

NOTES ON:

PRINCIPLES OF VETERINARY EPIDEMIOLOGY

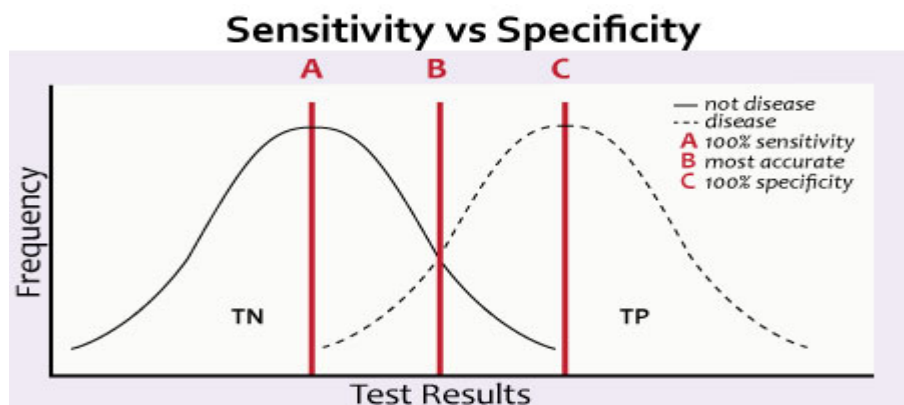
QUALITY OF SCREENING TESTS

Depends on:

1. **Validity** : ability of the test to distinguish between who has a disease and who does not ,A perfect test would be perfectly valid
2. **Reliability: repeatability of a test** .A perfectly reproducible method of disease ascertainment would produce the same results every time it was used in the same individual.

1-VALIDITY

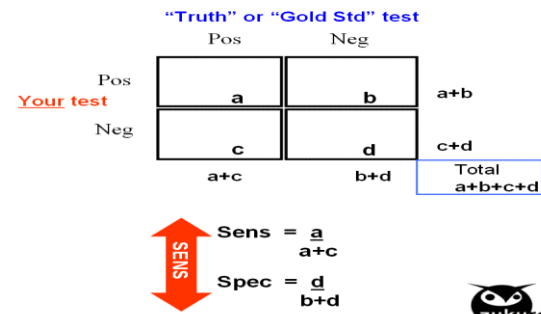
- * **Sensitivity** – the ability of the test to identify correctly those who HAVE the disease; the search for diseased persons
- * **Specificity** – the ability of the test to identify correctly those who DO NOT HAVE the disease; the search for well persons
- **SENSITIVITY AND SPECIFICITY** quantify a test's accuracy in the presence of known disease status
- **Note:** When calculating sensitivity or specificity, another more definitive test (gold standard) is used to know who really has or does not have the disease, e.g.) FOBT then colonoscopy w/ biopsy (the gold standard will determine true presence of ca)



2 X 2 TABLE

		DISEASE	
		+	-
T E S T	+	True + (a)	False + (b)
	-	False - (c)	True - (d)
		Sensitivity = $a / a + c$ = $TP / TP + FN$	Specificity = $d / b + d$ = $TN / FP + TN$

The only epi table that matters: The 2 x 2



Example(1): suppose a sample of 10000 animals was tested for presence of a disease agent using a test of 96% sensitivity and 94% specificity and diseased prevalence (true)20%.

Test results	Infected	Non infected	Total
Positive	1920	480	2400
Negative	80	7520	7600
Total	2000	8000	10000

Prevalence: 20% = $20 \times 10000 / 100 = 2000$ (infected)
 $10,000 - 2000 = 8000$ (non infected)

Sensitivity: 96% = $2000 \times 96 / 100 = 1920$ (true +ve)

Specificity: 94% = $8000 \times 94 / 100 = 7520$ (true -ve)

$2000 - 1920 = 80$ (false -ve)

$8000 - 7520 = 480$ (false +ve)

Example (2): Disease prevalence 1%, population 10000, sensitivity 95%, specificity 85%.

