Use of Diagnostic Tests in Herd Associated Problems

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Talk

- What we do in FDIU and outreach
- Epidemiology review – by a dummy
- Epidemiology and herd tests

Field Disease Investigation Unit

- Investigate herd problems in Pacific Northwest
- Work through veterinarians to identify important cases
  - Students run the investigation
  - On site investigation
  - Written report of findings and recommendations
  - Students present cases to vet school

Epi review

- **Important stuff to know when making decisions with diagnostic test**
  - **Sensitivity** = ability of a test to correctly classify an infected animal as being infected
  - Example: if a fecal culture is done on 165 animals that are known to be infected and 36 come up as culture positive than the Se of the test is 22%
    - Se = Number of test-pos animals/Number of truly infected animals = 36/165 = 22%
    - Truly infected animals that produce a test negative result are **False negatives**.

Important stuff to know when making decisions with diagnostic test

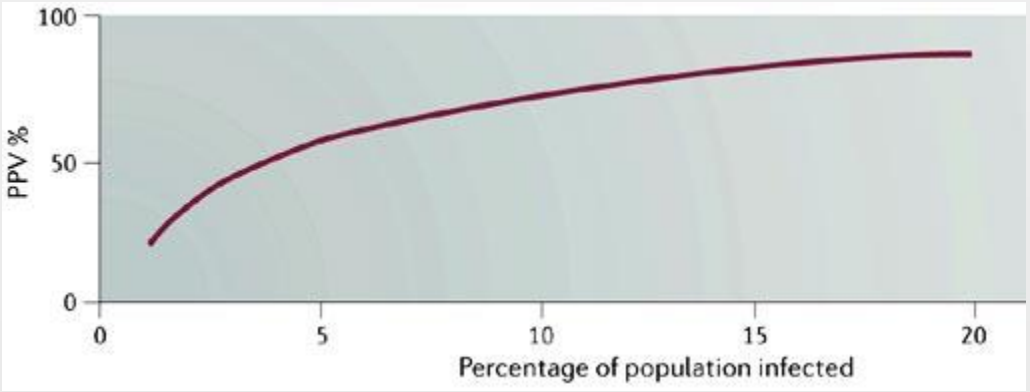
- **Specificity** = ability to correctly classify non-infected animals as non-infected
  - Sp = Number of test-neg animals/ number of truly noninfected animals = 540/545= 99%
  - Noninfected animals that produce a positive test result are called **False Positives**.

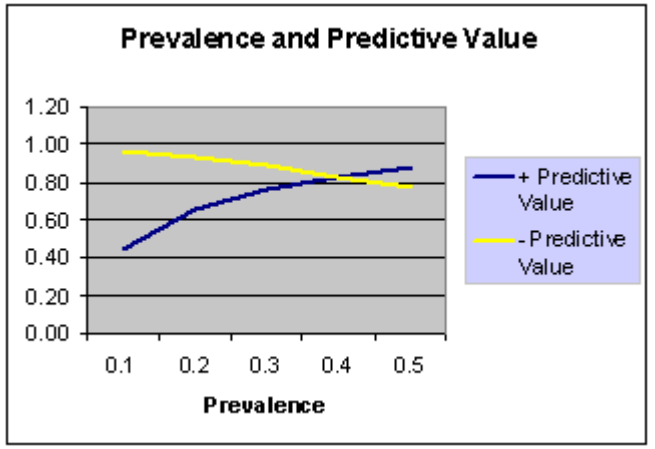
Important stuff to know when making decisions with diagnostic test

