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A STUDY OF ASSOCIATION BETWEEN ELISA RESPONSE TO INFECTIOUS DISEASE AGENTS AND CALVING INTERVAL IN CATTLE IN THE TROPICS OF MEXICO.

ESTUDO DA ASSOCIAÇÃO ENTRE RESPOSTAS AO ELISA FRENTE A INFECÇÕES E INTERVALOS ENTRE PARTOS EM BOVINOS

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SUMMARY

Forty eight cows of Holstein-Zebu crosses with at least one completed pregnancy were tested for antibodies to 20 disease agents. The testing was performed within one month (average two weeks) after calving when the IgG level constantly reaches its lowest value during the cows reproductive cycle. The results indicate that increasing levels of IgG against **Leptospira interrogans serovar hardjo** and **Mycobacterium paratuberculosis** may be associated with an increased calving interval. Increase in calving intervals could not be explained by age of cows or their genotypic characteristics.

Key words: infectious diseases, antibodies, calving intervals, México.

RESUMO

Quarenta e oito vacas cruzas Holandês-Zebu com pelo menos uma prenhez completa foram testadas para anticorpos contra 20 agentes infecciosos. O teste foi realizado dentro de um mês (média de 2 semanas) após o parto quando o nível de IgG alcança constantemente seu valor mais baixo durante o ciclo reprodutivo das vacas. Os resultados indicam que níveis crescentes de IgG contra **Leptospira interrogans serovar hardjo** e **Mycobacterium paratuberculosis** podem estar associados com um aumento no intervalo entre partos. Aumento nos intervalos entre partos não pôde ser explicado pela idade das vacas ou suas características genotípicas.

Palavras-chave: doenças infecciosas, anticorpos, intervalo entre partos, México.

INTRODUCTION

Little is known about subclinical infection as determined by antibody response and reproductive performance in cattle. ABBAS et al (1983) studied subclinical paratuberculosis in California dairy herds using ELISA and culturing. By matching cows within herds they demonstrated that subclinical paratuberculosis increased calving intervals on an average of 2 months. UHAA et al (1990) and AKHTAR et al (1990) doing cross sectional ELISA studies in large California dairy herds found suggestions of negative impact on reproduction performance associated with positive reaction to **Mycoplasma bovis** and **Campylobacter fetus.**

No studies seem to have done on impact of subclinical infections on reproductive performance of cattle in the tropics.

MATERIALS AND METHODS

The study was conducted with cattle at the Center for Research, Teaching and Extension in Tropical Livestock (Centro de Investigación, Enseñanza y Extensión en Ganadería Tropical-CIEEGT) located in the North-central part of the state of Veracruz, Mexico. The study area and the methods of ELISA have been described earlier (Barajas-Rojas et al, 1993a).

For the purpose of investigating association between antibody level (IgG) and reproductive performance ELISA was performed within a month (average two weeks) after calving and length of the subsequent calving interval was recorded. ELISA values obtained at different points of time may show considerable variations (BARAJAS-ROJAS et al, 1993a, 1993b, 1993c and 1993d) but the lowest values are consistently found shortly after calving and may provide

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the best basis for comparisons. The hypothesis is that the higher the ELISA value is shortly after calving the more likely it is that the cow has an active infection that may have a negative impact on conception when the cow is bred a few weeks later.

RESULTS

The overall results showing percent ELISA, calving intervals, genotype group and the age of cows are presented in Table I. The distribution of recorded calving intervals is shown in the histogram (Figure 1). Regression of calving interval on percent ELISA yielded no significant results which is not surprising since even the most promising plots (**Leptospira interrogans serovar hardjo**, Figure 2 and **Mycobacterium paratuberculosis**, Figure 3) do not indicate subpopulations with normal distribution and equal variances. The data were listed according to increasing calving interval as shown in Table I and divided into four groups each with 12 cows. The groups are not mutually exclusive; group I represents calving intervals 11 - 14 months, group II 14 - 16 months, group III 16 - 18 months and group IV 18 - 33 months. This type of grouping was used because it was felt that calving intervals were not always recorded exactly to month.

