

Appendix O
Immunologic Assessment

TABLE O-1.
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Percent Possibly Abnormal/(n)			Adj. Relative Risk (95% C.I.) ^a	p-Value		
				Current Dioxin						
				Low	Medium	High				
Composite	Current-by- Time-by-Age	Born ≥1942	≤18.6	0.0 (21)	9.4 (53)	3.5 (29)	1.01 (0.46,2.21)	0.198 ^b		
Skin Test			>18.6	25.0 (8)	10.5 (38)	3.3 (30)	0.45 (0.17,1.19)	0.109 ^c		
Diagnosis (Minimal-- 16-3 [g])		Born <1942	≤18.6	11.1 (36)	8.5 (47)	0.0 (10)	0.53 (0.20,1.40)	0.024 ^b		
			>18.6	0.0 (33)	4.7 (64)	8.0 (25)	1.86 (0.87,3.93)	0.198 ^c		
								0.105 ^c		

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
CD2 Cells ^d (Minimal-- 16-4 [c])	Initial-by- Current Alcohol Use	0-1	Low Medium High	37 80 43	1,675.9 1,604.4 1,726.6	0.017 (0.022)	0.442
		>1	Low Medium High	8 16 10	1,988.2 1,837.7 1,211.5	-0.168 (0.053)	0.002

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands and Comparisons by Current Dioxin Category								
Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.) ^e	p-Value ^f
CD2 Cells ^d (16-4 [jj])	Categorized Current Dioxin-by- Age	Born ≥1942 0	Background	8	1,653.3	A11		0.301
			Unknown	7	1,582.0	U vs. B	-71.3 --	0.795
			Low	1	1,920.8	L vs. B	267.5 --	0.667
			High	3	1,122.2	H vs. B	-531.1 --	0.082
	Categorized Current Dioxin-by- Lifetime Alcohol History	Born ≥1942 >0-40	Background	99	1,790.4	A11		0.194
			Unknown	35	1,557.7	U vs. B	-232.7 --	0.032
			Low	25	1,708.3	L vs. B	-82.1 --	0.523
			High	34	1,698.1	H vs. B	-92.3 --	0.418
		Born ≥1942 >40	Background	23	1,790.2	A11		0.591
			Unknown	5	1,593.8	U vs. B	-196.4 --	0.473
			Low	4	2,084.7	L vs. B	294.5 --	0.394
			High	9	1,943.4	H vs. B	153.2 --	0.525
		Born <1942 0	Background	11	1,642.4	A11		0.712
			Unknown	5	1,501.0	U vs. B	-141.4 --	0.611
			Low	5	1,777.0	L vs. B	134.6 --	0.656
			High	8	1,837.3	H vs. B	194.9 --	0.462
		Born <1942 >0-40	Background	111	1,628.3	A11		0.287
			Unknown	62	1,763.6	U vs. B	135.3 --	0.126
			Low	26	1,623.3	L vs. B	-5.0 --	0.965
			High	16	1,833.1	H vs. B	204.8 --	0.177
		Born <1942 >40	Background	54	1,631.7	A11		0.615
			Unknown	16	1,508.7	U vs. B	-123.0 --	0.403
			Low	12	1,781.1	L vs. B	149.4 --	0.403
			High	6	1,582.1	H vs. B	-49.6 --	0.827

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean/(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value	
				Low	Medium	High			
CD4 Cells ^d (Minimal-- 16-5 [g])	Current-by- Time-by- Lifetime	0-40	≤18.6	901.3 (18)	826.9 (41)	708.0 (17)	-0.087 (0.041)	0.013 ^g	
			>18.6	818.3 (15)	860.1 (36)	908.2 (23)	0.044 (0.035)	0.200 ^h	
		>40	≤18.6	820.1 (4)	778.6 (7)	1079.8 (5)	0.101 (0.077)	0.054 ^g	
	Alcohol History		>18.6	976.4 (10)	1032.1 (10)	836.5 (7)	-0.099 (0.070)	0.191 ^h	
			≤18.6	820.1 (4)	778.6 (7)	1079.8 (5)	0.101 (0.077)	0.163 ^h	
			>18.6	976.4 (10)	1032.1 (10)	836.5 (7)	-0.099 (0.070)	0.054 ^g	
CD4 Cells ^d (Maximal-- 16-5 [h])	Current-by- Time-by- Age	Born ≥1942	≤18.6	897.5 (13)	1044.2 (28)	930.6 (21)	0.032 (0.038)	0.753 ^g	
			>18.6	702.6 (3)	952.2 (20)	959.5 (22)	0.051 (0.045)	0.411 ^h	
		Born <1942	≤18.6	948.2 (26)	888.6 (42)	769.3 (8)	-0.069 (0.043)	0.265 ^h	
	Alcohol History		>18.6	898.9 (21)	936.1 (46)	1036.9 (21)	0.044 (0.035)	0.043 ^g	
			≤18.6	948.2 (26)	888.6 (42)	769.3 (8)	-0.069 (0.043)	0.114 ^h	
			>18.6	898.9 (21)	936.1 (46)	1036.9 (21)	0.044 (0.035)	0.207 ^h	

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
CD8 Cells ^d (Minimal-- 16-6 [c])	Initial-by- Lifetime Alcohol History	0	Low	4	437.2	0.023 (0.074)	0.760
			Medium	7	458.3		
			High	8	490.6		
		>0-40	Low	32	505.1	-0.005 (0.037)	0.894
			Medium	67	432.4		
			High	32	488.2		
		>40	Low	9	698.0	-0.178 (0.073)	0.016
			Medium	21	582.1		
			High	13	382.5		
CD8 Cells ^d (Maximal-- 16-6 [d])	Initial-by- Current Alcohol Use	0-1	Low	48	496.1	0.005 (0.023)	0.844
			Medium	112	470.3		
			High	61	504.3		
		>1	Low	16	561.3	-0.110 (0.051)	0.033
			Medium	22	496.4		
			High	11	357.7		
CD20 Cells ^d (Minimal-- 16-7 [c])	Initial-by- Age	Born ≥1942	Low	9	199.2	-0.040 (0.070)	0.566
			Medium	44	156.0		
			High	29	161.2		
		Born <1942	Low	36	117.4	0.165 (0.053)	0.002
			Medium	52	168.6		
			High	24	189.8		

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands and Comparisons by Current Dioxin Category

Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.) ^e	p-Value ^f	
CD20 Cells ^d (16-7 [μ])	Categorized Current Dioxin-by- Age	Born ≥ 1942	Background	133	200.4	All		0.307	
			Unknown	46	170.2	U vs. B	-30.2 --	0.069	
			Low	30	183.3	L vs. B	-17.1 --	0.410	
			High	43	185.9	H vs. B	-14.5 --	0.420	
	Born <1942		Background	168	156.9	All		0.006	
			Unknown	81	179.9	U vs. B	23.0 --	0.047	
			Low	41	186.3	L vs. B	29.4 --	0.053	
			High	30	215.9	H vs. B	59.0 --	0.002	

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
CD14 Cells ^d (Minimal-- 16-8 [c])	Initial-by- Lifetime Cigarette Smoking History	0 pack-yrs 0-1 drinks/ day	Low	6	35.7	-0.040 (0.104)	0.699
			Medium	20	31.7		
			High	17	26.4		
		0 pack-yrs >1 drinks/ day	Low	3	27.6	-0.249 (0.218)	0.256
	Initial-by- Current Alcohol Use		Medium	0	--		
			High	3	14.2		
	>0 pack-yrs 0-1 drinks/ day	Low	31	16.6	0.135 (0.068)	0.051	
		Medium	60	20.1			
		High	27	26.6			
	>0 pack-yrs >1 drinks/ day	Low Medium High	Low	5	33.6	-0.325 (0.182)	0.078
			Medium	17	20.7		
			High	7	11.2		

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean(n) Current Dioxin			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
CD14 Cells ^d (Maximal-- 16-8 [h])	Current-by- Time-by- Lifetime Cigarette Smoking History	0	≤18.6	28.1 (18)	32.8 (17)	33.7 (8)	0.101 (0.102)	0.309 ^g 0.321 ^h
			>18.6	22.7 (6)	33.0 (15)	24.7 (14)	-0.029 (0.084)	0.730 ^h
			>0-10	27.8 (8)	24.7 (25)	22.1 (15)	-0.135 (0.109)	0.841 ^g 0.216 ^h
	>10	>10	≤18.6	42.5 (5)	25.2 (18)	19.5 (9)	-0.168 (0.123)	0.176 ^h
			>18.6	33.3 (13)	40.4 (28)	26.6 (8)	-0.063 (0.083)	0.014 ^g 0.452 ^h
			>18.6	24.0 (13)	23.1 (34)	48.0 (20)	0.242 (0.086)	0.006 ^h

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
CD25 Cells ^d (Minimal-- 16.9 [c])	Initial-by- Current Cigarette Smoking	0 cigs/day	Low	12	7.7	-0.186 (0.116)	0.116
		≤10 pack-yrs	Medium	23	8.6		
		≤40 drink-yrs	High	15	5.8		
	Initial-by- Lifetime Cigarette Smoking	0 cigs/day	Low	1	15.5	-0.059 (0.287)	0.837
		≤10 pack-yrs	Medium	5	16.4		
		>40 drink-yrs	High	5	11.0		
	Initial-by- History	0 cigs/day	Low	7	12.8	-0.091 (0.151)	0.549
		>10 pack-yrs	Medium	9	9.1		
		≤40 drink-yrs	High	5	6.3		
	Initial-by- Lifetime Alcohol History	0 cigs/day	Low	1	6.8	0.792 (0.566)	0.164
		>10 pack-yrs	Medium	5	10.5		
		>40 drink-yrs	High	1	30.1		
	>0 cigs/day	Low	0	--	0.548 (0.372)	0.144	
		≤10 pack-yrs	Medium	10	13.7		
		≤40 drink-yrs	High	4	23.4		
	>0 cigs/day	Low	0	--	-0.346 (0.607)	0.570	
		≤10 pack-yrs	Medium	3	11.3		
		>40 drink-yrs	High	1	21.2		
	>0 cigs/day	Low	4	11.3	0.242 (0.218)	0.270	
		>10 pack-yrs	Medium	10	9.5		
		≤40 drink-yrs	High	5	19.2		
	>0 cigs/day	Low	3	20.1	0.046 (0.222)	0.835	
		>10 pack-yrs	Medium	5	4.9		
		>40 drink-yrs	High	5	8.9		

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
CD25 Cells ^d (Maximal-- 16-9 [d])	Initial-by- Current Cigarette Smoking	0 cigs/day	Low	21	6.3	-0.102 (0.083)	0.219
		≤10 pack-yrs	Medium	31	6.9		
		≤40 drink-yrs	High	20	4.6		
	Initial-by- Lifetime Cigarette Smoking History	0 cigs/day	Low	3	24.8	-0.116 (0.193)	0.547
		≤10 pack-yrs	Medium	6	11.0		
		>40 drink-yrs	High	6	10.3		
	Initial-by- Lifetime Alcohol History	0 cigs/day	Low	8	13.1	-0.189 (0.126)	0.136
		>10 pack-yrs	Medium	14	9.3		
		≤40 drink-yrs	High	7	6.3		
	>0 cigs/day	Low	4	12.1	-0.004 (0.261)	0.989	
		≤10 pack-yrs	Medium	7	8.4		
		≤40 drink-yrs	High	1	23.4		
	>0 cigs/day ≤10 pack-yrs	Low	1	1.2	0.791 (0.264)	0.003	
		Medium	6	14.0			
		High	8	12.0			
	>0 cigs/day ≥10 pack-yrs	Low	2	1.7	0.460 (0.271)	0.091	
		Medium	5	8.7			
		High	1	16.5			
	>0 cigs/day ≥10 pack-yrs ≤40 drink-yrs	Low	3	7.4	0.178 (0.176)	0.311	
		Medium	14	8.0			
		High	7	12.8			
	>0 cigs/day ≥10 pack-yrs ≥40 drink-yrs	Low	1	2.9	0.066 (0.197)	0.737	
		Medium	8	9.0			
		High	6	5.7			

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands and Comparisons by Current Dioxin Category

Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Difference of Adj. Means (95% C.I.)	p-Value
HLA-DR Cells ^d (Minimal-- 16-10 [c])	Initial-by- Age	Born ≥1942	Low Medium High	9 44 30	638.2 439.8 371.9	-0.128 (0.054)	0.020
		Born <1942	Low Medium High	36 53 24	387.9 463.3 487.5	0.087 (0.044)	0.050
HLA-DR Cells ^d (Maximal-- 16-10 [d])	Initial-by- Age	Born ≥1942 0-1	Low Medium High	17 39 36	384.0 471.8 386.3	-0.031 (0.035)	0.376
	Initial-by- Current Alcohol Use	Born ≥1942 >1	Low Medium High	5 4 7	549.2 421.3 364.5	-0.139 (0.091)	0.129
		Born <1942 0-1	Low Medium High	32 73 26	439.6 402.8 532.3	0.077 (0.033)	0.019
		Born <1942 >1	Low Medium High	11 20 4	546.6 362.0 340.6	-0.051 (0.084)	0.546
Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Difference of Adj. Means (95% C.I.)	p-Value
HLA-DR Cells ^d (16-10 [j])	Categorized Current Dioxin-by- Age	Born ≥1942	Background Unknown Low High	132 46 30 44	450.6 404.0 481.3 407.0	A11 U vs. B L vs. B H vs. B	0.157 0.127 0.439 0.158
		Born <1942	Background Unknown Low High	168 81 43 30	404.4 450.6 461.3 494.4	A11 U vs. B L vs. B H vs. B	0.027 0.052 0.058 0.015

