Diagnosis and Intervention

to control Paratuberculosis in Farmed Deer

New technologies for Old diseases

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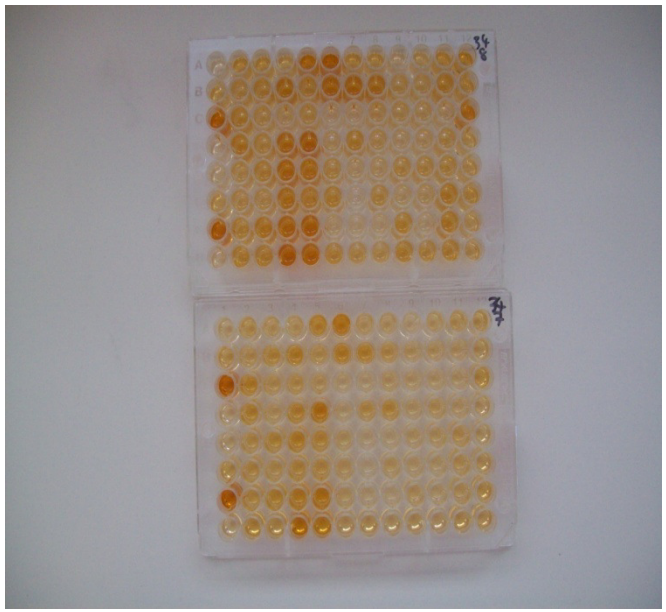
Diagnostic testing for JD in the live animal

- Serum Antibody by ELISA (Paralisa)
  - ✓ High throughput. (Cost effective?)
  - ✓ Fast.
  - ✗ Specificity

Current Immuno-diagnostic assays

Paralisa™- multi antigen ELISA for Johne's Disease based on responses to PPDj and PpAg



Diagnostic tests can be carried out on cattle, deer or sheep.

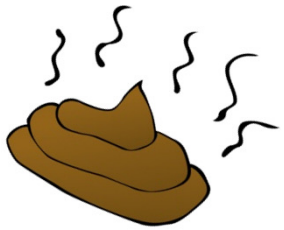
Relationship between IgG_1 ELISA and disease

	Culture (+) Infected	Lesion-positive animals		
		Disease +	Disease ++	Disease+++
ELISA(+)	**77/100**	39/43	37/40	66/67
ELISA sensitivity	**77%**	**91%**	**93%**	**98.5%**

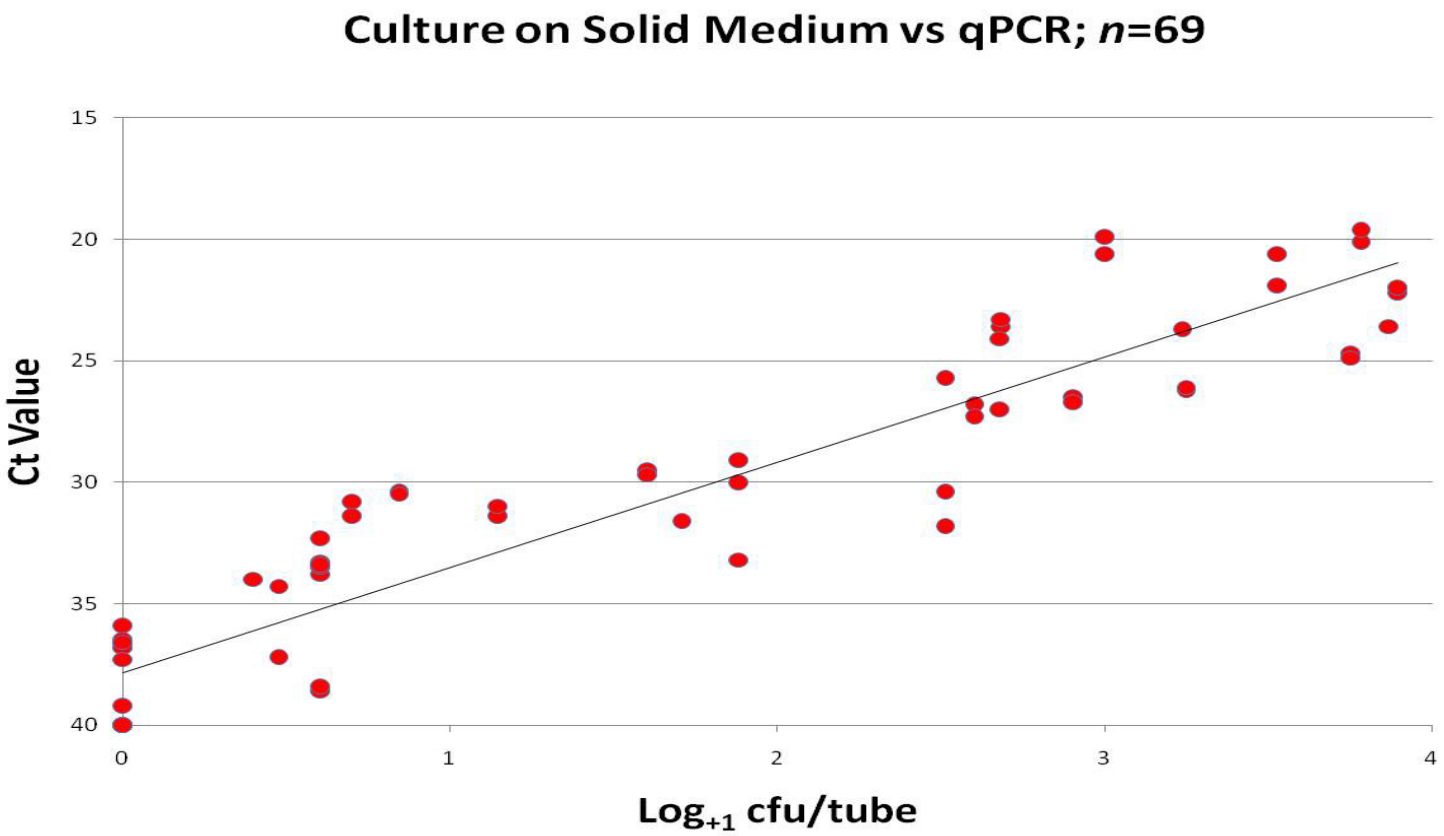
Inverse Relationship: [Antibody] & Disease Severity