The Kruskal-Wallis one way analysis of variance by ranks was then performed on the four groups; the results are shown in Table II. The possibilities existed that differences in calving intervals may be due not to

Table I. Percent ELISA at calving interval and subsequent calving interval in months in cows from the tropics of Mexico, 1988, 1989.

Animal	CF	LH	BTV	MB	AM	PM	CB	TG	ST	SD	BRSV	BB	CL	HS	IBR	BVD	PI3	MP	LM	RV	Calving interval in months	Genotyp	Age
237	65	35	64	61	63	45	42	59	51	39	85	35	50	95	7	17	43	37	39	36	11	1	3076
287	44	26	136	29	27	68	41	39	26	73	62	47	33	37	25	43	30	53	25	50	11	1	2264
249	47	28	60	64	64	41	69	30	64	34	100	32	20	22	11	32	26	37	14	35	11	2	2506
282	28	63	79	61	36	40	41	31	57	45	92	72	45	32	18	25	34	81	35	29	11	1	2549
10	25	104	76	12	26	19	19	27	31	10	21	20	32	24	2	2	30	13	19	55	11	1	3634
211	27	35	41	106	34	25	28	33	21	13	81	33	29	16	8	1	33	25	23	81	12	1	2659
240	36	40	139	41	26	57	26	22	21	34	47	41	38	32	15	25	37	21	15	32	13	1	2364
31.5	22	59	68	59	39	29	16	28	22	21	27	20	26	25	3	4	50	14	13	13	13	2	1557
6	43	67	60	49	34	71	38	51	62	29	38	28	57	63	4	5	42	48	42	22	13	1	4045
475	41	70	128	104	85	45	43	49	47	40	67	36	26	49	73	75	50	54	50	56	13	2	1539
265	53	25	100	45	58	35	52	33	47	66	55	49	58	33	18	32	58	66	63	38	13	2	2523
235	13	39	50	47	59	95	42	41	41	45	77	61	54	31	38	26	41	46	25	48	14	1	2536
581	31	56	85	49	74	88	46	73	28	25	36	34	37	20	114	87	37	85	25	34	14	2	1430
79	13	60	120	71	40	55	38	46	62	38	67	42	21	27	18	35	36	61	10	54	14	1	3220
116	19	31	69	45	52	25	34	33	57	36	58	34	40	29	6	5	27	90	15	13	14	1	3215
192	72	59	52	54	61	119	30	36	105	79	71	42	32	20	2	29	135	120	107	38	14	1	2579
296	45	18	38	21	43	17	30	9	28	18	65	33	23	48	1	3	69	25	17	44	15	1	2247
25.7	52	128	101	72	86	49	52	66	50	40	94	62	24	42	32	3	38	56	22	68	15	2	803
477	72	53	66	81	41	39	26	59	86	101	51	51	38	15	34	22	66	51	55	57	15	2	2016
207	25	35	56	54	54	48	28	61	68	61	12	10	22	41	5	12	28	33	77	55	15	2	3095
285	39	48	69	37	35	21	15	21	30	22	69	58	30	31	31	11	61	39	47	37	15	1	1734