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
TLC ^d (Minimal-- 16-12 [c])	Initial-by- Current Alcohol Use	0-1	Low	37	2,065.1	0.014 (0.021)	0.500
			Medium	80	1,988.4		
			High	44	2,121.2		
	>1	>1	Low	8	2,352.2	-0.125 (0.050)	0.013
			Medium	17	2,135.1		
			High	10	1,540.4		

Ranch Hands and Comparisons by Current Dioxin Category

Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.) ^e	p-Value ^f
TLC ^d (16-12 [j])	Categorized Current Dioxin-by- Age	Born ≥1942 0	Background	8	2,095.0	A11		0.108
			Unknown	7	2,018.5	U vs. B	-76.5 --	0.813
			Low	1	2,426.7	L vs. B	331.7 --	0.649
			High	2	1,203.4	H vs. B	-891.6 --	0.021
	Categorized Current Dioxin-by- Lifetime Alcohol History	Born ≥1942 >0-40	Background	101	2,217.0	A11		0.230
			Unknown	34	1,967.1	U vs. B	-249.9 --	0.048
			Low	25	2,132.4	L vs. B	-84.6 --	0.568
		Born ≥1942 >40	High	33	2,073.7	H vs. B	-143.3 --	0.274
			Background	24	2,150.2	A11		0.447
			Unknown	5	1,974.4	U vs. B	-175.8 --	0.568
		Born <1942 0	Low	4	2,589.3	L vs. B	439.1 --	0.260
			High	9	2,407.2	H vs. B	257.0 --	0.342
			Background	10	2,001.7	A11		0.677
			Unknown	5	1,948.4	U vs. B	-53.3 --	0.871
			Low	5	2,219.1	L vs. B	217.4 --	0.536
			High	8	2,315.2	H vs. B	313.5 --	0.313

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands and Comparisons by Current Dioxin Category

Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.) ^e	p-Value ^f
TLC ^d (16-12 [j]) (continued)	Born <1942	Background	105	1,993.2	A11			0.129
		Unknown	60	2,183.4	U vs. B	190.2 --	0.065	
		Low	25	1,991.7	L vs. B	-1.5 --	0.992	
		High	16	2,293.1	H vs. B	299.9 --	0.086	
	>40	Background	52	1,976.1	A11			0.744
		Unknown	16	1,919.3	U vs. B	-56.8 --	0.738	
		Low	12	2,169.6	L vs. B	193.5 --	0.338	
		High	6	2,027.1	H vs. B	51.0 --	0.846	

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
PHA Net Response (Minimal-- 16-14 [c1])	Initial-by- Lifetime Alcohol History	0	Low	4	157,545	-25,362 (10,069)	0.014
			Medium	7	105,211		
			High	7	75,067		
		>0-40	Low	32	116,980	439 (4,375)	0.920
			Medium	65	139,659		
			High	32	123,884		
		>40	Low	8	82,849	21,052 (8,418)	0.015
			Medium	23	132,459		
			High	13	155,876		
PHA Net Response (Maximal-- 16-14 [d1])	Initial-by- Lifetime Cigarette Smoking History	0	Low	24	132,218	-2,711 (2,355)	0.252
			Medium	30	127,264		
			High	22	96,570		
		>0-10	Low	14	133,225	-167 (2,346)	0.943
			Medium	42	126,375		
			High	22	143,614		
		>10	Low	23	126,107	1,036 (2,399)	0.667
			Medium	61	121,775		
			High	26	137,651		

TABLE O-1. (Continued)
**Summary of Dioxin-by-Covariate Interactions for
Immunology Variables**
Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
PHA Net Response (Maximal-- 16-14 [d3])	Initial-by- Current Alcohol Use	0-1	Low	46	149,842	2,849 (2,764)	0.305
			Medium	110	151,293		
			High	59	162,900		
	>1		Low	15	193,480	-6,184 (6,951)	0.375
			Medium	23	153,345		
			High	11	151,283		
PHA Net Response (Minimal-- 16-14 [c4])	Initial-by- Lifetime Cigarette Smoking History	0	Low	9	133,091	-2,889 (5,426)	0.596
			Medium	19	156,965		
			High	20	127,260		
		>0-10	Low	14	132,804	4,709 (5,881)	0.426
			Medium	34	162,885		
			High	13	160,366		
	>10		Low	21	134,841	8,603 (4,761)	0.075
			Medium	42	148,555		
			High	19	176,828		

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value	
				Low	Medium	High			
PHA Net Response (Minimal-- 16-14 [g])	Current-by- Time-by- Lifetime Alcohol History	0-40	≤18.6	147,386 (18)	153,806 (40)	154,213 (17)	3,817 (5,287)	0.485 ^g 0.473 ^h	
				114,064 (15)	162,408 (35)	138,160 (22)			
		>40	>18.6	68,227 (3)	139,403 (8)	196,600 (5)	-764 (4,722)	0.872 ^h	
	>40		≤18.6	161,228 (10)	149,443 (11)	148,630 (7)	33,399 (10,297)	0.006 ^g 0.002 ^h	
			>18.6				-6,161 (9,770)	0.530 ^h	

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands and Comparisons by Current Dioxin Category

Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.) ^e	p-Value ^f
PHA Net Reponse (16-14 [j3])	Categorized Current Dioxin-by- Current Alcohol Use	0-1	Background	221	144,913	A11		0.137
			Unknown	102	139,787	U vs. B	-5,126 (-16,469,6,217)	0.376
			Low	59	156,095	L vs. B	11,182 (-2,209,24,574)	0.103
			High	60	151,352	H vs. B	6,439 (-7,201,20,079)	0.355
		>1	Background	75	145,089	A11		0.164
			Unknown	19	172,322	U vs. B	27,233 (2,682,51,785)	0.030
			Low	11	146,921	L vs. B	1,832 (-27,335,31,000)	0.902
			High	12	142,569	H vs. B	-2,520 (-31,686,26,648)	0.866

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean/(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
Unstimulated MLC Response ^d (Minimal-- 16-16 [g])	Current-by- Time-by- Lifetime Alcohol History	0-40	≤ 18.6	4,844	4,864	3,324	-0.083 (0.089)	0.279 ^g
				(18)	(41)	(18)		0.354 ^h
		>40	>18.6	4,127	4,140	4,227	0.044 (0.085)	0.603 ^h
				(15)	(34)	(22)		
			<18.6	1,845	4,242	7,077	0.318 (0.166)	0.159 ^g
	Unstimulated MLC Response ^d (Maximal-- 16-16 [h])	0	>18.6	(4)	(8)	(5)	0.059 ^h	
				5,236	4,580	4,986		0.830 ^h
				(10)	(11)	(6)		
			≤ 18.6	4,191	4,757	3,046	-0.036 (0.113)	0.041 ^g
				(16)	(17)	(8)		0.750 ^h

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
Unstimulated MLC Responded (Maximal-- 16-16 [h]) (continued)	>0-10		<18.6	5,005 (8)	5,746 (25)	4,939 (15)	-0.029 (0.122)	0.781 ^g
				3,614 (5)	5,701 (17)	4,282 (8)		0.815 ^h
				4,339 (13)	5,880 (28)	6,304 (8)		0.877 ^h
	>10		>18.6	6,141 (13)	4,876 (34)	5,126 (19)	0.092 (0.092)	0.312 ^g
				4,339 (13)	5,880 (28)	6,304 (8)		0.316 ^h
				6,141 (13)	4,876 (34)	5,126 (19)		0.650 ^h

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
NKCA 50/1 Percent Release (Minimal-- 16-19 [c])	Initial-by- Current Cigarette Smoking	0-Never ≤ 40 drink-yrs	Low	8	41.6	-1.09 (1.69)	0.520
			Medium	15	41.8		
			High	17	39.8		
	Initial-by- Lifetime Alcohol History	0-Never > 40 drink-yrs	Low	1	35.0	-8.43 (5.67)	0.139
			Medium	5	42.1		
			High	3	32.1		
	Initial-by- Former Cigarette Smoking	0-Former ≤ 40 drink-yrs	Low	20	39.4	0.81 (1.55)	0.603
			Medium	27	38.0		
			High	13	42.4		
	>0-20 cigs/day	>40 drink-yrs	Low	4	41.5	-2.99 (3.75)	0.427
			Medium	8	41.7		
			High	4	37.1		
	>0-20 cigs/day	≤ 40 drink-yrs	Low	4	38.8	0.93 (3.17)	0.769
			Medium	18	36.2		
			High	6	38.1		

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Initial Dioxin)

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
NKCA 50/1 Percent Release (Minimal-- 16-19 [c]) (continued)	>0-20 cigs/day	Low	1	27.2	3.07 (7.18)	0.670	
	>40 drink-yrs	Medium	4	34.9			
		High	2	33.5			
	>20 cigs/day	Low	3	29.6	4.59 (3.34)	0.171	
	≤40 drink-yrs	Medium	12	36.7			
		High	4	43.7			
	>20 cigs/day	Low	3	37.9	4.73 (4.02)	0.241	
	>40 drink-yrs	Medium	5	28.0			
		High	3	43.4			

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean/(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
NKCI 50/1 Net Response (Minimal-- 16-20 [g])	Current-by- Time-by- Race	Black	≤18.6	870.0 (1)	881.0 (2)	-- (0)	-235.5 (192.8)	0.063 ^g 0.225 ^h
			>18.6	604.0 (1)	1094.0 (1)	964.5 (2)	123.5 (90.2)	0.174 ^h
	Non-Black	Non-Black	≤18.6	828.1 (21)	840.0 (47)	887.3 (23)	35.6 (14.4)	0.033 ^g 0.015 ^h
			>18.6	778.9 (23)	806.8 (45)	853.4 (28)	-5.8 (13.9)	0.680 ^h

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean/(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
NKCI 50/1 Net Response (Maximal-- 16-20 [h])	Current-by- Time-by- Race	Black	≤18.6	836.7 (2)	790.2 (2)	807.5 (1)	-47.9 (58.1)	0.022g 0.411h
			>18.6	-- (0)	603.4 (3)	945.4 (2)	126.1 (55.6)	0.025h
	Net Response (Maximal-- 16-20 [h])	Non-Black	≤18.6	808.4 (36)	786.5 (68)	868.3 (30)	21.1 (8.9)	0.017g 0.020h
			>18.6	826.9 (23)	793.5 (61)	779.1 (41)	-9.5 (8.6)	0.271h

Ranch Hands and Comparisons by Current Dioxin Category

Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.)	p-Value
NKCI 50/1 Net Response (16-20 [j])	Categorized Current Dioxin-by- Current Alcohol Use (Non-Blacks)	0-1	Background	210	818.3	All		0.387
			Unknown	99	796.8	U vs. B	-21.5 (-50.4,7.4)	0.146
			Low	59	798.4	L vs. B	-19.9 (-53.9,14.0)	0.250
			High	59	798.2	H vs. B	-20.1 (-54.6,14.5)	0.256
	>1	Background	19	808.0	U vs. B	4.6 (-57.0,66.1)	0.885	
			10	928.3	L vs. B	124.9 (47.6,202.1)	0.002	
			12	771.9	H vs. B	-31.5 (-104.5,41.6)	0.399	

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Current Dioxin) and Time

Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	<u>Adj. Mean/(n)</u>			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
NKCI 50/1 Percent Release (Minimal-- 16-21 [g])	Current-by- Time-by- Race	Black	≤ 18.6	78.0 (1)	69.5 (2)	-- (0)	-18.7 (15.2)	0.222 ^h
				62.0 (1)	76.0 (1)	72.0 (2)		0.131 ^h
			>18.6					
	Non-Black		≤ 18.6	67.7 (21)	64.9 (47)	67.9 (23)	2.9 (1.1)	0.034 ^g 0.013 ^h
			>18.6	63.7 (23)	65.1 (45)	68.2 (28)	-0.4 (1.1)	0.733 ^h
NKCI 50/1 Percent Release (Maximal-- 16-21 [h])	Current-by- Time-by- Race	Black	≤ 18.6	69.3 (2)	66.8 (2)	64.2 (1)	-4.0 (4.6)	0.026 ^g 0.383 ^h
				-- (0)	49.4 (3)	75.4 (2)		0.036 ^h
			>18.6					
	Non-Black		≤ 18.6	65.6 (36)	64.8 (68)	71.5 (30)	2.0 (0.7)	0.010 ^g 0.007 ^h
			>18.6	67.5 (23)	65.0 (61)	64.2 (41)	-0.6 (0.7)	0.396 ^h