Diagnostic testing for JD in the live animal

- Faecal Culture/qPCR
  - ✓ Specific.
  - ✓ Sensitive.
  - ✗ Cost

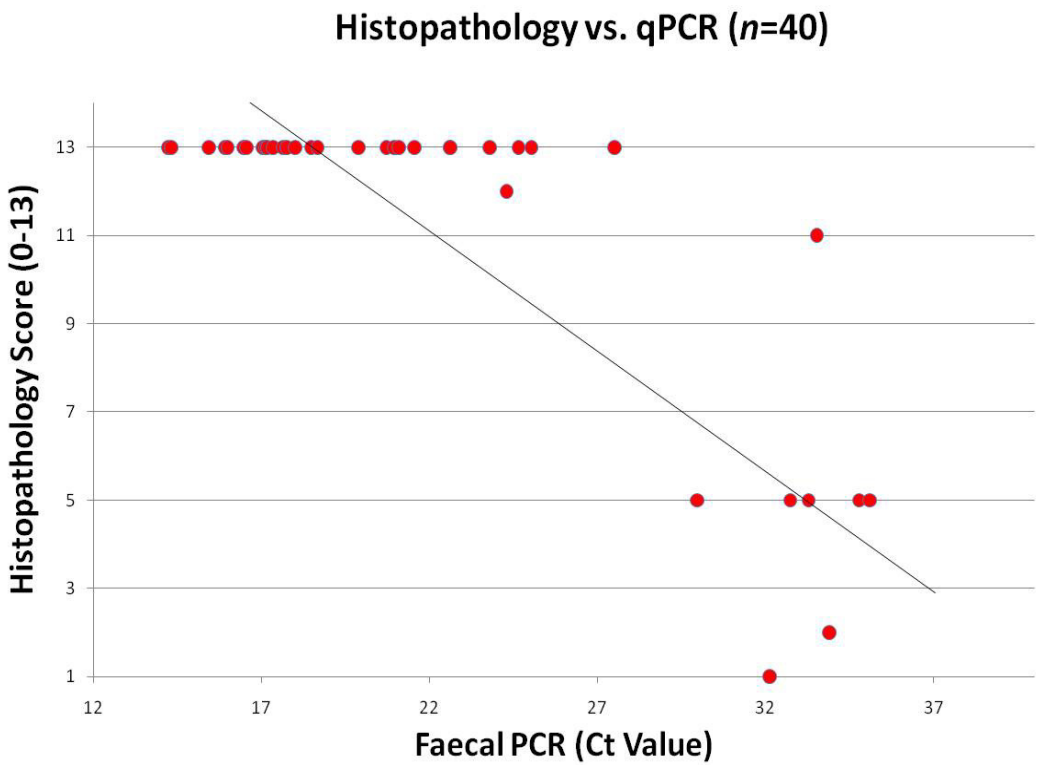


Correlation between culture and qPCR



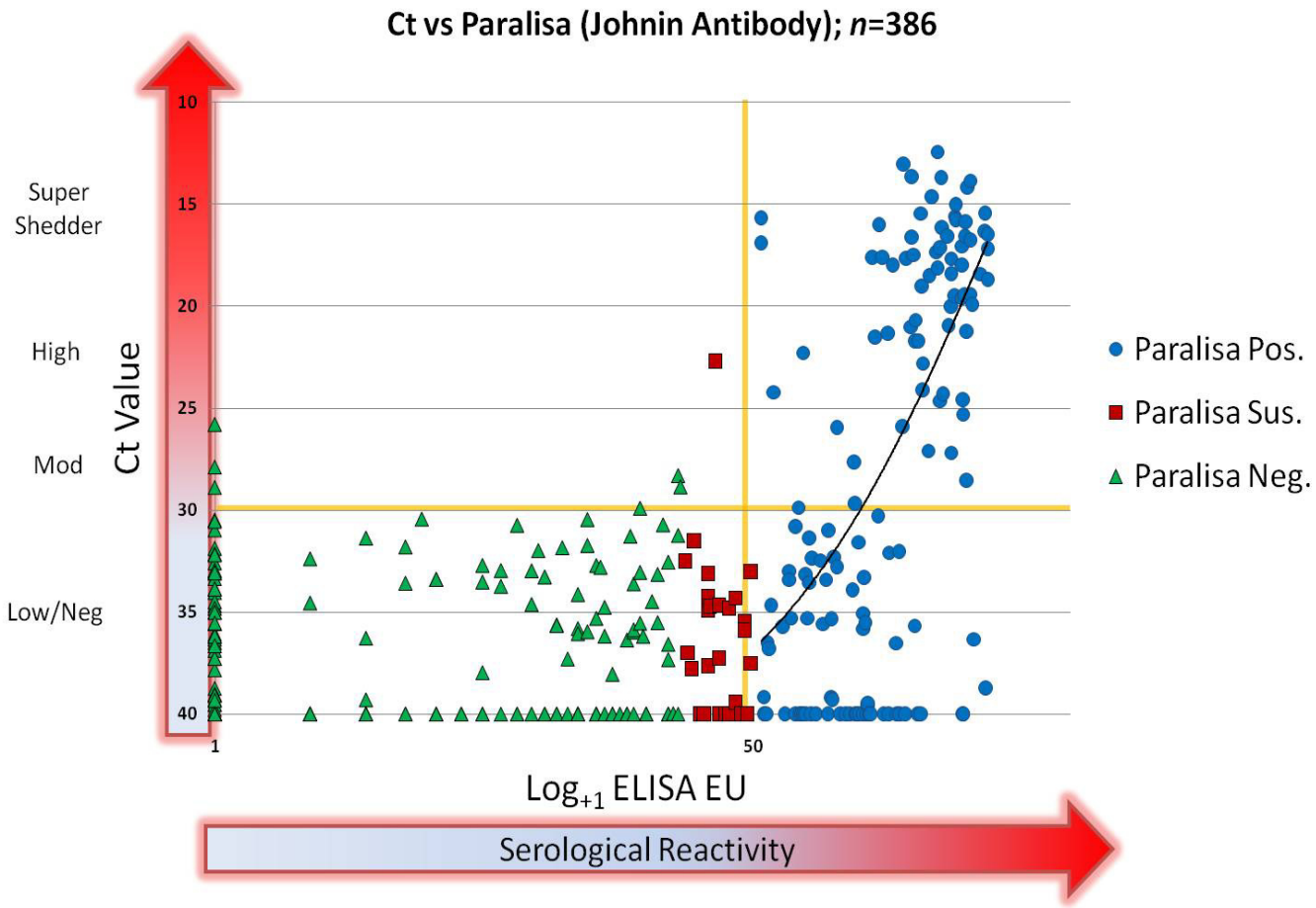
n = 69 Spearman correlation = 0.9469 p < 0.0001