70.6	36	46	75	69	41	31	38	17	32	39	57	30	32	10	27	2	42	89	44	51	16	3	697
349	47	20	62	56	86	30	42	39	65	28	79	44	62	44	3	15	29	25	27	29	16	2	2716
316	58	50	107	24	48	33	41	63	62	91	57	140	33	24	15	33	41	55	45	65	16	1	1994
36.5	23	90	55	35	42	19	30	42	29	38	32	36	16	34	49	7	14	28	21	82	16	2	1086
413	93	26	67	89	49	56	47	98	58	29	41	46	51	59	55	112	41	42	103	49	16	2	1751
285	51	38	73	59	86	52	25	38	71	51	78	30	23	46	1	5	95	22	31	34	16	1	2190
292	33	63	51	27	51	82	50	21	56	12	87	30	25	22	9	18	22	19	50	49	16	1	2021
141	56	55	41	46	66	26	34	17	42	25	55	65	42	47	6	4	55	48	66	60	16	1	2714
368	14	27	49	13	14	26	19	23	58	23	42	26	20	21	4	16	29	23	31	89	16	1	1652
3.6	39	89	52	47	38	43	34	43	53	61	74	45	48	38	36	8	65	62	66	58	17	2	1143
92	115	21	55	22	39	102	30	29	58	22	53	41	36	27	14	10	4	22	12	63	17	1	2949
471	26	29	64	15	20	9	16	24	31	19	38	37	22	26	5	1	50	63	90	98	17	2	1468
179	45	72	111	86	101	81	40	19	63	66	23	37	43	21	19	36	37	35	25	45	18	1	2973
34.5	62	66	21	35	70	13	29	28	35	25	43	28	34	32	3	25	15	33	13	33	18	2	1575
523	85	108	72	49	55	56	53	63	65	104	60	99	53	96	29	49	64	36	45	100	18	2	1543
1	31	62	63	104	65	74	18	29	52	50	61	4	35	23	25	7	75	32	21	40	18	1	4712
343	41	91	122	29	30	43	42	44	24	53	87	68	37	47	23	12	40	129	37	65	18	2	2050
535	58	66	75	100	65	47	42	51	46	45	94	24	34	58	32	34	59	66	39	27	19	2	1776
296	95	59	42	64	65	53	34	23	50	26	68	25	33	24	27	8	24	37	26	26	19	1	2703
40.5	39	104	193	32	51	52	48	53	45	75	44	72	74	34	17	8	48	144	36	81	19	2	988
233	36	36	122	22	33	45	40	47	27	54	61	59	40	33	23	24	45	102	37	49	19	2	2206
218	26	41	49	32	34	38	39	11	16	11	34	32	35	40	2	16	34	40	44	71	20	2	2453
497	56	71	161	11	31	34	26	63	41	77	84	63	39	59	39	30	60	123	32	66	20	2	1552
457	54	89	112	75	69	29	27	25	106	68	9	105	27	40	22	35	8	42	43	66	21	1	2072
252	26	43	32	29	53	22	57	24	60	29	100	43	14	8	12	12	18	62	7	15	25	1	2759
286	51	61	59	80	72	68	75	70	58	52	79	44	56	48	9	3	69	25	17	44	28	1	2340
16	12	7	52	30	44	31	35	25	47	13	56	19	2	18	1	15	25	8	24	52	33	1	3572