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands and Comparisons by Current Dioxin Category								
Variable/ (Table Ref.)	Interaction	Stratum	Current Dioxin Category	n	Adj. Mean	Contrast	Difference of Adj. Means (95% C.I.)	p-Value
NKCI 50/1 Percent Release (16-21 [j])	Categorized Current Dioxin-by- Current Alcohol Use (Non-Blacks)	0-1 drinks/day	Background	180	67.1	All		0.282
		≤40 drink-yrs	Unknown	89	65.4	U vs. B	-1.74 (-4.12,0.65)	0.155
		Low	50	64.9	L vs. B	-2.19 (-5.04,0.67)	0.135	
		High	51	65.2	H vs. B	-1.93 (-4.84,0.97)	0.193	
	Categorized Current Dioxin-by- Lifetime Alcohol History (Non-Blacks)	0-1 drinks/day	Background	30	67.8	All		0.962
		>40 drink-yrs	Unknown	10	66.0	U vs. B	-1.77 (-8.49,4.95)	0.607
		Low	9	67.9	L vs. B	0.12 (-6.93,7.18)	0.973	
		High	8	67.5	H vs. B	-0.28 (-7.61,7.06)	0.941	
	>1 drinks/day ≤40 drink-yrs	Background	30	64.9	All			0.177
		Unknown	8	66.0	U vs. B	1.15 (-6.37,8.68)	0.764	
		Low	5	72.6	L vs. B	7.78 (-0.51,16.08)	0.067	
		High	6	60.5	H vs. B	-4.37 (-13.23,4.48)	0.333	
	>1 drinks/day >40 drink-yrs	Background	42	67.6	All			0.135
		Unknown	11	66.8	U vs. B	-0.73 (-7.32,5.86)	0.828	
		Low	5	77.6	L vs. B	9.99 (0.87,19.12)	0.033	
		High	6	65.0	H vs. B	-2.54 (-10.22,5.14)	0.518	

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log ₂ (Current Dioxin) and Time								
Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Time (Yrs.)	Adj. Mean(n) <u>Current Dioxin</u>			Adj. Slope (Std. Error)	p-Value
				Low	Medium	High		
IgA ^d (Minimal-- 16-22 [g])	Current-by- Time-by- Current Cigarette Smoking	0-Never	≤18.6	208.2 (21)	194.3 (33)	227.0 (15)	0.056 (0.048)	0.940 ^g
			>18.6	211.1 (10)	252.7 (29)	244.8 (25)	0.060 (0.043)	0.157 ^h
			0-Former	231.7 (30)	217.7 (43)	237.5 (18)	0.021 (0.044)	0.511 ^g 0.635 ^h
		>0-20	≤18.6	220.2 (26)	259.8 (43)	244.9 (27)	0.058 (0.035)	0.104 ^h
			>18.6	258.7 (9)	232.6 (26)	242.6 (10)	0.054 (0.071)	0.120 ^g 0.445 ^h
			≤18.6	268.2 (9)	234.9 (34)	209.9 (10)	-0.089 (0.061)	0.146 ^h
	Current-by- Time-by- Current Cigarette Smoking	>20	≤18.6	204.8 (11)	211.8 (25)	248.6 (9)	0.068 (0.065)	0.190 ^g 0.292 ^h
			>18.6	241.2 (9)	201.7 (21)	209.5 (11)	-0.041 (0.053)	0.435 ^h
			≤18.6	223.4 (38)	197.6 (55)	220.2 (20)	0.005 (0.032)	0.621 ^g 0.872 ^h
		>0-20	>18.6	240.8 (22)	240.7 (34)	249.9 (33)	0.026 (0.030)	0.375 ^h
			≤18.6	214.7 (39)	218.3 (69)	222.1 (27)	0.026 (0.031)	0.157 ^g 0.387 ^h
			>18.6	185.3 (31)	240.0 (70)	255.2 (33)	0.083 (0.026)	0.001 ^h
IgA ^d (Maximal-- 16-22 [h])	Current-by- Time-by- Current Cigarette Smoking	0-Never	≤18.6	224.8 (13)	235.9 (31)	239.8 (17)	0.031 (0.047)	0.223 ^g 0.507 ^h
			>18.6	212.1 (9)	253.1 (37)	207.9 (18)	-0.047 (0.045)	0.293 ^h
			≤18.6	200.2 (14)	209.9 (33)	244.5 (15)	0.041 (0.044)	0.532 ^g 0.360 ^h
		>20	>18.6	179.6 (14)	214.1 (28)	207.2 (15)	0.004 (0.039)	0.917 ^h

TABLE O-1. (Continued)
Summary of Dioxin-by-Covariate Interactions for
Immunology Variables

Ranch Hands - Log₂ (Initial Dioxin)							
Variable/ (Assumption-- Table Ref.)	Interaction	Stratum	Initial Dioxin	n	Adj. Mean	Adj. Slope (Std. Error)	p-Value
IgG ^d (Minimal-- 16-23 [c])	Initial-by- Lifetime Alcohol History	0	Low	11	1,152.0	0.012 (0.009)	0.208
			Medium	20	1,139.0		
			High	23	1,127.7		
	>0-40		Low	93	1,082.1	0.011 (0.009)	0.238
			Medium	173	1,117.2		
			High	68	1,170.7		
	>40		Low	23	1,147.8	0.006 (0.009)	0.552
			Medium	55	1,098.9		
			High	32	1,083.9		
IgM ^d (Minimal-- 16-24 [c])	Initial-by- Current Alcohol Use	0-1	Low	104	100.5	0.026 (0.020)	0.183
			Medium	199	98.1		
			High	102	104.8		
	>1-4		Low	19	130.2	-0.118 (0.052)	0.024
			Medium	45	96.9		
			High	17	95.8		
	>4		Low	4	150.2	-0.087 (0.069)	0.210
			Medium	6	101.4		
			High	5	94.1		

^aRelative risk for a twofold increase in dioxin.

^bTest of significance for homogeneity of relative risks (current dioxin continuous, time categorized).

^cTest of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

^dAdjusted means transformed from natural logarithm scale; adjusted slope and standard error based on natural logarithm of dependent variable versus log₂ dioxin.

^eDifference of means after transformation to original scale; confidence interval on difference of means not given because analysis was performed on natural logarithm scale.

^fP-value is based on difference of means on natural logarithm scale.

^gTest of significance for homogeneity of slopes (current dioxin continuous, time categorized).

^hTest of significance for slope equal to 0 (current dioxin continuous, time categorized).

Notes: Initial Dioxin: Minimal--Low: 52-93 ppt; Medium: >93-292 ppt; High: >292 ppt.

Maximal--Low: 25-56.9 ppt; Medium: >56.9-218 ppt; High: >218 ppt.

Current Dioxin: Minimal--Low: >10-14.65 ppt; Medium: >14.65-45.75 ppt; High: >45.75 ppt.

Maximal--Low: >5-9.01 ppt; Medium: >9.01-33.3 ppt; High: >33.3 ppt.

All: All categories.

Background (B) (Comparisons): Current Dioxin ≤10 ppt.

Unknown (U) (Ranch Hands): Current Dioxin ≤10 ppt.

Low (L) (Ranch Hands): 15 ppt < Current Dioxin ≤33.3 ppt.

High (H) (Ranch Hands): Current Dioxin >33.3 ppt.

APPENDIX O-1.

Data Displays for the Immunologic Assessment

The following figures graphically display relationships between the dependent variables and measures of dioxin for the immunologic assessment. The panels are arranged as follows:

Panel	Group	Assumption	Dioxin Measure
a	Ranch Hand	Minimal	Initial
b	Ranch Hand	Maximal	Initial
c	Comparison	--	Current
d	Ranch Hand	--	Current

Dioxin measures are presented in original units, but spacing of intervals is based on the logarithm (base 2) scale, similar to the statistical analysis. The dependent variable is also presented in original units, but spacing is based on the scale used for analysis, as described in the chapter. For continuous variables, current dioxin values of 0.0 ppt are displayed as 0.3 ppt. For these variables, the reference line indicates the general relationship, unadjusted for any covariates, between the (transform of the) dependent variable and \log_2 dioxin. Also, graphs for CD25 cells are based only on nonzero values, parallel to the statistical analyses presented in Chapter 16. For composite skin test diagnosis, the percent of participants that exhibited a possibly abnormal condition is displayed on the vertical axis for given intervals of dioxin. The intervals of dioxin and the sample sizes for each of these intervals are given below. A list of figures found in this appendix follows the table.

Dioxin Interval	Dioxin Scale Midpoint	Panel			
		a	b	c	d
0.0-0.5	0.25	0	0	29	6
>0.5-2.0	1	0	0	25	8
>2.0-8.0	4	0	0	521	192
>8.0-32.0	16	0	13	45	313
>32.0-128.0	64	166	326	1	121
>128.0-512.0	256	180	180	0	24
>512.0-2,048.0	1024	48	48	0	2
>2,048.0	4096	3	3	0	0

Figure		Page
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O-1-6	CD14 Cells versus Dioxin.....	O-1-8
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O-1-11	Unstimulated PHA Response versus Dioxin.....	O-1-13
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O-1-16	NKCA 50/1 Net Response versus Dioxin.....	O-1-18
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O-1-18	NKCI 50/1 Net Response versus Dioxin.....	O-1-20
O-1-19	NKCI 50/1 Percent Release versus Dioxin.....	O-1-21
O-1-20	IgA versus Dioxin.....	O-1-22
O-1-21	IgG versus Dioxin.....	O-1-23
O-1-22	IgM versus Dioxin	O-1-24