Correlation between pathology and qPCR



n = 40 Spearman correlation = 0.7900 $p < 0.001$

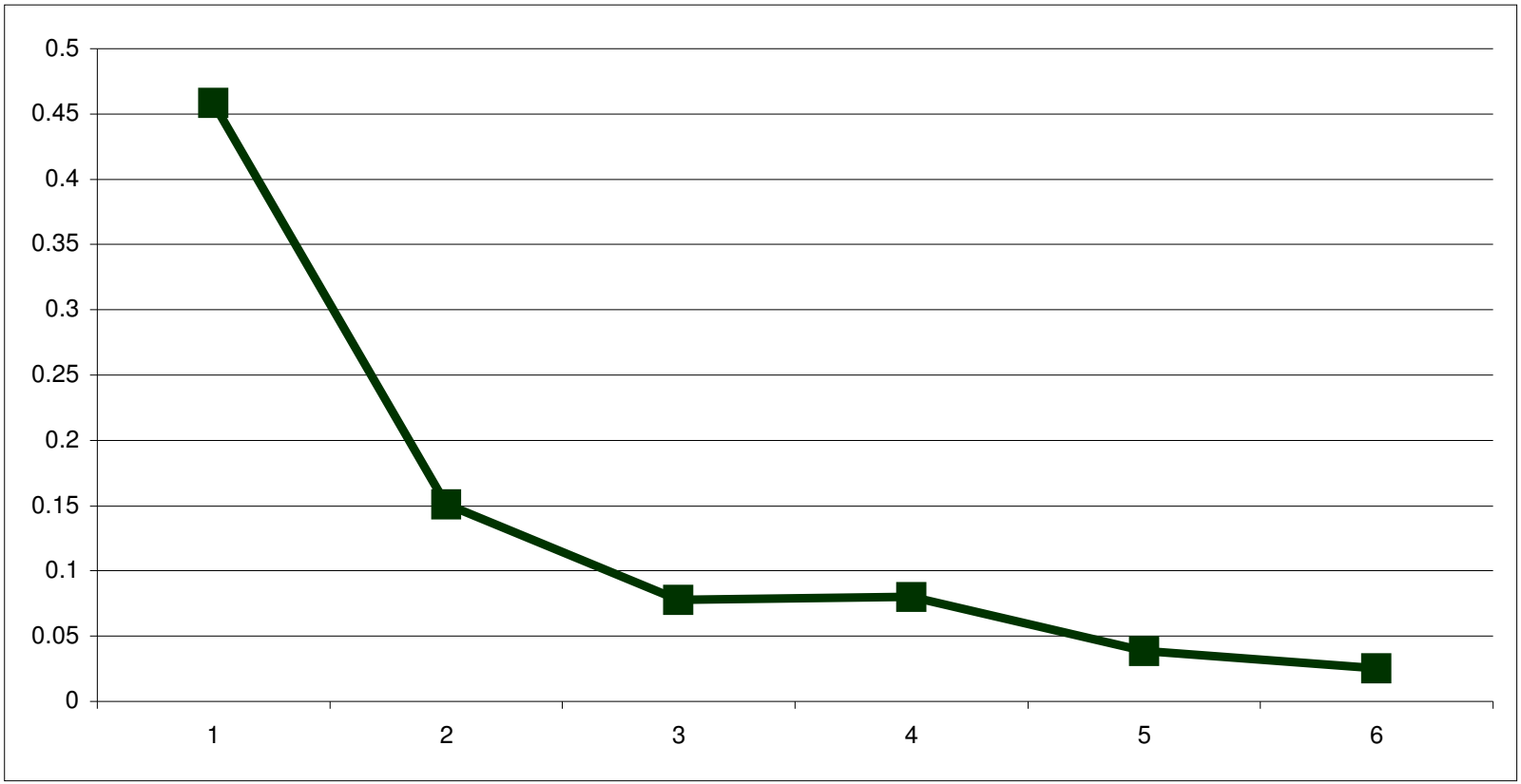
Correlation between Faecal shedding of Bacteria and ELISA