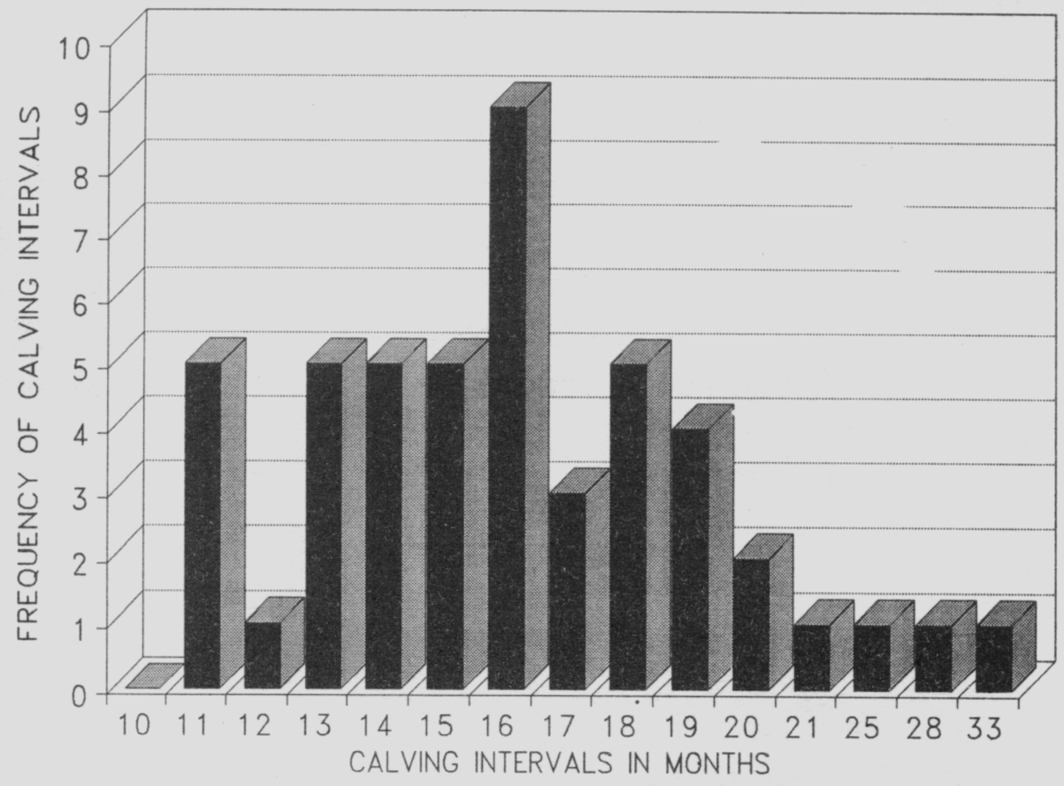

FIGURE 1. Histogram of distribution of calving interval in 48 cows in the tropics of Mexico, 1988, 1989.

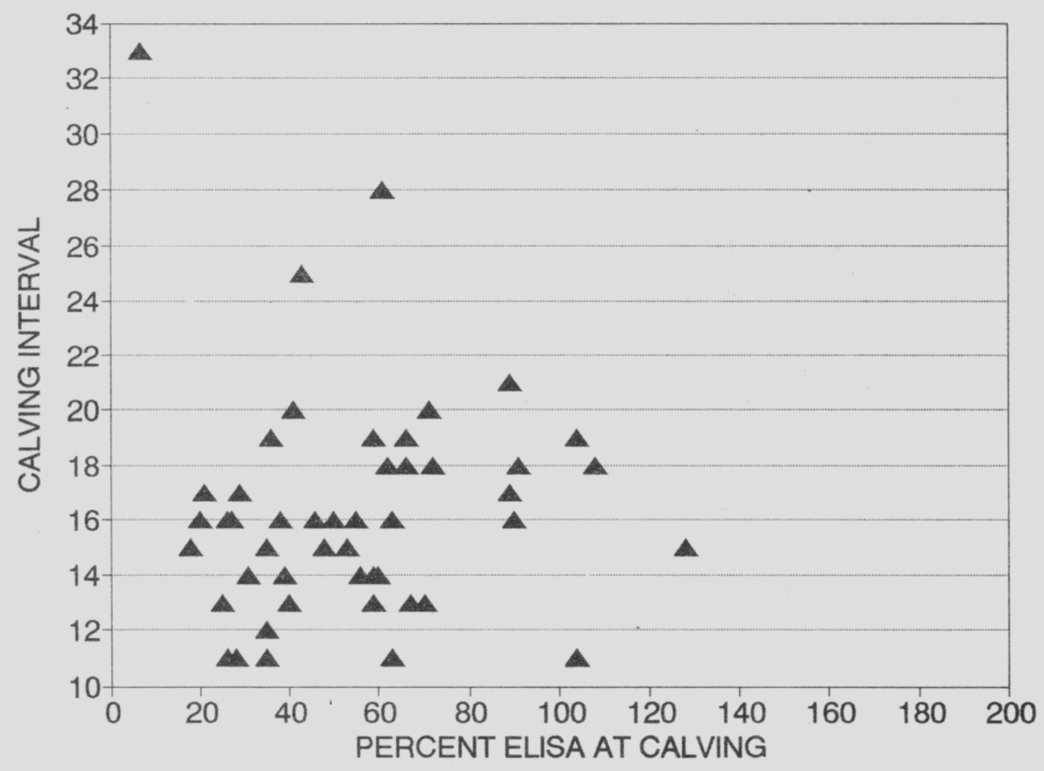

FIGURE 2. Plot of percent ELISA against **Leptospira interrogans serovar hardjo** shortly after calving and the length (months) of the subsequent calving interval. Cattle in the tropics of Mexico, 1988, 1989.