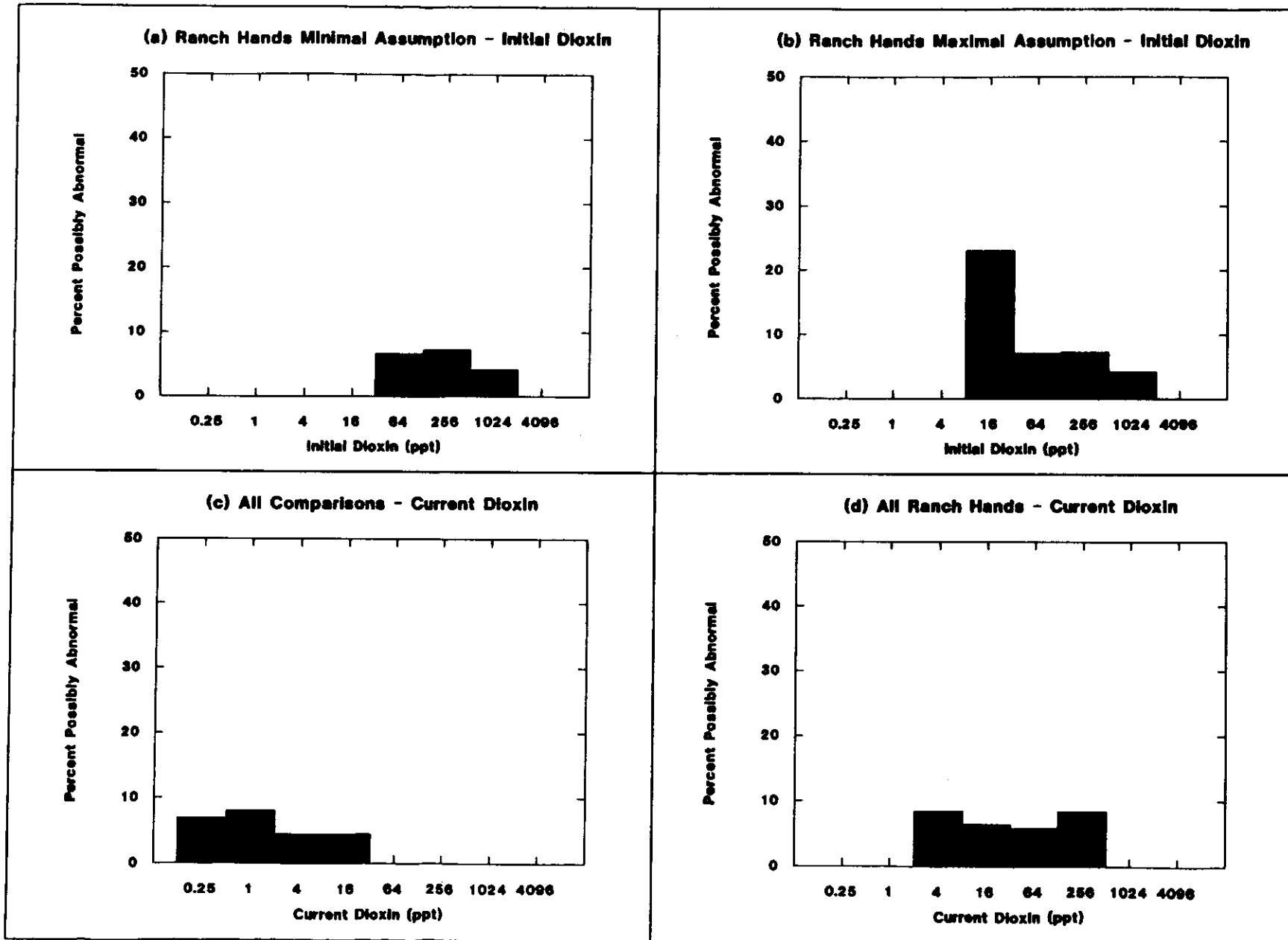


FIGURE O-1-1. Composite Skin Test Diagnosis versus Dioxin

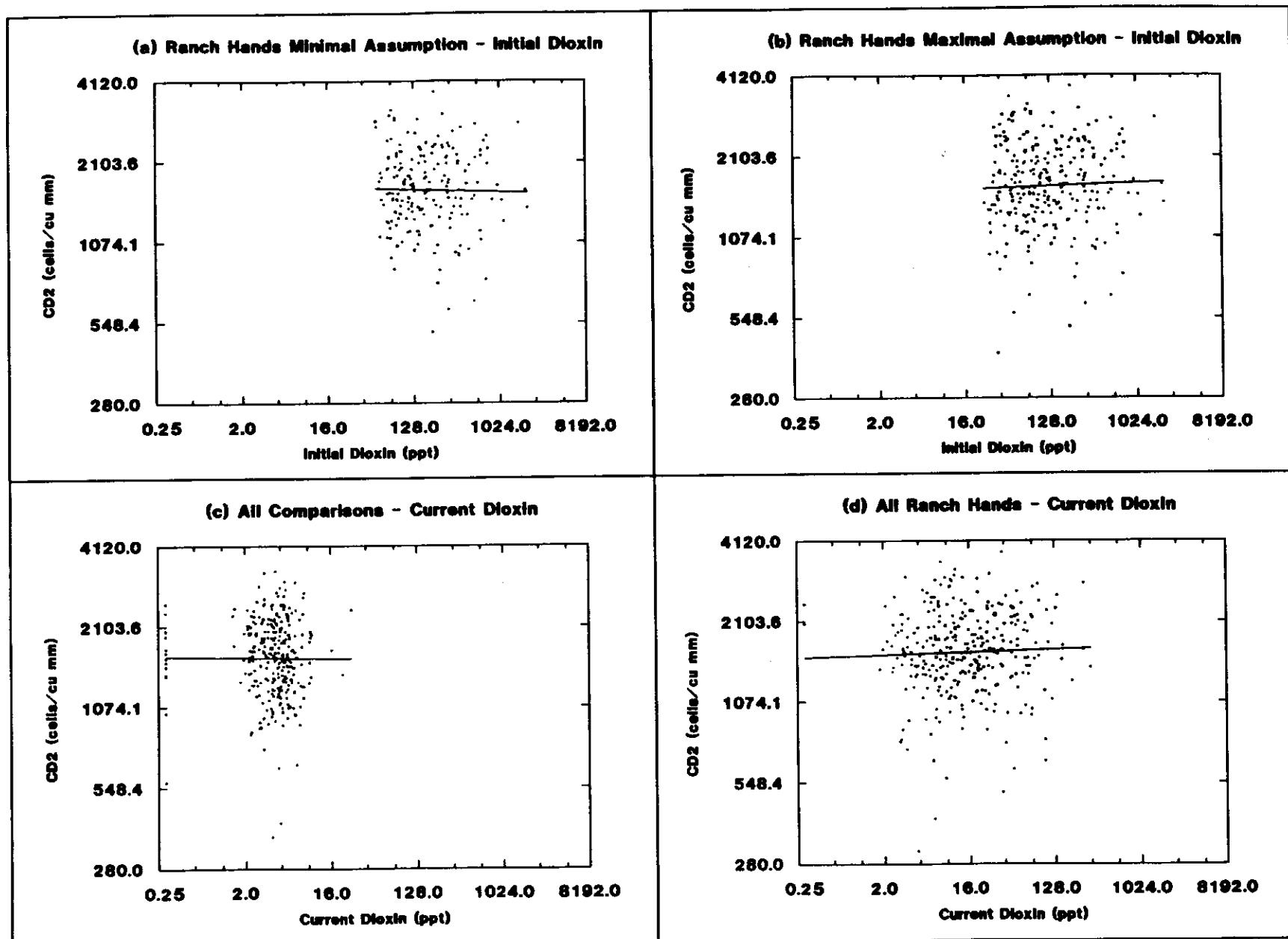


FIGURE O-1-2. CD2 Cells versus Dioxin

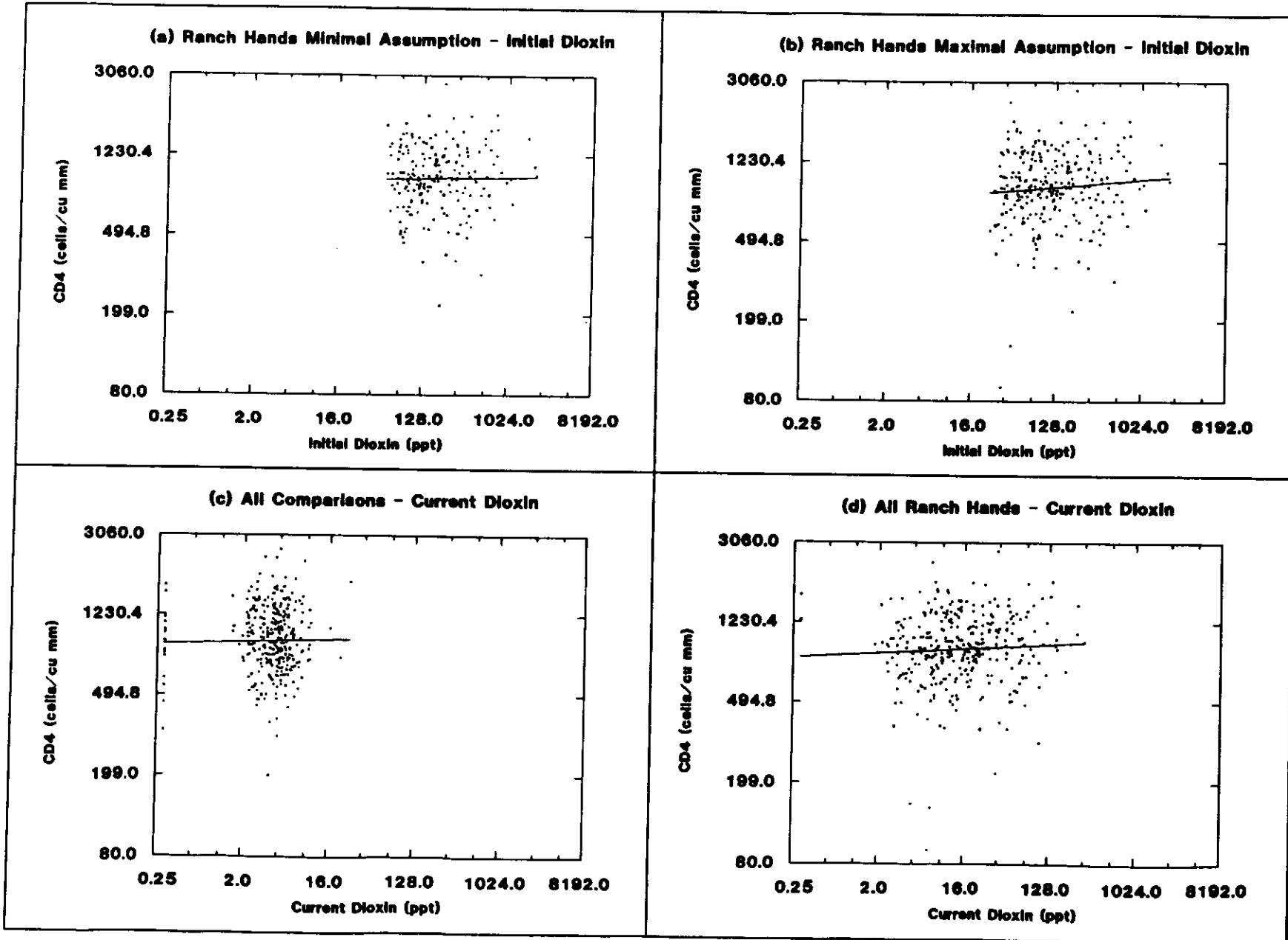


FIGURE O-1-3. CD4 Cells versus Dioxin

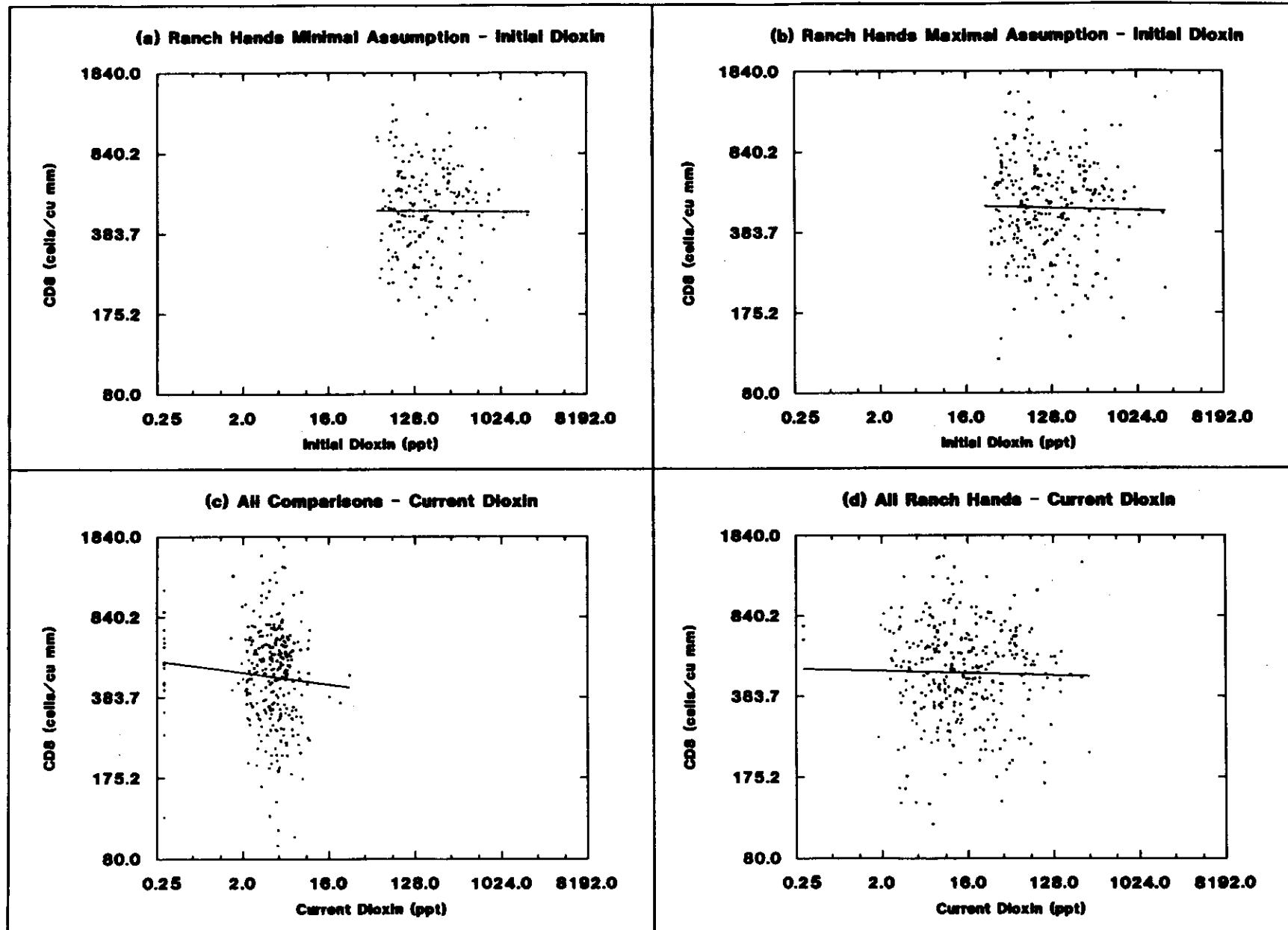