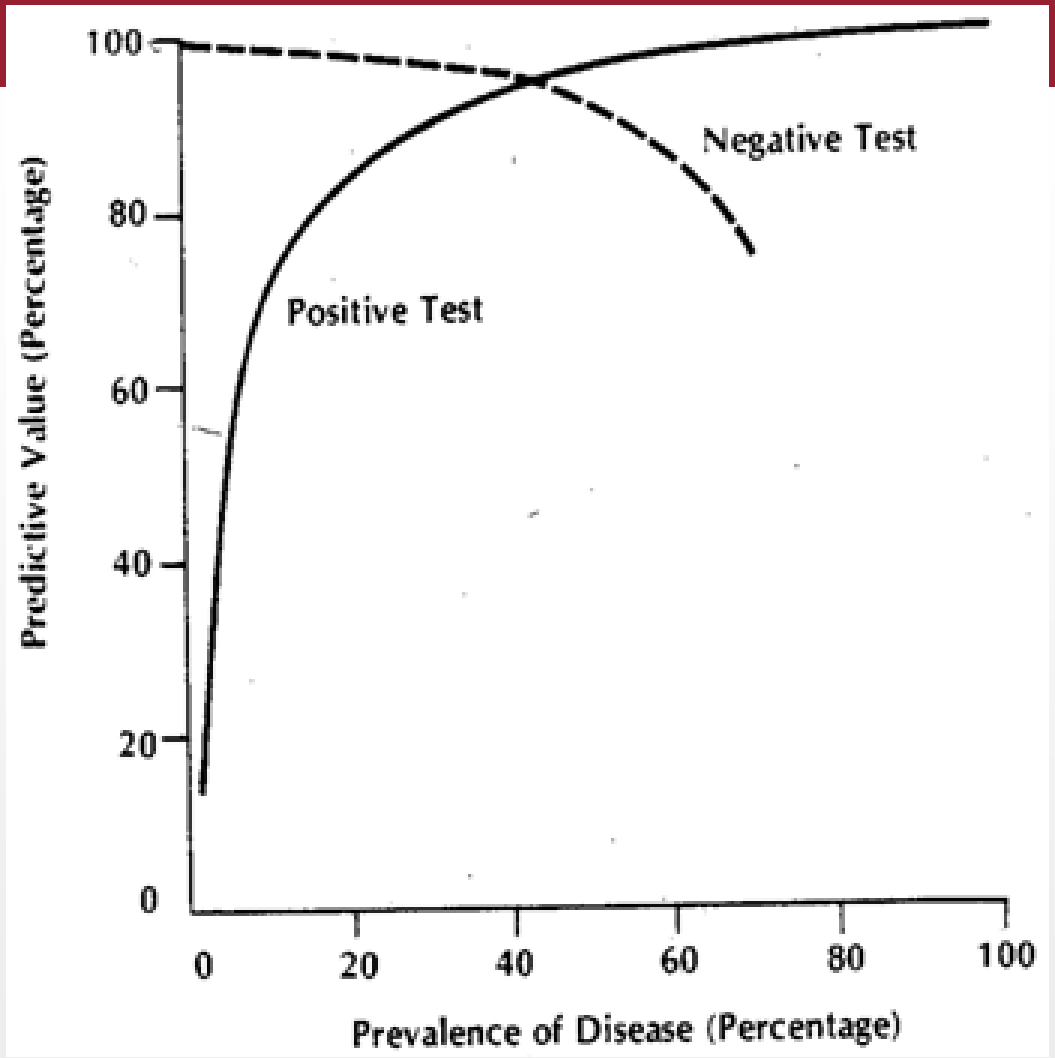
- **Se**
- **Sp**
- **Positive predictive value** – how likely is it that an animal is truly infected if it has a positive test result
- **Negative predictive value** – how confident that an animal is truly non-infected if it has a negative test result

PPV depends on the prevalence of the condition

- The positive predictive value (PPV) of a test will depend not only on the sensitivity of the test but also on the prevalence of the condition within the population being tested. The figure below shows how the positive predictive value for a test with 96% sensitivity varies according to the prevalence of infection in the population.







- Relationship between disease prevalence and predictive value in a test with 95% sensitivity and 85% specificity.
  (From Mausner JS, Kramer S: Mausner and Bahn Epidemiology: An Introductory Text. Philadelphia, WB Saunders, 1985, p. 221.)

Sample size

- What level of performance is required of the test?
- 95% confidence interval
  - We can be 95% certain that the interval contains the true values of sensitivity or specificity
- Or will 75% be ok.
- Depends on the consequences of the outcome
  - Cull don't cull
  - Expensive management change or inexpensive change

Error in biological diagnostic tests

- Inadequate sample size
- Improper sample handling
- Inappropriate time of sample collection (feeding, production cycle ect.)
- Laboratory error

Support for diagnostic tests

- Other herd data that supports findings
- Fitting clinical signs
- Risk factors are present

What sample size do we use?