infectious agents but to age differences or differences between the genotypic groups of cows. Figure 4 shows a plot of calving intervals against age of cows at previous calving; there is no significant association (R^2 = 0.0003). A t-test on calving intervals of genotype groups 1 (50% Holstein, 50% Zebu) and 2 (75% Holstein, 25% Zebu) showed no difference between the two groups (95% confidence interval for difference in mean calving interval was -0.60 to 1.48).

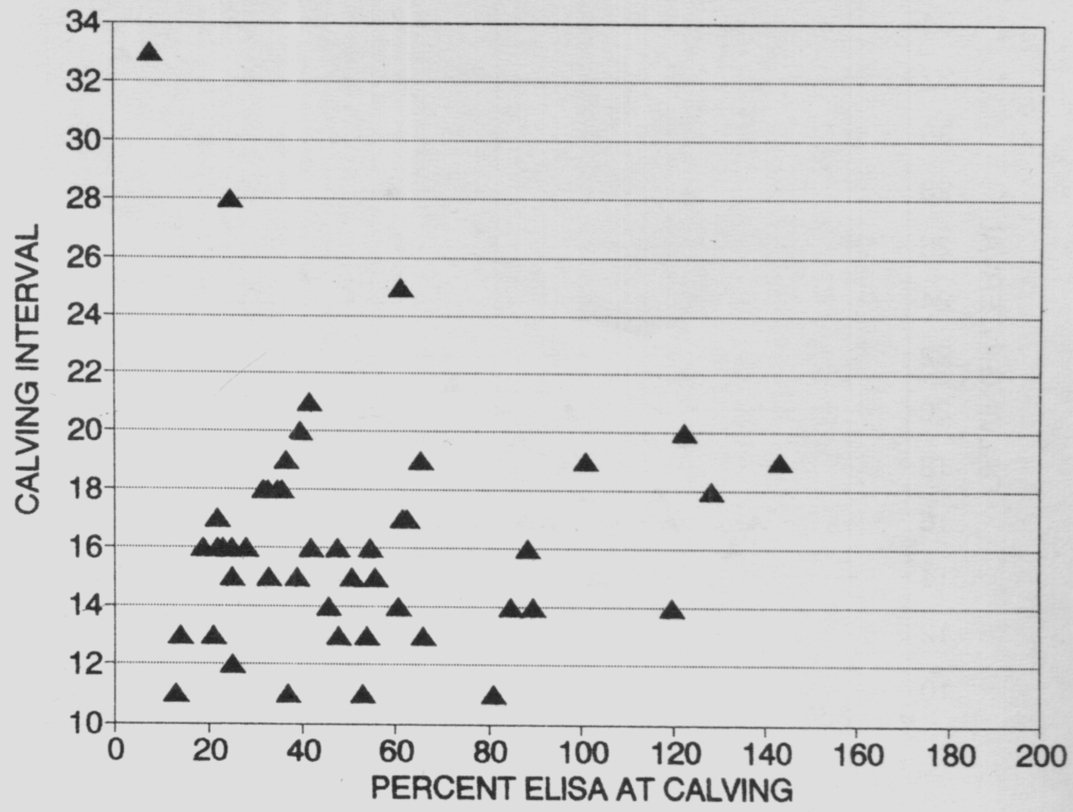

FIGURE 3. **Plot of percent ELISA against Mycobacterium paratuberculosis** shortly after calving and length of the subsequent calving interval (months). Cattle in the tropics of Mexico, 1988, 1989.