FIGURE O-1-4. CD8 Cells versus Dioxin

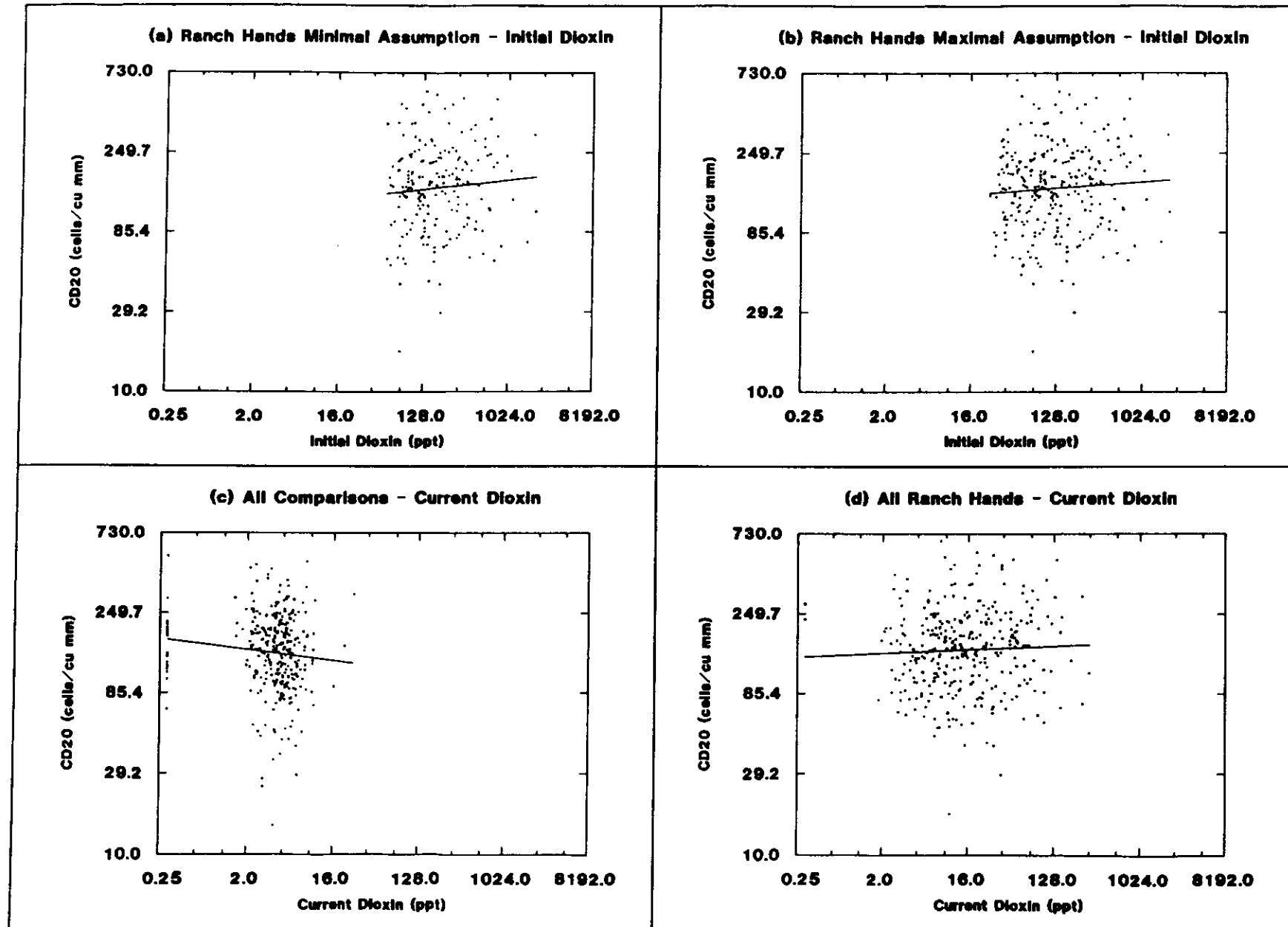


FIGURE O-1-5. CD20 Cells versus Dioxin

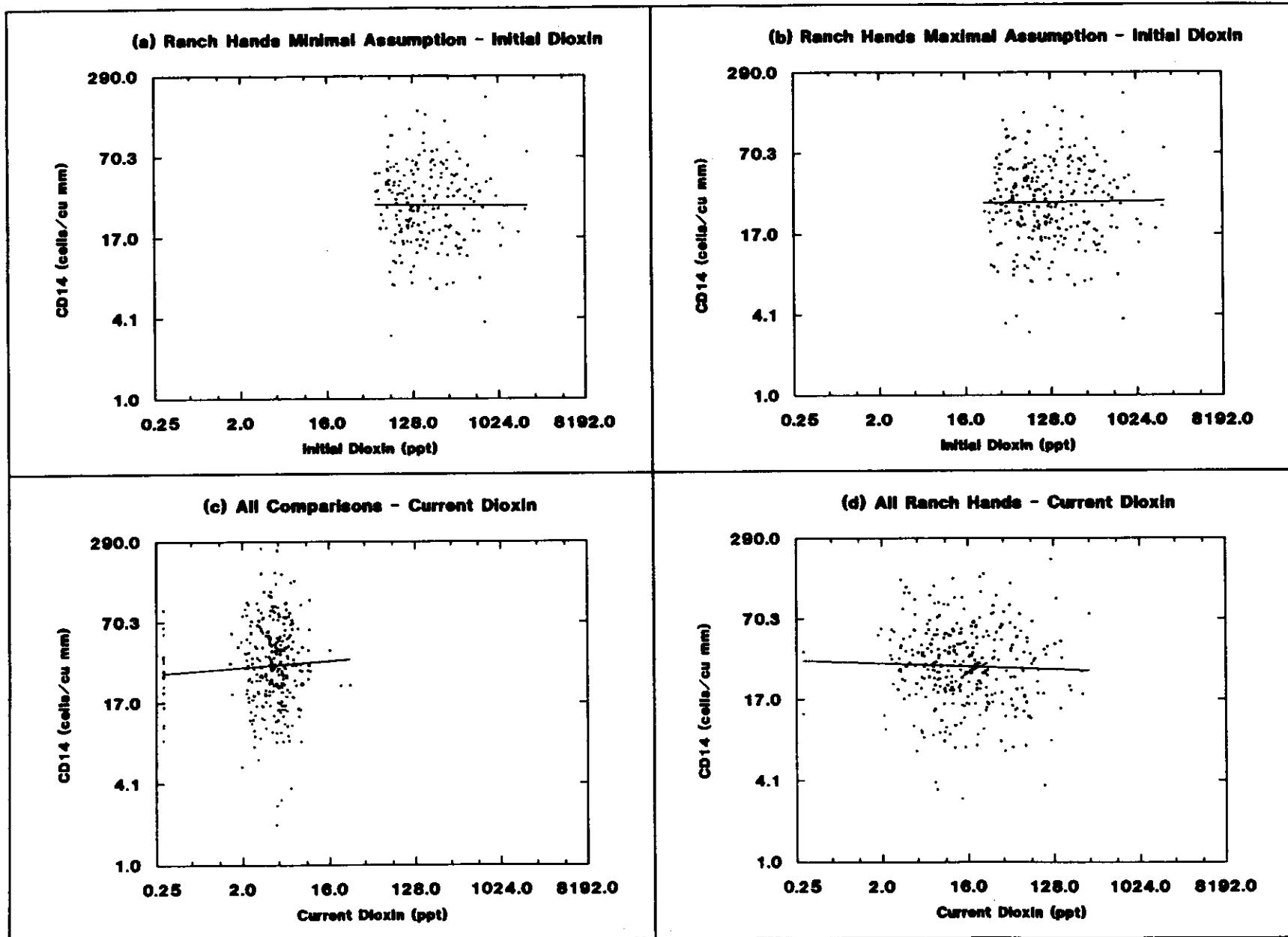


FIGURE O-1-6. CD14 Cells versus Dioxin

61-0

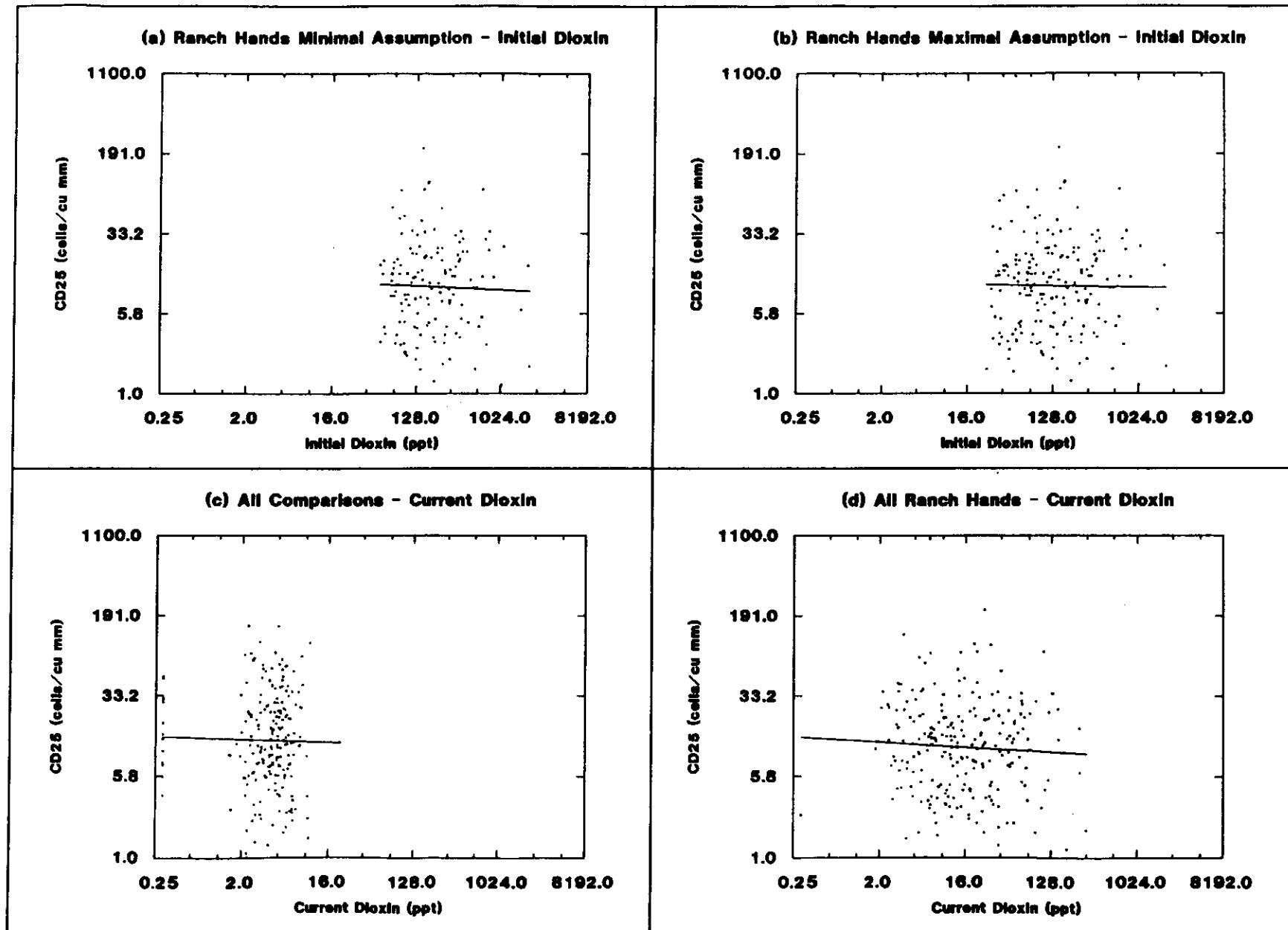


FIGURE O-1-7. CD25 Cells versus Dioxin

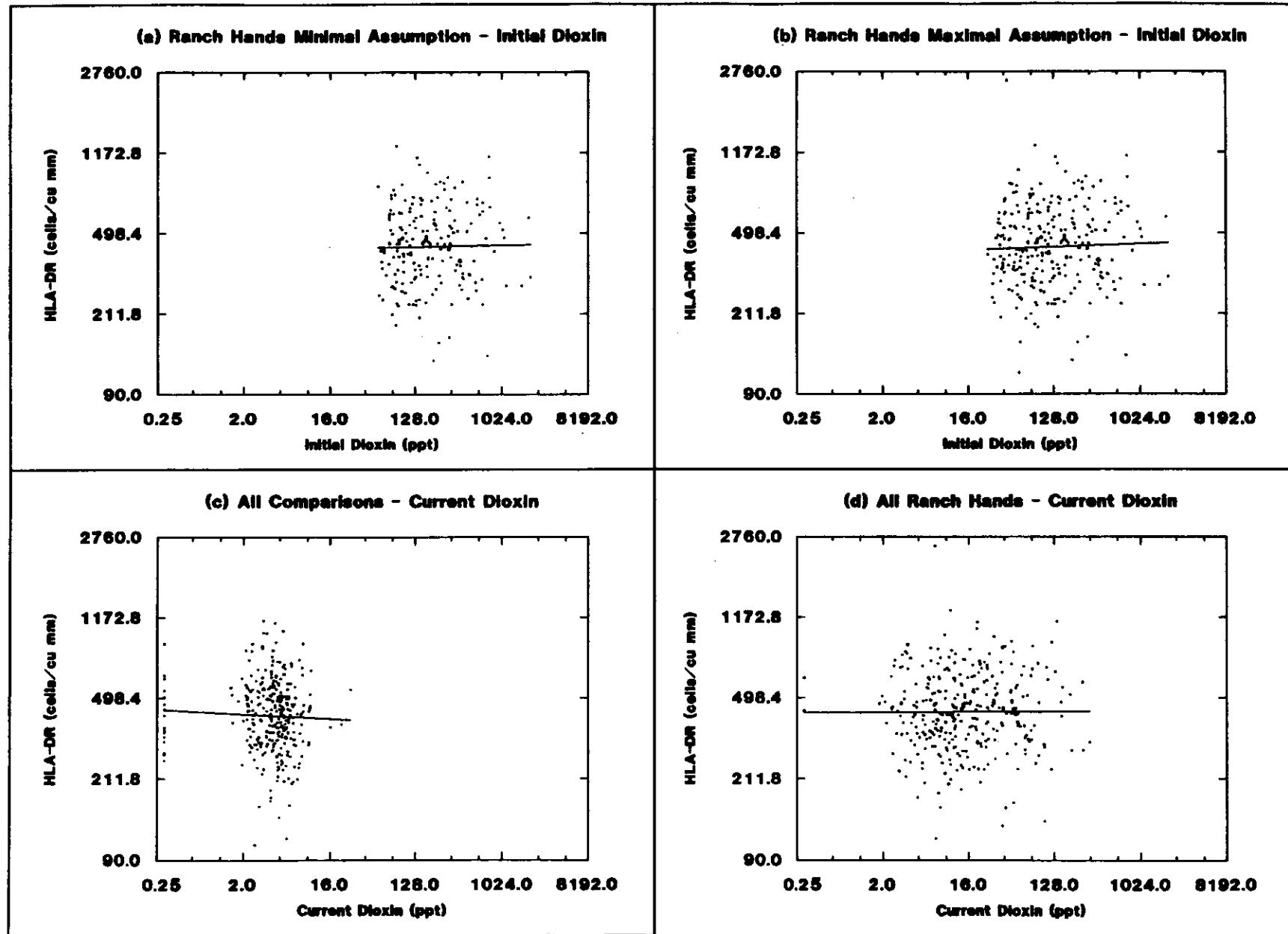