Sensitivity, specificity, positive and negative predictive values for Paralisa™ to predict *M. ptb* shedding as determined by qPCR.(=< 30Ct)

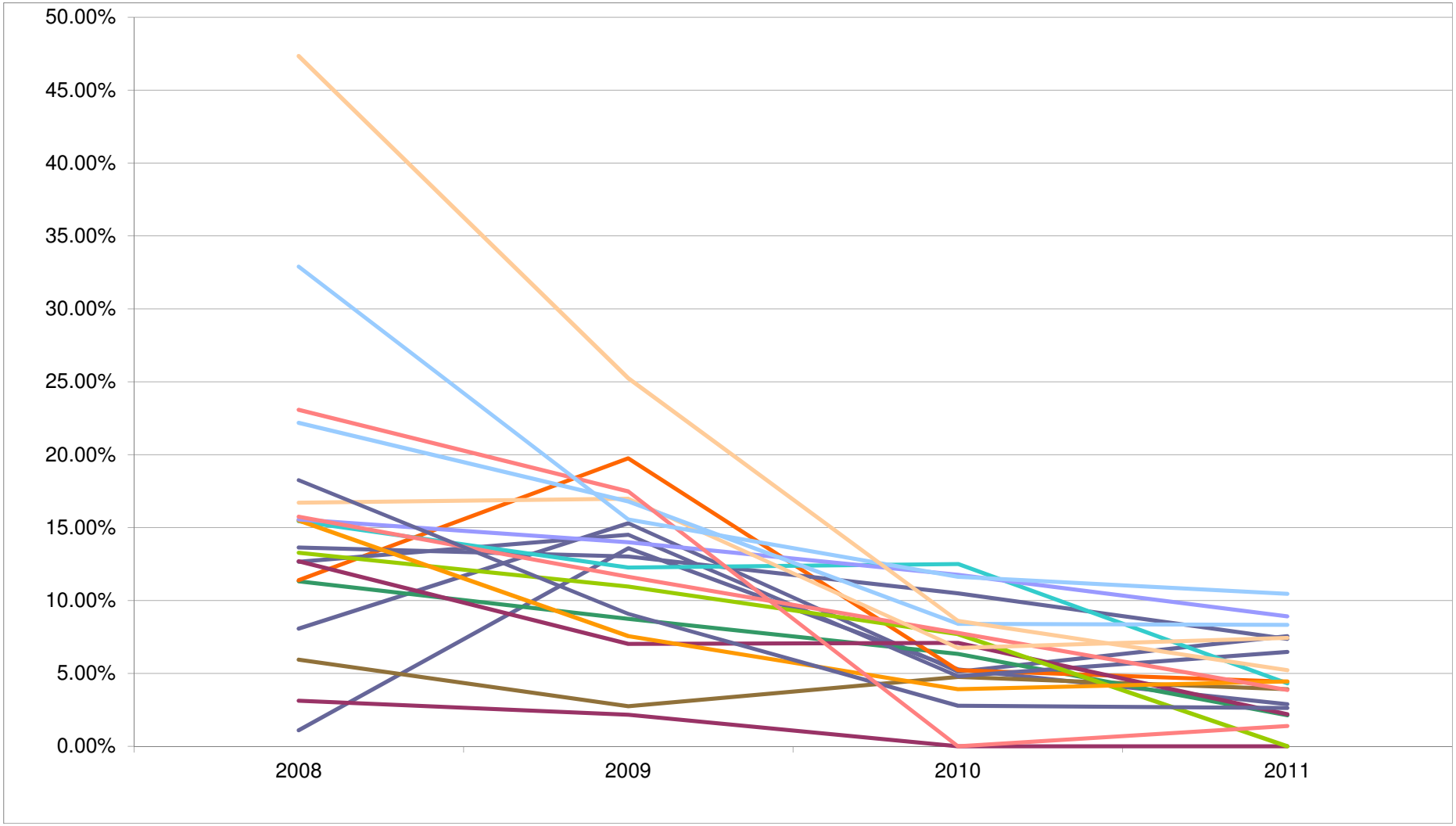
	EU≥ 50 (95% CI)	**EU≥118 (95% CI)**
Sensitivity	**0.91** (0.82, 0.96)	**0.81** (0.70, 0.89)
Specificity	**0.78** (0.73, 0.82)	**0.95** (0.92, 0.97)
Positive Predictive Value	**0.50** (0.42, 0.59)	**0.79** (0.69, 0.88)
Negative Predictive Value	**0.97** (0.94, 0.99)	**0.95** (0.92, 0.97)

Immunodiagnostics to Control Infection in 5 deer herds (6,000 animals)