Table II. Analysis of variance by ranks of percent ELISA in cows grouped according to calving intervals

AGENT	Test statistic	D F	P
Leptospira interrogans serovar hardjo	7.11	3	0.90 - 0.95
Mycobacterium paratuberculosis	6.63	3	0.90 - 0.95
Bluetongue virus	4.33	3	< 0.90
Anaplasma marginale	2.20	3	< 0.90
Toxoplasma gondii	1.16	3	< 0.90
Rotavirus	1.13	3	< 0.90

The other 14 agents yielded lower test statistics.

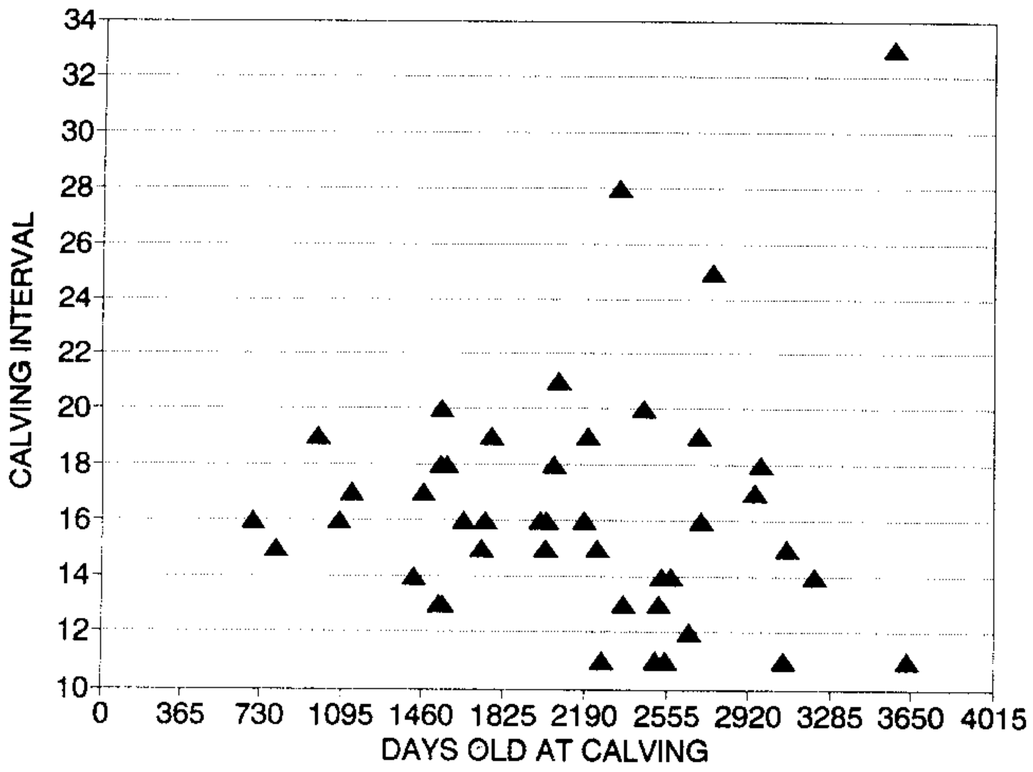

FIGURE 4. Plot of age (days) at calving and the subsequent calving interval (months). Cattle in the tropics of Mexico, 1988, 1989.

DISCUSSION

The data presented here suggest that subclinical disease as reflected in increased ELISA values immediately after calving may have a negative impact on reproductive performance. The results obtained for **Leptospira interrogans serovar hardjo** make biological sense although they fail to reach the statistical significance. The results for **Mycobacterium paratuberculosis** although less convincing are in agreement with earlier findings in a different environment ABBAS et al (1983). It must be added that no clinical cases of leptospirosis or paratuberculosis have been reported in the study herd.

The number of cows which could be included in this study is small (48) and this may be a reason that the findings of AKHTAR et al (1990) and UHAA et al (1990) could not be confirmed. These authors did cross-sectional studies of several hundred California dairy cows and still did not get completely convincing results.

More studies, building on the experience of past studies, should be done in order to get a better evaluation of the impact of subclinical diseases.

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