FIGURE O-1-8. HLA-DR Cells versus Dioxin

III-O

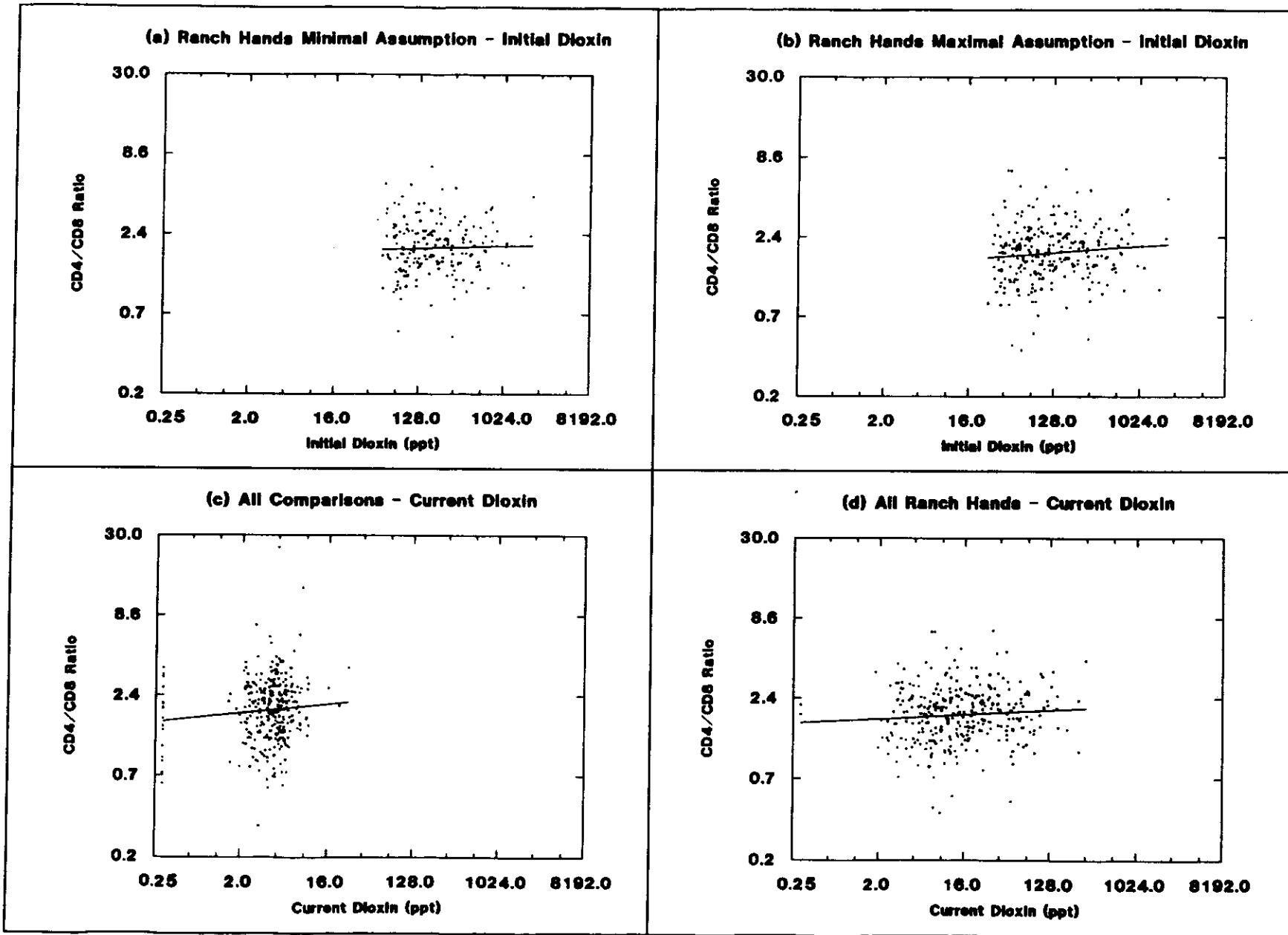


FIGURE O-1-9. CD4/CD8 Ratio versus Dioxin

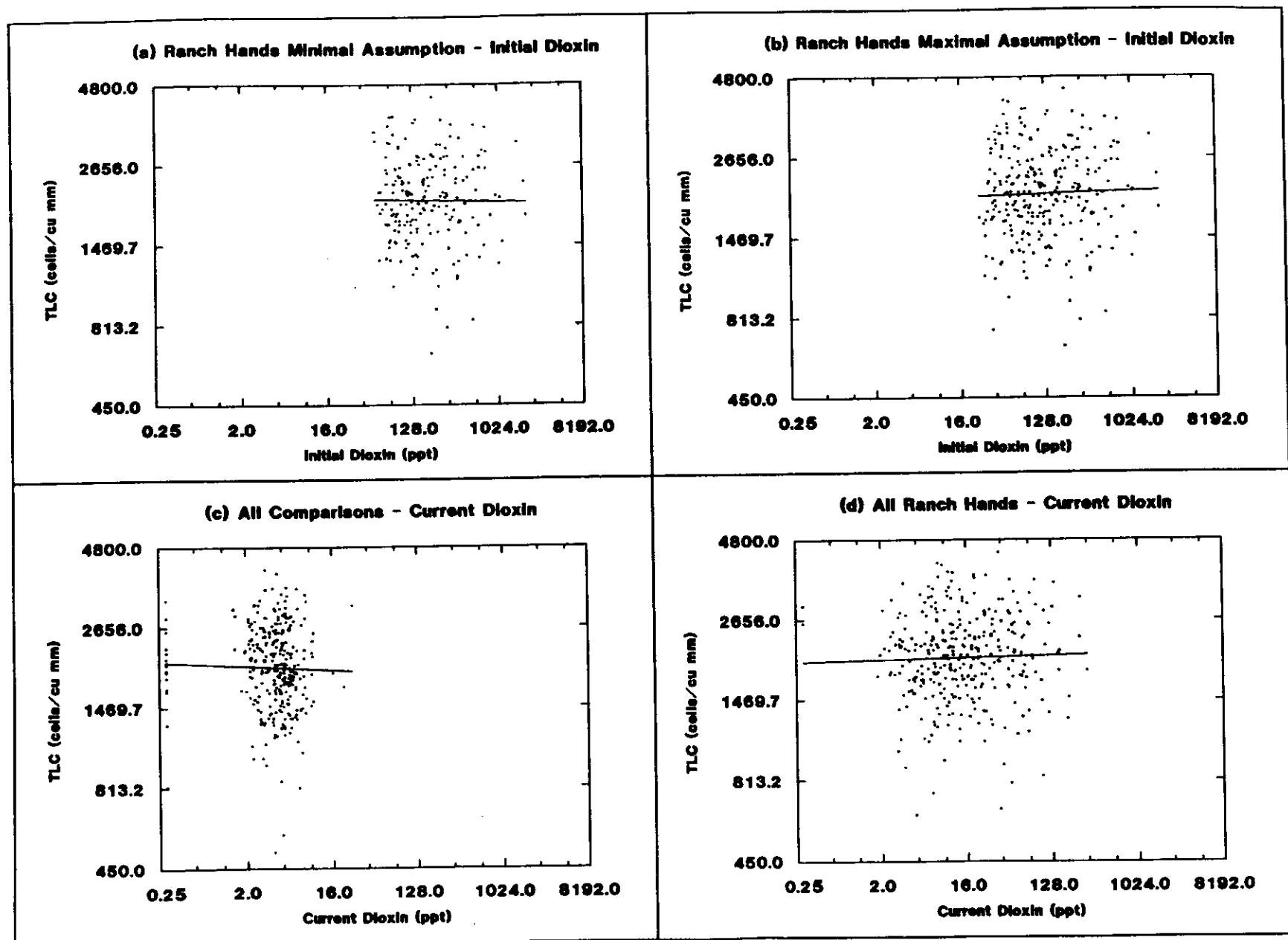


FIGURE O-1-10. TLC versus Dioxin

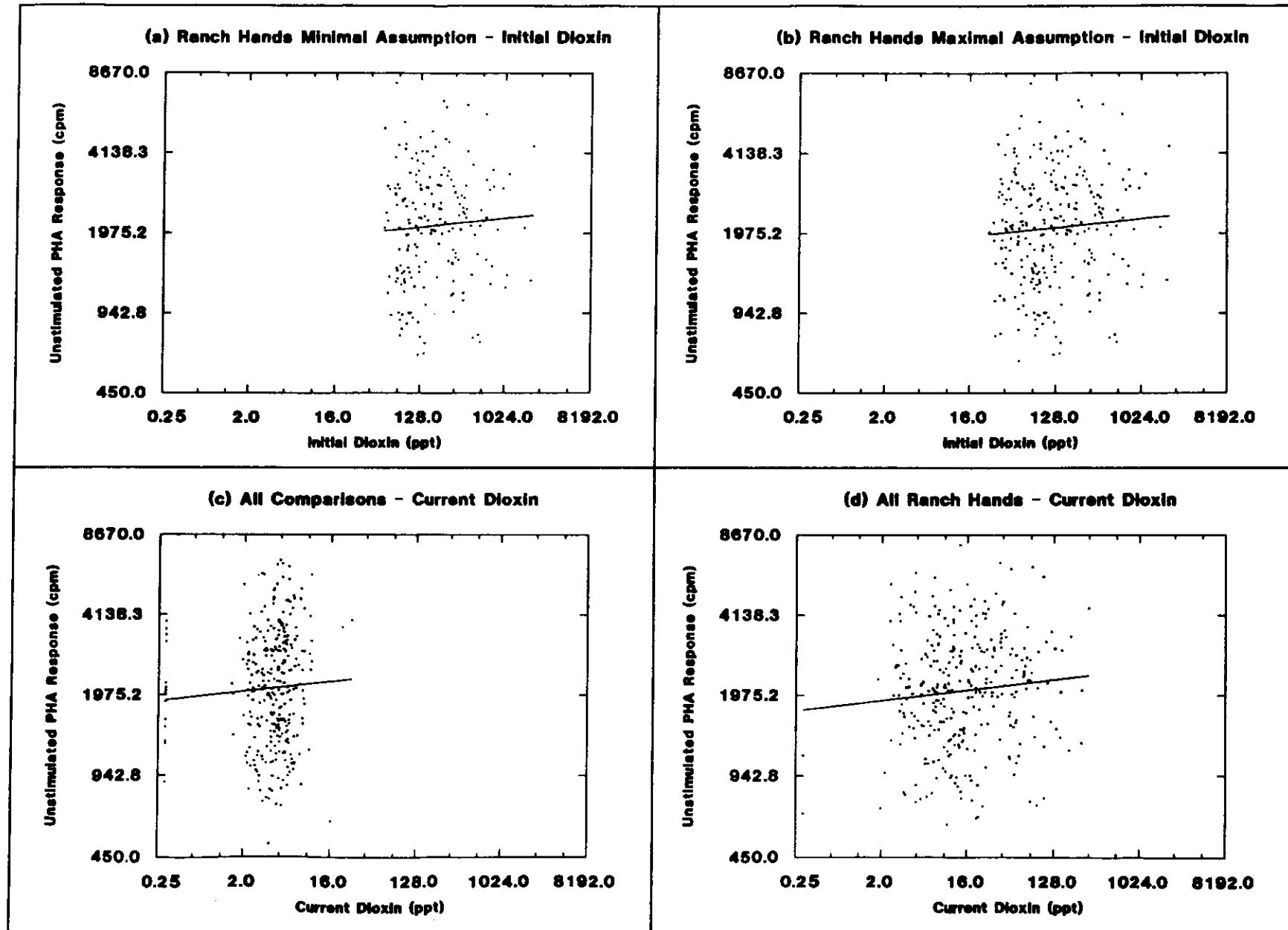


FIGURE O-1-11. Unstimulated PHA Response versus Dioxin

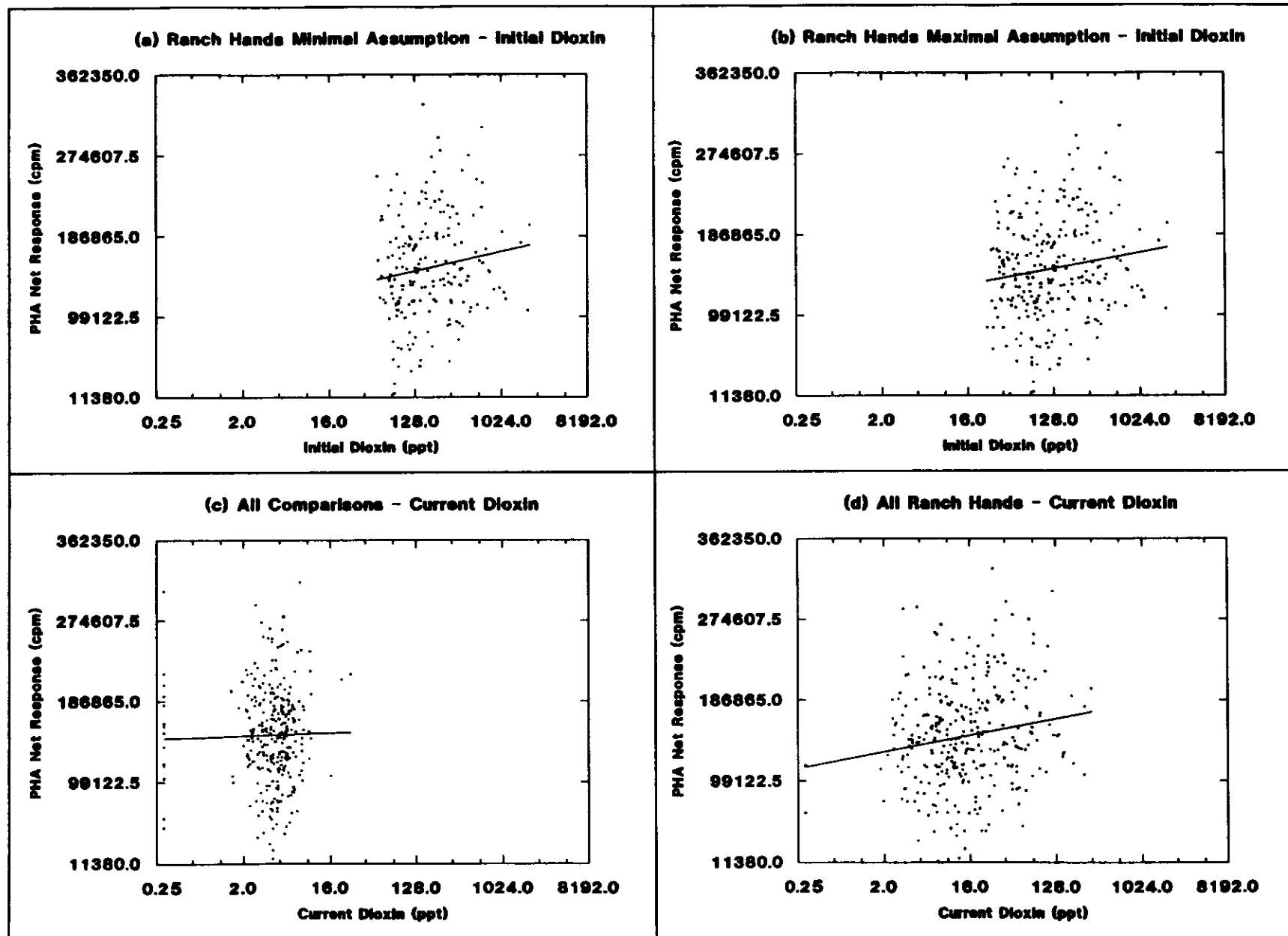