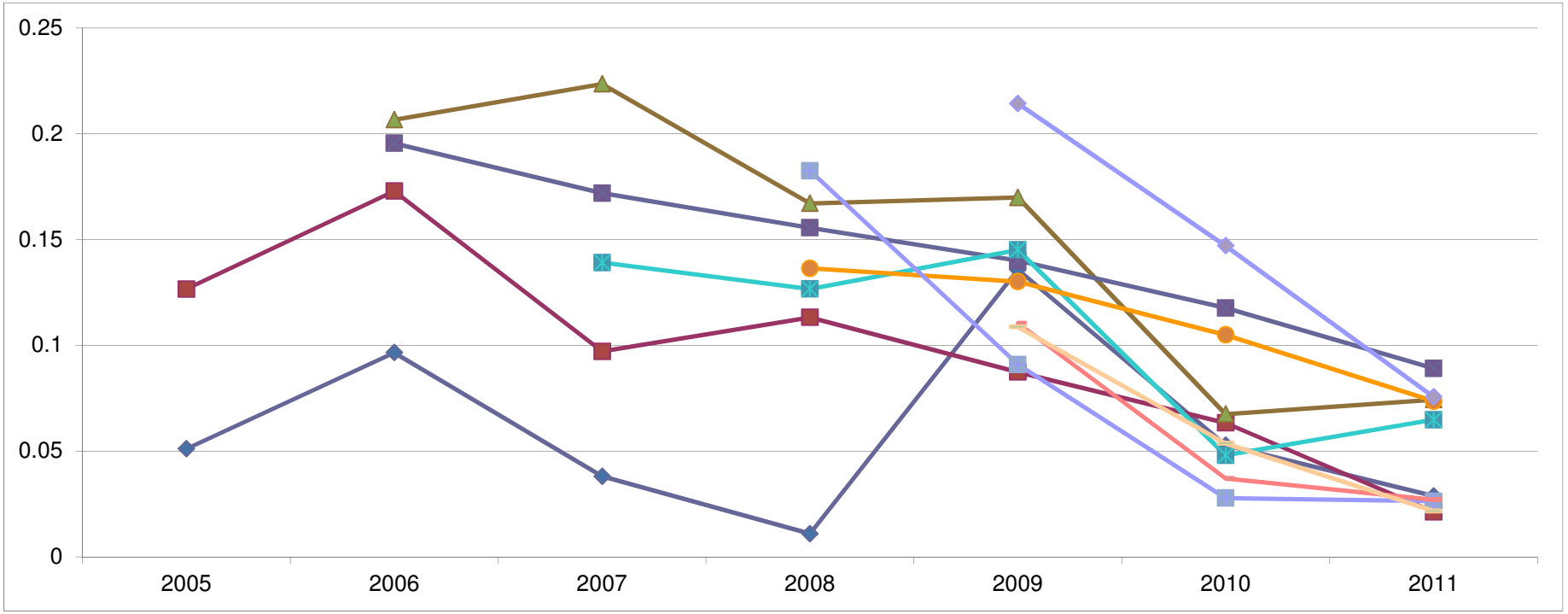


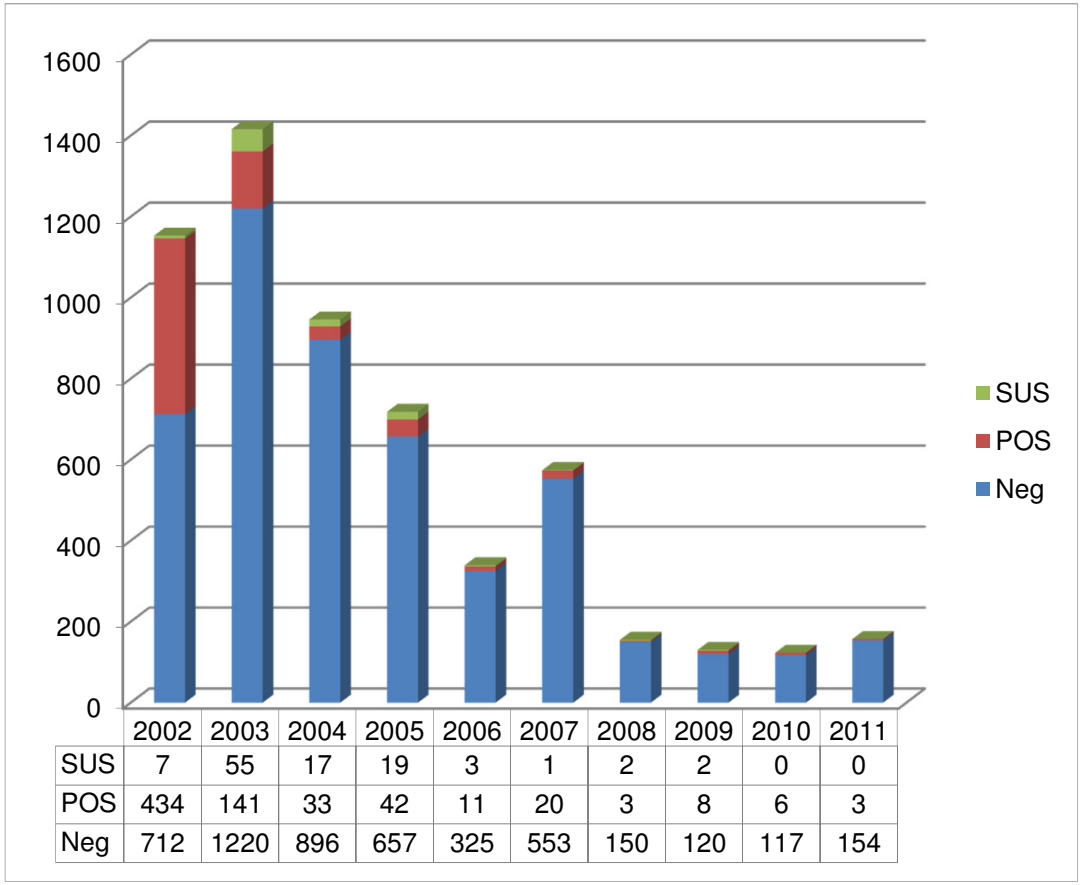
Most disease is removed after the first test