TEST RESULTS	Infected	Non infected	Total
Positive	95	1485	1580
Negative	5	8415	8420
Total	100	9900	10000

- Prevalence: 1% = $1 \times 10000 / 100 = 100$ (infected)
 $10000 - 100 = 9900$ (non infected)
- Sensitivity: 95% = $100 \times 95 = 95$ (true +ve)
- Specificity: 85% = $9900 \times 85 / 100 = 8415$ (true -ve)
 $100 - 95 = 5$ (false -ve)
 $9900 - 8415 = 1485$ (false +ve)

Example(3): Calculation using a fixed threshold or gold standard measure:

Somatic cell	Mastitis	Healthy	Total
Elevated SCC	40	190	230
Low SCC	10	760	770
Total	50	950	1000

- **Prev.%** = $5 \cdot 1000 / 100 = 50$ (mastitis cow)
 $1000 - 50 = 950$ (non mastitis (healthy) cow)
- **Sensitivity** 80% = $50 \cdot 80 = 40$ (true reactor or elevated)
- **Specificity** 80% = $950 \cdot 80 / 100 = 760$ (true non-reactors)
 $50 - 40 = 10$ (false non reactors or slow SCC)
 $950 - 760 = 190$ (false reactor or elevated SCC)
- **Positive predictive value** = $40 / 230 = 0.173 = 17.3\%$
- **Negative predictive value** = $190 / 770 = 0.247 = 24.7\%$

Test Result (PTB)	Disease + Osteomyelitis	Disease - No Osteo	
Positive +	33		Total Test+ 37
Negative -			Total Test- 39
	Total D+ 50	Total D- 26	Total Subjects 76

PPV = .89
 $\frac{33}{37}$

Sensitivity = $\frac{33}{50}$

Specificity = $\frac{36}{39}$

NPV = $\frac{36}{39}$

DISEASE (PATHOGEN) CONTROL STRATEGIES

1. **EXCLUSION / PREVENTION** “Keep it out of here”

❖ **Control**

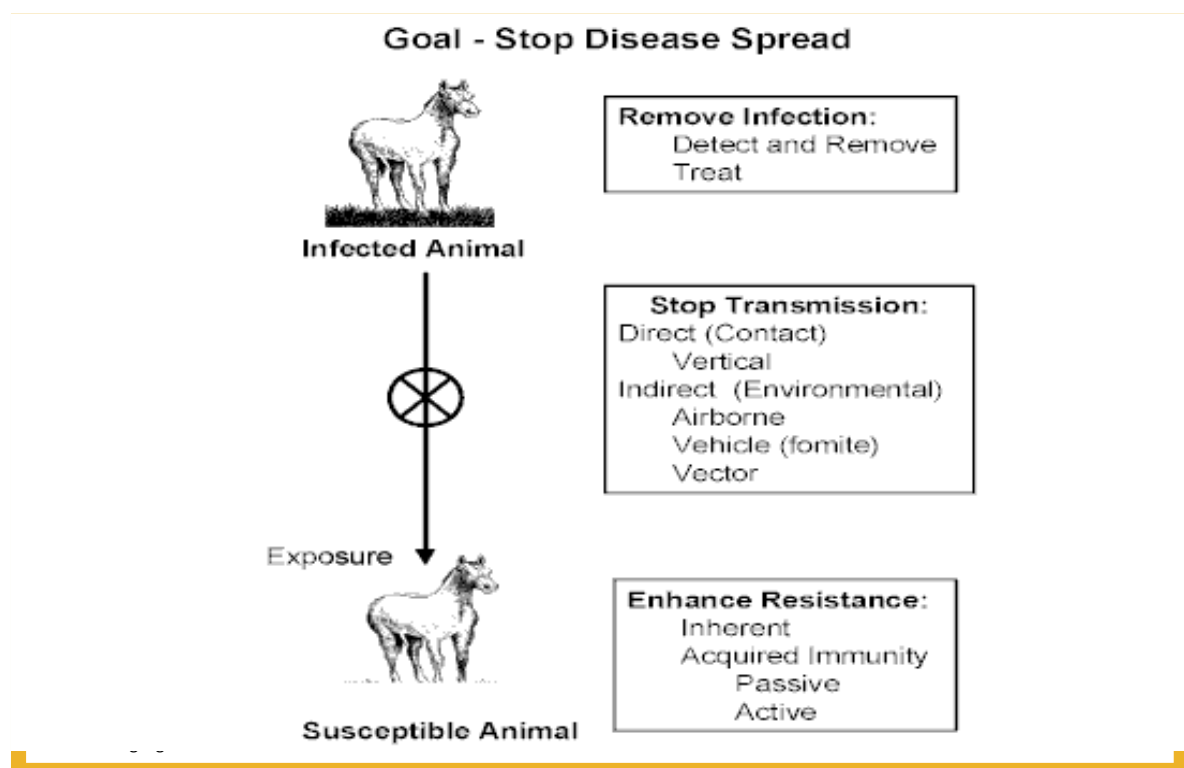
1. Reduction of disease incidence, prevalence, morbidity,
2. mortality, and disability to a locally acceptable level