FIGURE O-1-12. PHA Net Response versus Dioxin

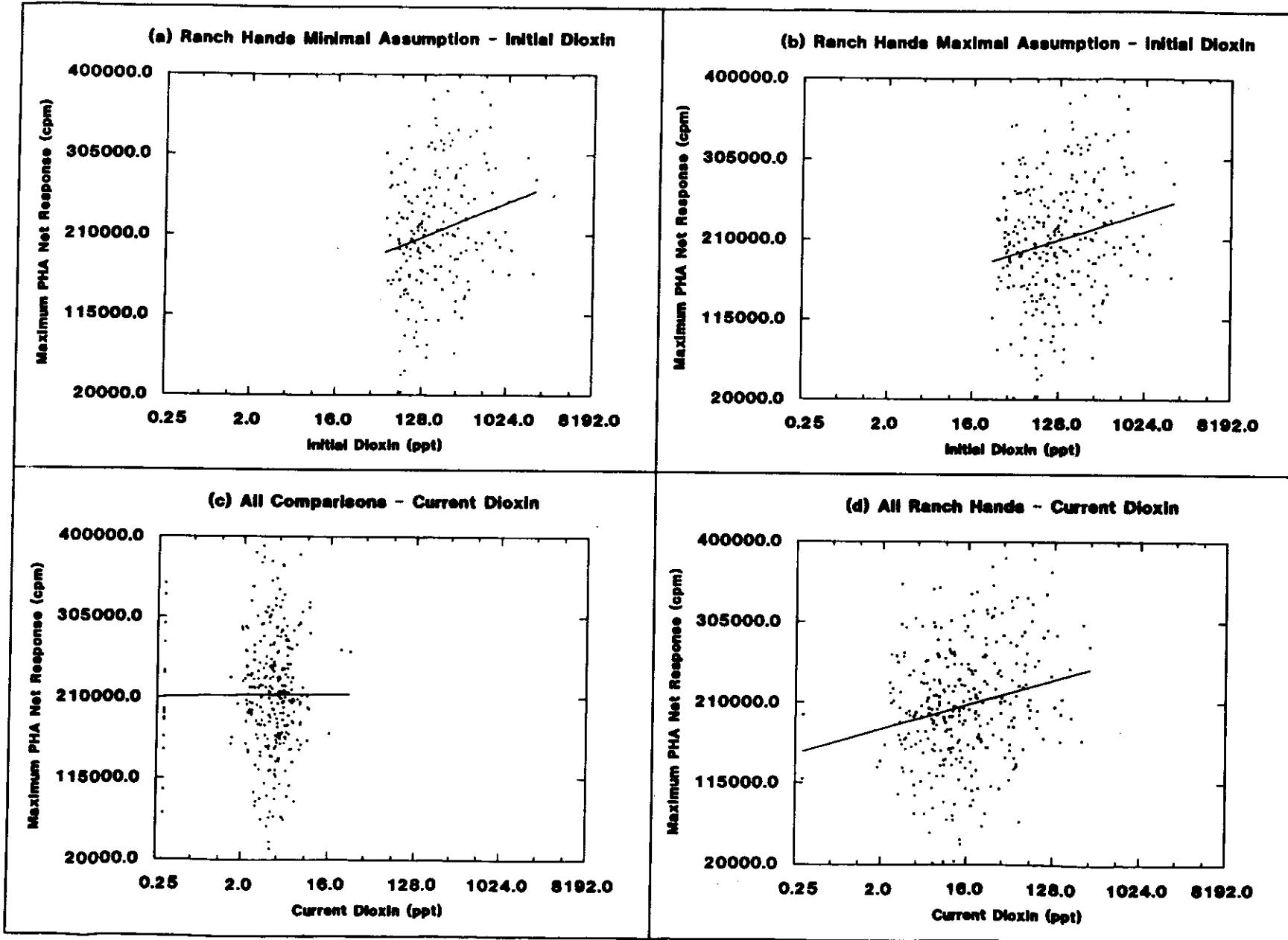


FIGURE O-1-13. Maximum PHA Net Response versus Dioxin

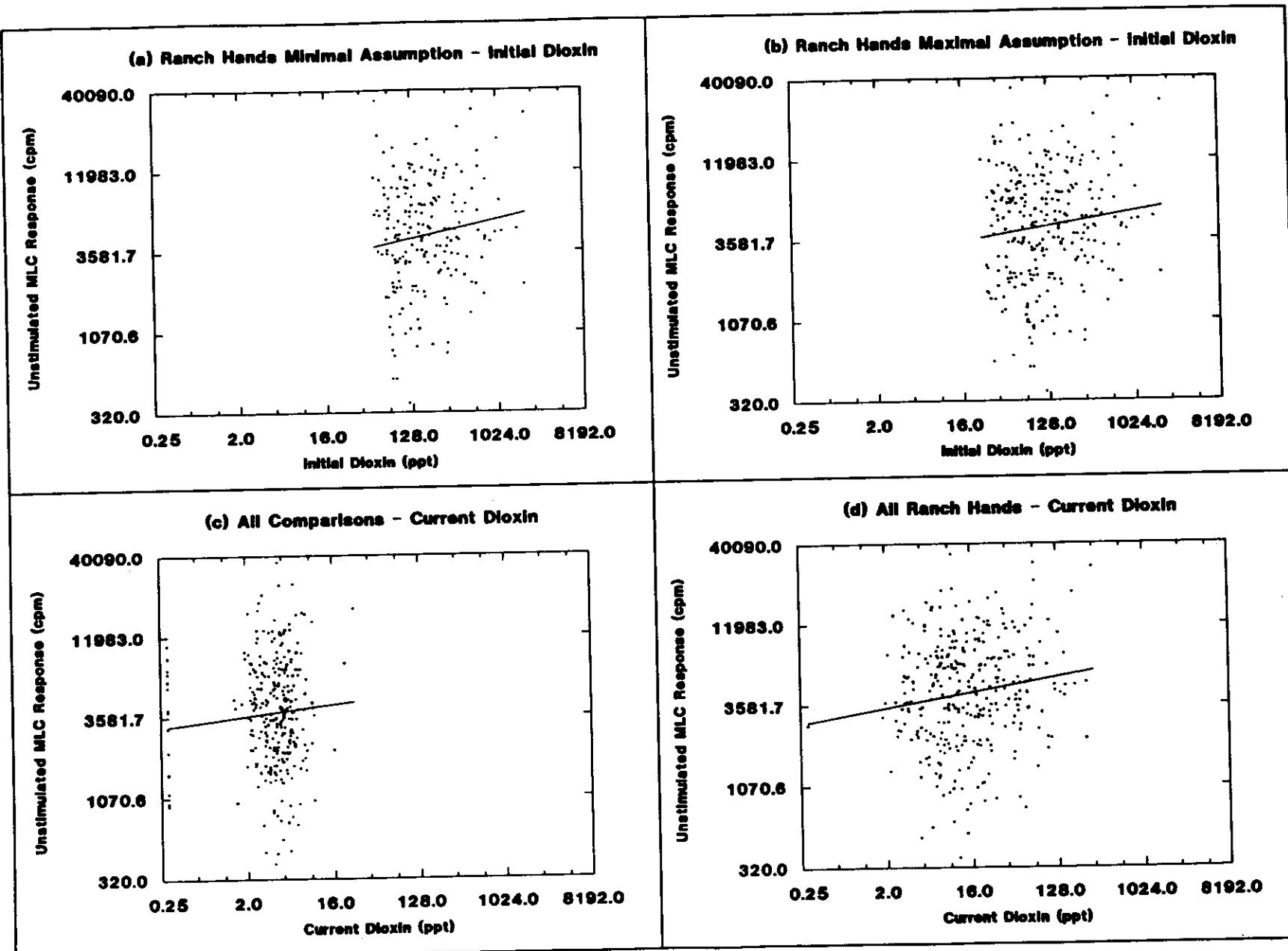


FIGURE O-1-14. Unstimulated MLC Response versus Dioxin

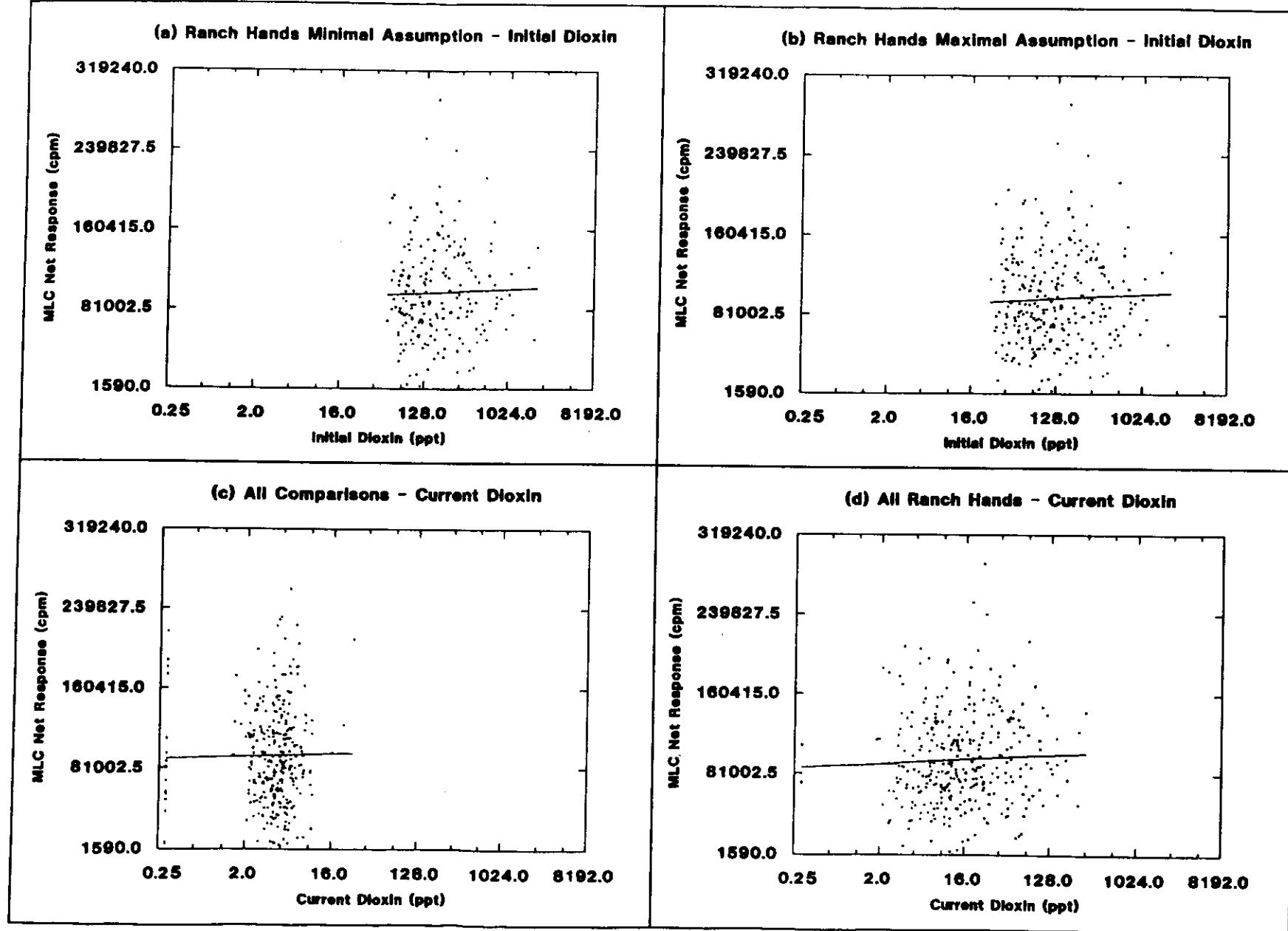