Sequential data from 18 Deer herds

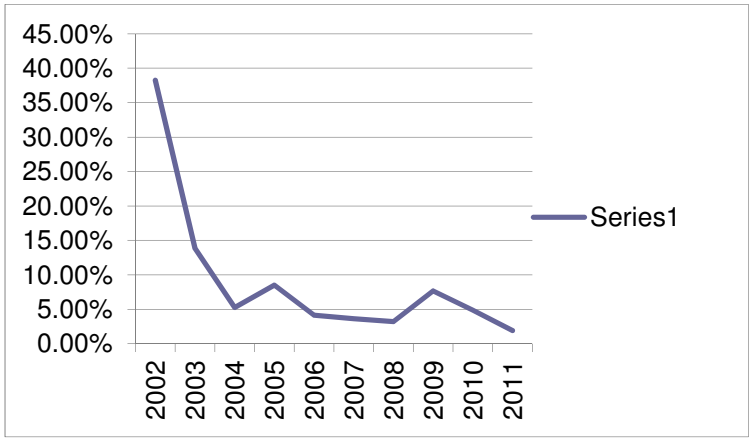


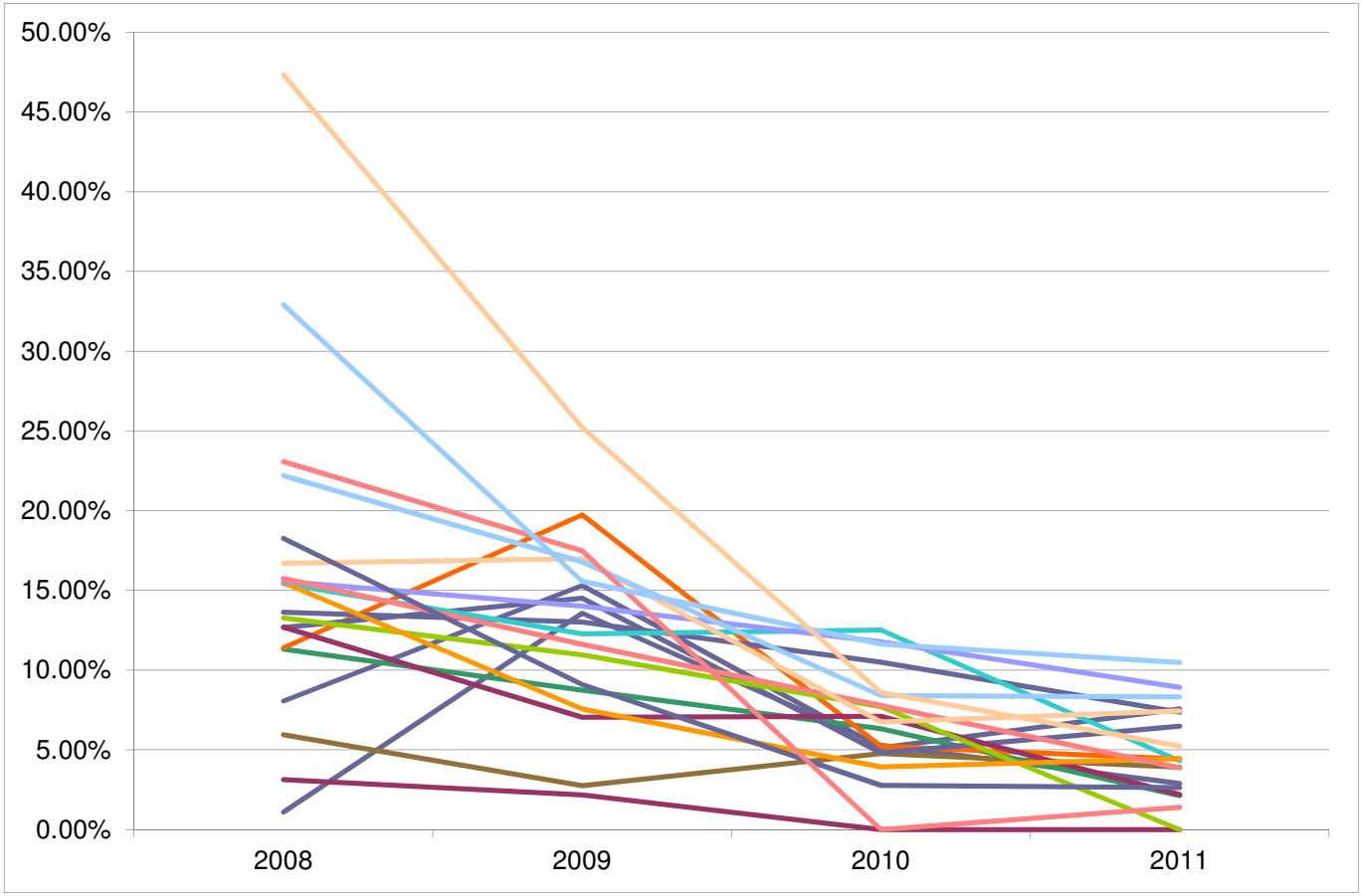
Data from 8 Random Herds with sequential testing





	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SUS	7	55	17	19	3	1	2	2	0	0
POS	434	141	33	42	11	20	3	8	6	3
Neg	712	1220	896	657	325	553	150	120	117	154