- 8 and 12
  - 8 for a mean and 12 for proportion
  - Herd-Based Evaluations for Nutritional and Metabolic Disease in Dairy Herds, Dr. Garrett Oetzel
  - 75% confidence interval

BVD

- BVD ELISA diagnostic test ~99% Se and 95% Sp
  - Pooling samples decreases Se by 6 – 7%
- Very low prevalence for BVD PI
  - <1%
  - Test all eligible animals
- Presence of BVD with clinical animals
  - 8 - 12 affected group
  - 8 - 12 unaffected group

Epi tools web site

- http://epitools.ausvet.com.au/content.php?page=home

Testing multiple groups

- Importance of testing both affected group and unaffected
  - Rota/Corona virus AB testing
  - Fitting the diagnostic test result to a condition
  - No difference between groups
  - Results that appeared insignificant actually were

Affected Animals

Ewe	Milk July	Milk August	SCC July	SCC August	CMT	Pathogen isolated
90004	2.2	1.5	826,000	2,950,000	trace	none
11	2	1.3	274,000	2,391,000	3	CNS
13009	2.9	2.2	2,630,000	560,000	2	Strep. uberis
184	2	1.5	185,000	606,000	2	None
186	2	2.5	3,703,000	3,095,000	3	None
41	1.6	0.8	18,000	2,637,000	trace	None
47	1.6	1.5	4,996,000	1,866,000	3	None
54	3.9	2	4,338,000	941,000	2	Proteus mirabilis
69	0.6	1	3,671,000	1,051,000	2	Enterococcus durans
71	1	1	1,881,000	1,314,000	2	CNS
72	3.5	2	660,000	1,414,000	3	Enterococcus sp.
73	2	1	162,000	474,000	2	Questionable
mean	2.118	1.572				
median	2	1.5				

Negative control group

Ewe	Milk July	Milk August	SCC July	SCC August	CMT	Pathogen isolated
0008	2.2	2.5	183,000	98,000	0	none
10	2	1.8	30,000	264,000	trace	none
13014	2.5	1.5	111,000	93,000	trace	none
16	2.2	2.3	6,170,000	68,000	trace	none
28	1.6	1.5	54,000	18,000	0	none
3	1	0.8	142,000	18,000	1	none
34	2	1	75,000	54,000	trace	none
5	2	1.8	66,000	14,000	0	none
61	2.2	1.5	51,000	68,000	trace	none
92	3.1	1.5	581,000	81,000	1	none
96	2.5	1.8	2,030,000	20,000	0	none
100	3.9	3.6	1,296,000	58,000	0	Questionable
mean	2.118	1.636				
median	2.2	1.5				

Questions?

Websites

- Epi tools epidemiological calculator
  - http://epitools.ausvet.com.au/content.php?page=home

New Over The Counter Drug Rule

- CVM GFI #263 Recommendations for Sponsors of Medically Important Antimicrobial Drugs Approved for Use in Animals to Voluntarily Bring Under Veterinary Oversight All Products That Continue to be Available Over-the-Counter
- List of drugs affected by #263 https://www.fda.gov/animal-veterinary/antimicrobial-resistance/list-approved-new-animal-drug-applications-affected-gfi-263

VCPR

According to the US Food and Drug Administration:

A valid veterinarian-client-patient relationship is one in which: 1. A veterinarian has assumed the responsibility for making medical judgmentsregarding the health of (an) animal(s) and the need for medical treatment, and the client (the owner of the animal(s) or other caretaker) has agreed tofollow the instructions of the veterinarian. 2. The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition; and 3. The practicing veterinarian is readily available for follow up in case of adverse reactions or failure of the regimen of therapy.

Such a relationship can exist only when the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of examination of the animal(s), and/or by medically appropriate and timely visits to the premises where the animal(s) are kept.

How has the new ruling affected you?

- What things have you done at your practice that seem to work?
- What challenges have you faced?
- Have others faced the same challenges? What did you do about it?

Thank you