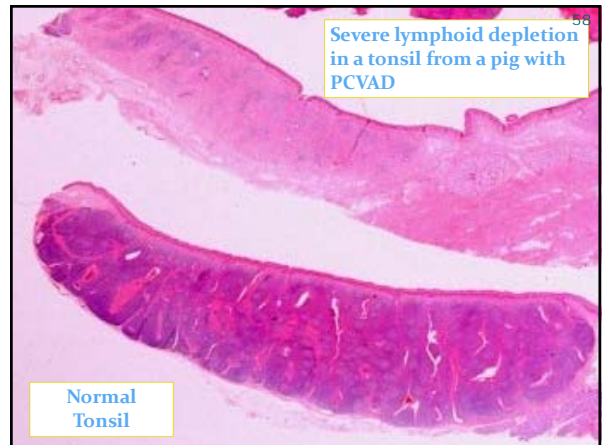
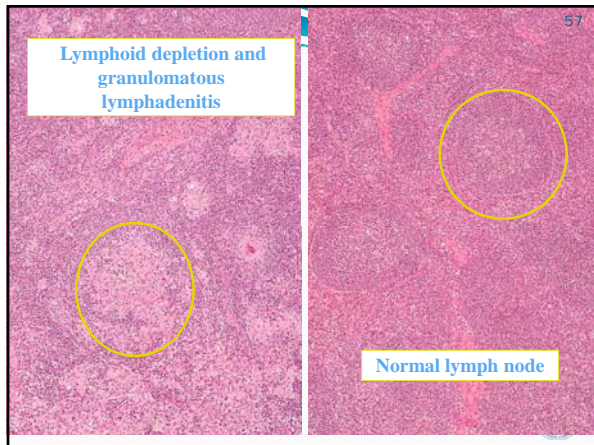
Homologous HI H₁N₂

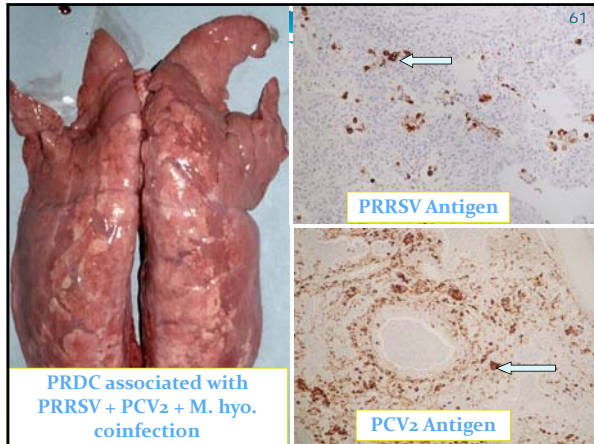
	Pig ID	6/29/2005	7/27/2005	Pig ID	6/29/2005	7/27/2005
1	14169	<10	40	11	14179	<10
2	14170	<10	80	12	14180	<10
3	14171	<10	20	13	14181	<10
4	14172	<10	80	14	14182	<10
5	14173	<10	160	15	14183	<10
6	14174	<10	10	16	14184	<10
7	14175	<10	20	17	14185	<10
8	14176	<10	640	18	14186	<10
9	14177	<10	80	19	14187	<10
10	14178	<10	160	20	14188	<10

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- ### Farm Z
- History of respiratory problems
 - Pigs received at 50 – 55# from same sow nursery
 - Sow herds are PRRS +
 - Pigs are vaccinated for
 - Mycoplasma
 - Erysipelas
 - PCV₂
- 







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Solutions

- Pigs or people?

This slide has a white background with a blue header. It contains the word 'Solutions' in a large font, followed by a single bullet point: 'Pigs or people?'. A small circular logo is in the bottom right corner.

- 64
- ### Solutions
- Both
 - People
 - Better management/backup plans
 - More aggressive at letting the vet know all information
 - Vaccinations were not being given
 - Pigs
 - Vaccines can be helpful
 - Multiple health challenges (PRRS, PCV2, Mycoplasma)
 - Ulcers are secondary
- This slide has a white background with a blue header. It contains the word 'Solutions' in a large font, followed by a bulleted list of solutions categorized by 'Both', 'People', and 'Pigs'. A small circular logo is in the bottom right corner.

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Case 3

This slide has a solid blue background with the text 'Case 3' in a light green font. A small circular logo is in the bottom right corner.





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What is your diagnosis?

A small circular logo with a caduceus symbol is located in the bottom right corner of the slide.



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Questions ?

Thank you for your time!!

A small circular logo with a caduceus symbol is located in the bottom right corner of the slide.