2. **ELIMINATION:**

- Reduction of infection and disease to zero in a defined area. Continued efforts required.

3. **ERADICATION**

- “Permanent reduction of worldwide incidence to zero .Continued efforts not required.



I) ERADICATION OF DISEASE IN POPULATIONS

1. **Case-finding surveys** by detection of disease prevalence, incidence rate, cumulative incidence, mortality rate, case fatality rate about the disease.
2. **Selective slaughter.** It is the deliberate killing of a minority of infected animals to protect the well majority. The selective slaughter of diseased animals or reactors to immunodiagnostic screening tests has featured prominently in many successful modern, large scale campaigns against animal diseases.
3. **Depopulation.** Complete depopulation of an affected restricted population may be the only available procedure to protect the large – scale population of domestic animals in disease control programmes when :-
When a diagnostic test can not be applied to an affected population in order to carry selective slaughter. When the population is inaccessible for other measures
4. **Quarantine measures.** Is the separation of sick animals from healthy ones and restriction of animal movement during the longest incubation period until proved to be diseased or free?
OIE: Office International des Epizooties .World Organization for Animal Health created in 1924 in Paris
OIE List A Diseases are transmissible diseases which are of serious socio-economic or public health consequence and which are of major importance in the international trade of animals.
5. **Mass treatment.** It was suggested after the application of the successful mass detection techniques as to combat the diseases occurring in a very high prevalence as total depopulation of the affected herds not economically. The used treatment should be safe and cheap agents.
6. **Mass immunization.**-Is one of the most effective procedures in livestock diseases prevention that undertaken in veterinary medicine as a part of biosecurity programmes for prevention of disease reoccurrence
7. **Environmental control.** It is concerned with biosecurity measures which are taken to keep disease agent out of population, herds or groups of animals. Using of clean water, housing improvements such as adequate ventilation and lighting, shelter, measures and waste disposal, pasture rotation.
8. **Biological control** .Using of natural enemies of parasites as using fish feeding on snails or grass that snails are hidden on it , or using type of insects or fish that can feed ova or egg on banks of river so can damage the normal life cycle
9. **Vector and reservoir control** . **Reservoir of diseases may be wild or domestic animals , so the control of wild animal by depopulation that is of**

good value when that reservoir is known as rodents in case of plague and vampire bats in case of rabies virus disease .

10. Education .application of literatures , fact sheets and media on biosecurity and sanitation programmes for the vet, breeders , farmers and those having approach to vet field , also the importance of public health and its relation to vet.