50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
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2008
2009
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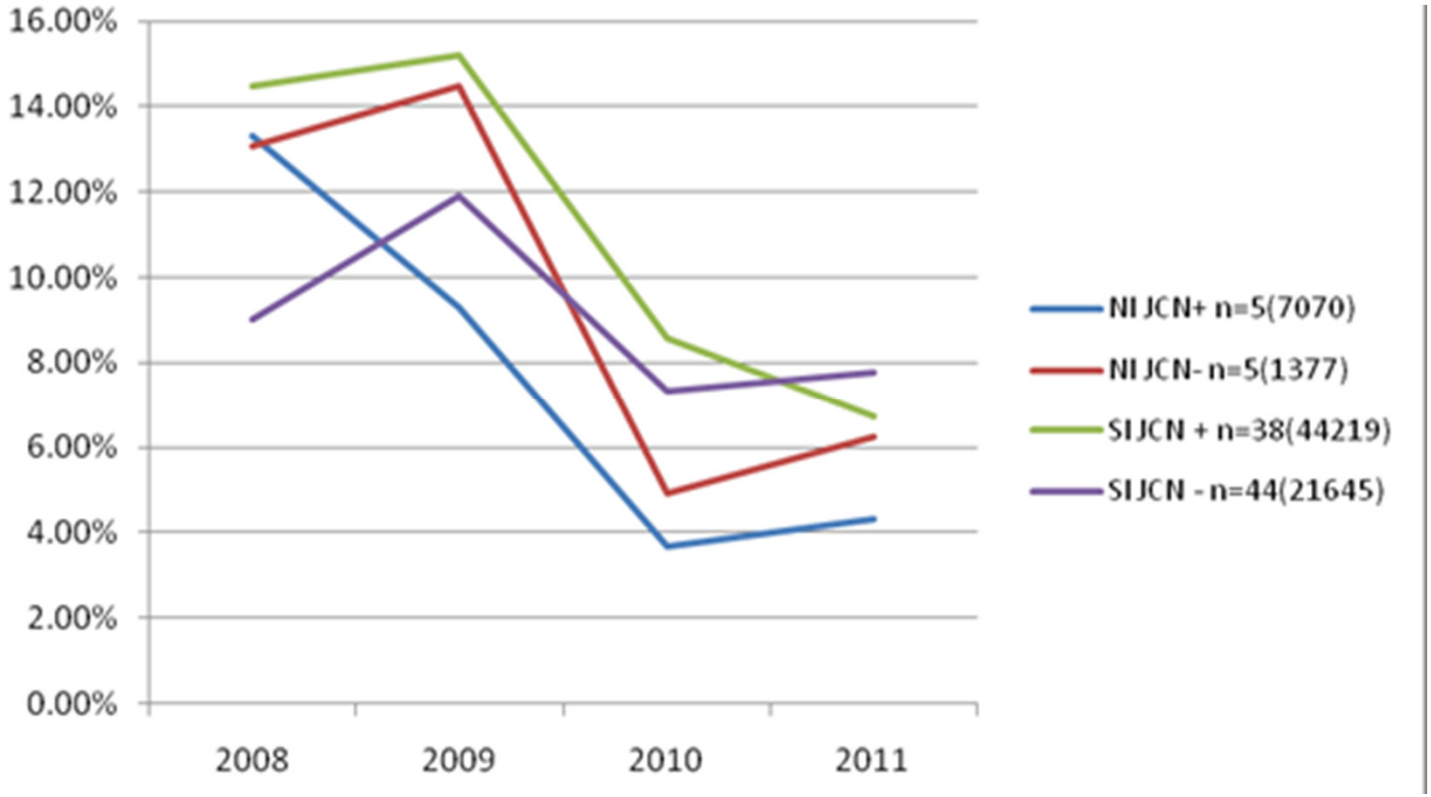
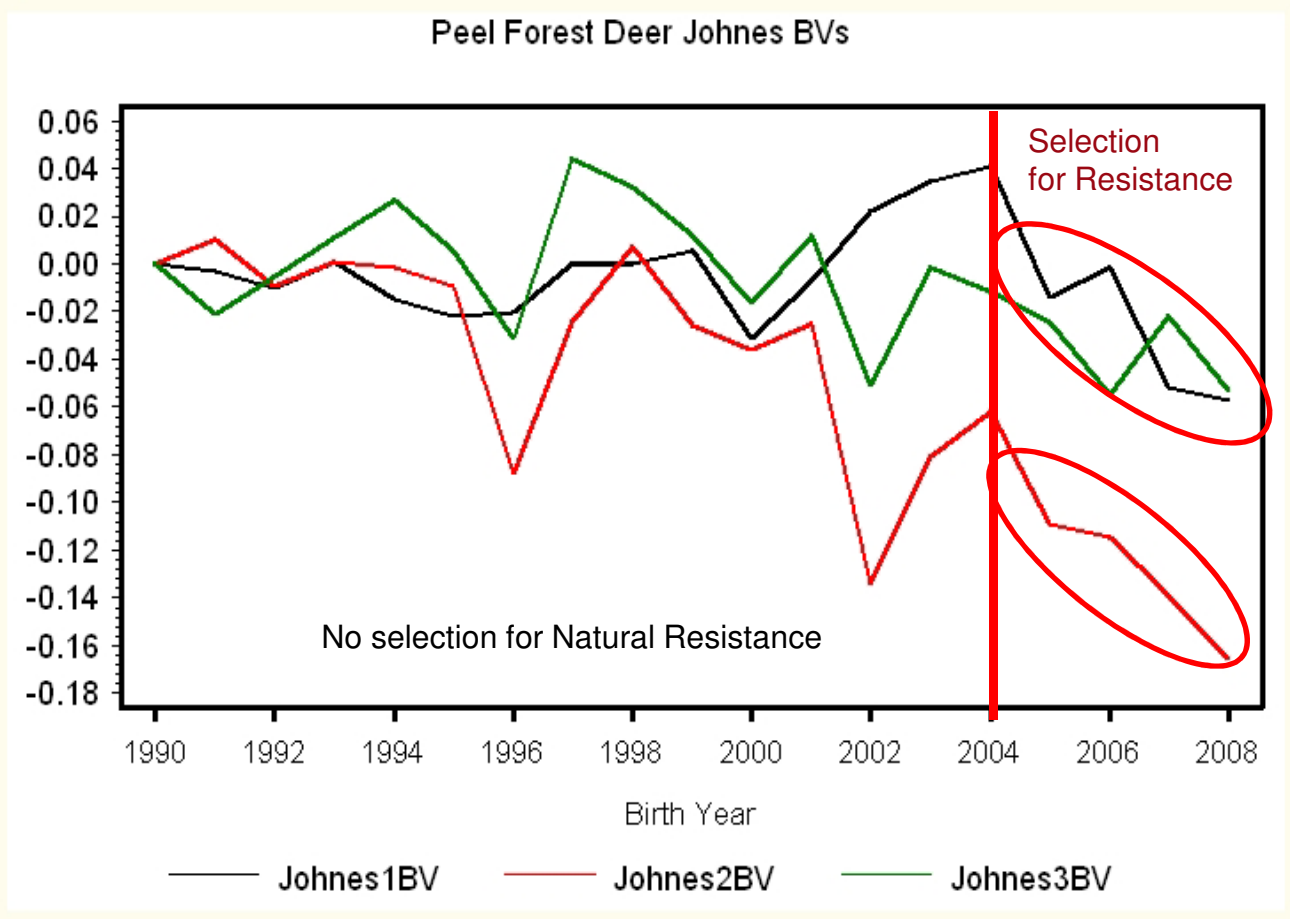
2011


16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
2008
2009
2010
2011
NIJCN+ n=5(7070)
NIJCN- n=5(1377)
SIJCN + n=38(44219)
SIJCN - n=44(21645)

Genetic Progress towards Resilience using Diagnostic testing to accelerate Natural Selection

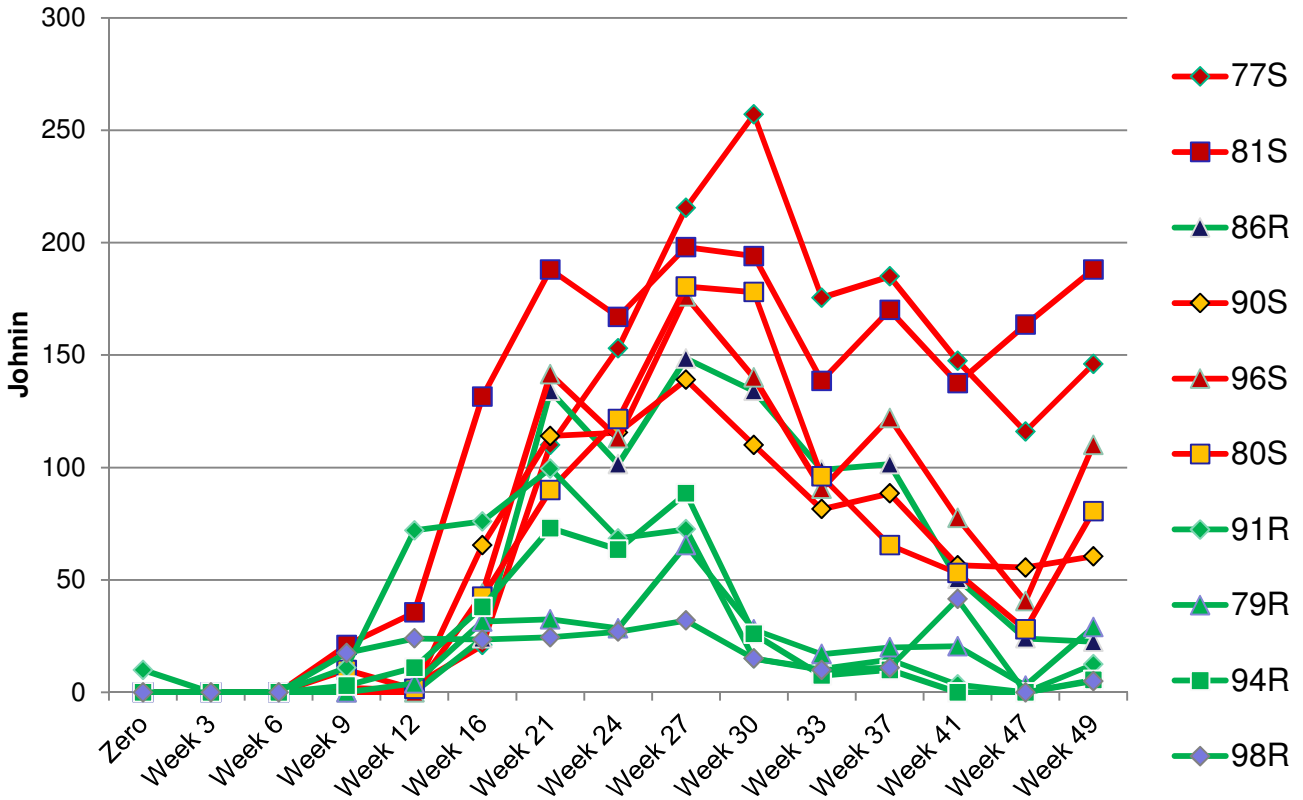
No control strategy

Diagnostic Intervention



Serological reactivity in Experimentally Infected fawns

Sire	Tag	LSS	PB/MB
R	92	0	
R	91	2	
R	79	5	PB
R	84	5	
R	88	5	
R	94	5	PB
R	98	5	PB
R	86	13	MB
R	82	Cl 13	MB
	Av	6	
S	89	3	
S	77	11	MB
S	80	11	PB
S	81	11	PB
S	90	13	MB
S	96	13	MB
S	85	C 13	MB
S	93	Cl 13	MB
	Av	11	



Cost of Johne's disease at Peel Forest in 10 years

- Deaths $400 x 150 animals $ 600,000
- Loss of stud sales $400K x 3yrs $ 1,200,000
- Culling infected stud animals x 10 yrs $ 800,000
- Bloodtesting/culling x 5 yrs $ 200,000

Total = $ 2,800,000

Added Value from Intervention at Peel Forest

- Reduced Death from disease **>5% to < 0.75%**
- Increased venison production per su. **5-10%**
- Admissability and response by PF assured Integrity within the Deer Industry **Brand Value**
- Satisfaction in Producing healthy animals **Priceless !!!**
- Identification of **Resilient** and Susceptible Genotypes **Scientific asset ?**

Disease Research in Middle Earth