FIGURE O-1-15. MLC Net Response versus Dioxin

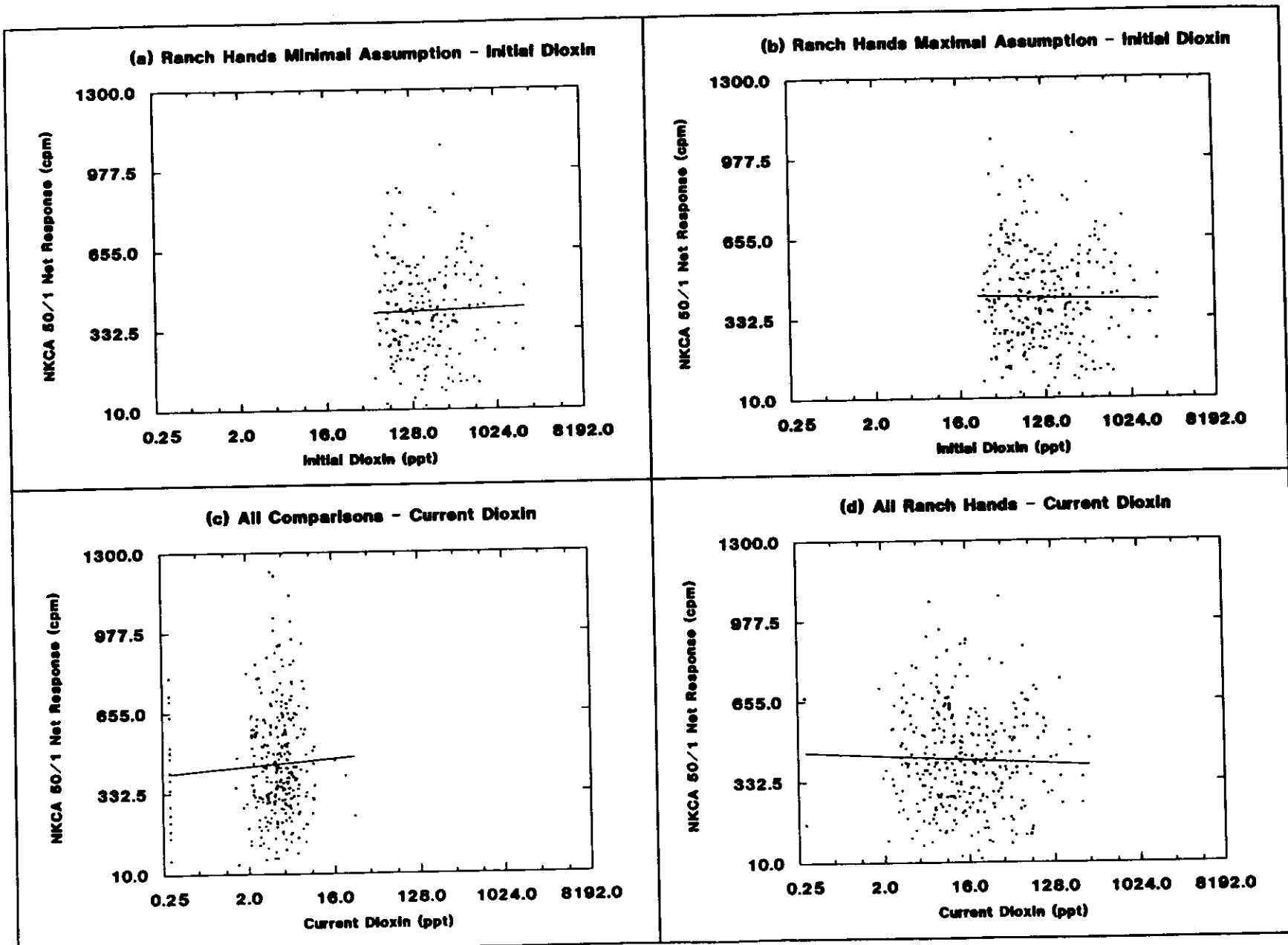


FIGURE O-1-16. NKCA 50/1 Net Response versus Dioxin

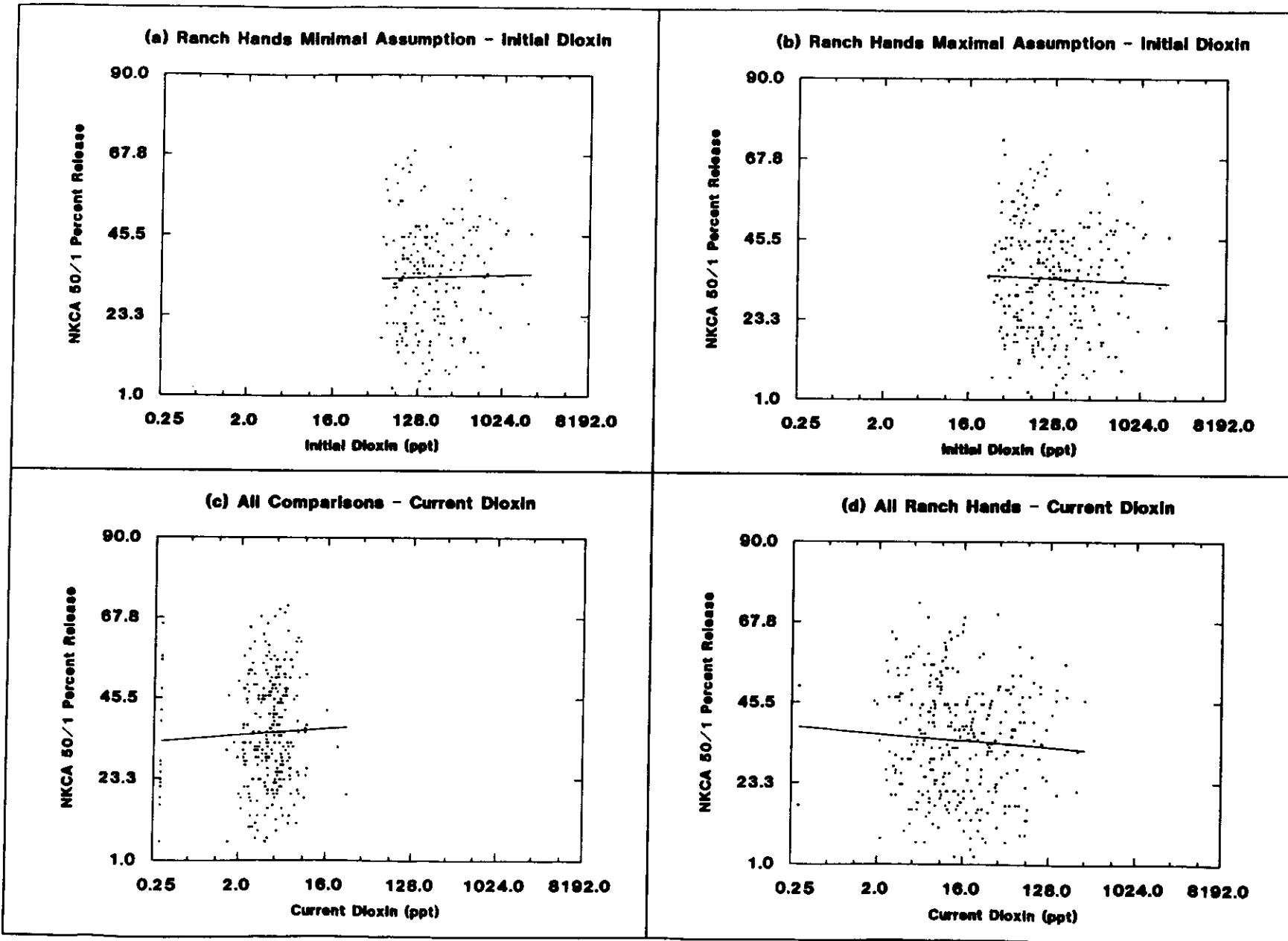


FIGURE O-1-17. NKCA 50/1 Percent Release versus Dioxin

O-1-O

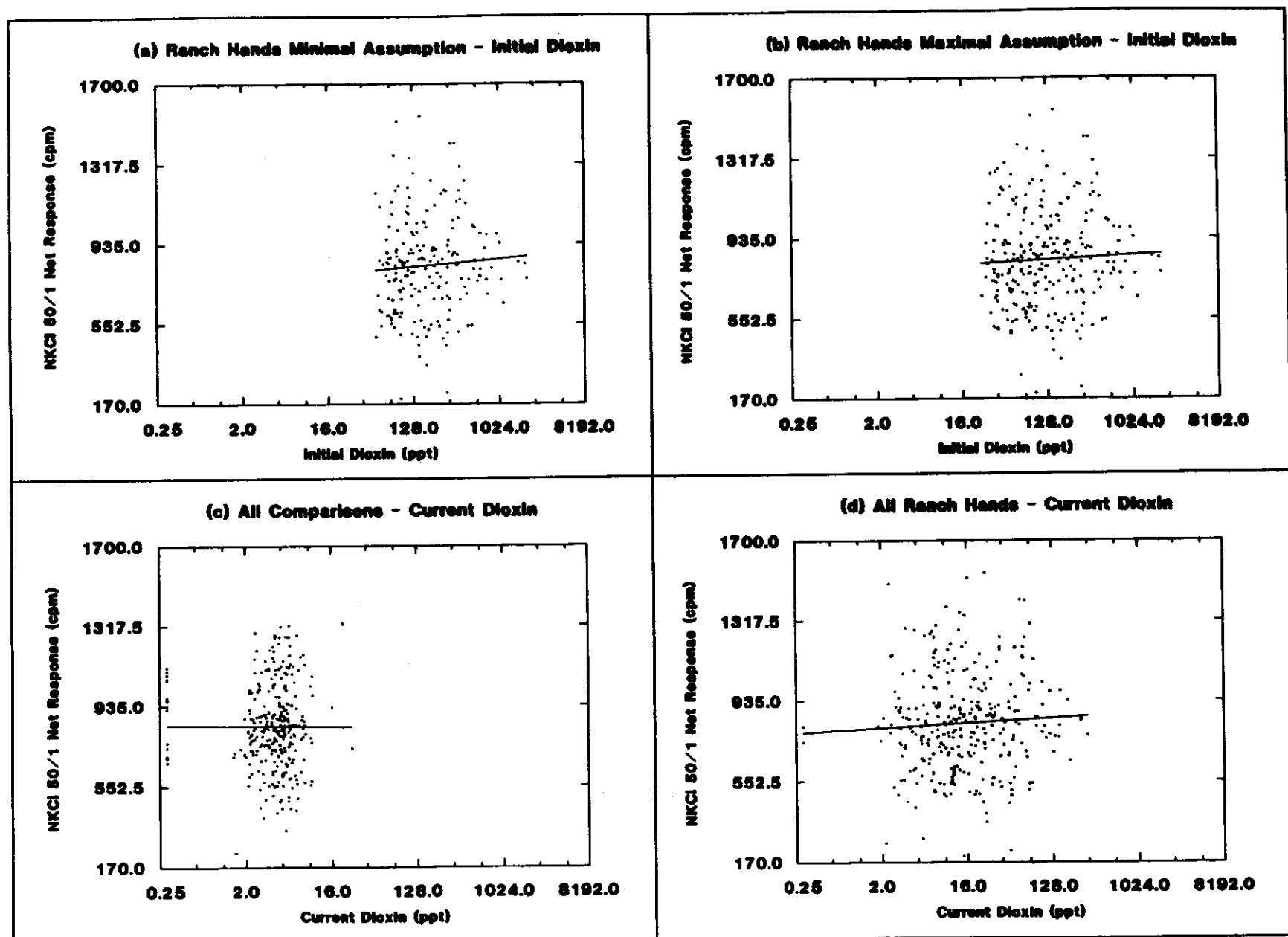


FIGURE O-1-18. NKCI 50/1 Net Response versus Dioxin

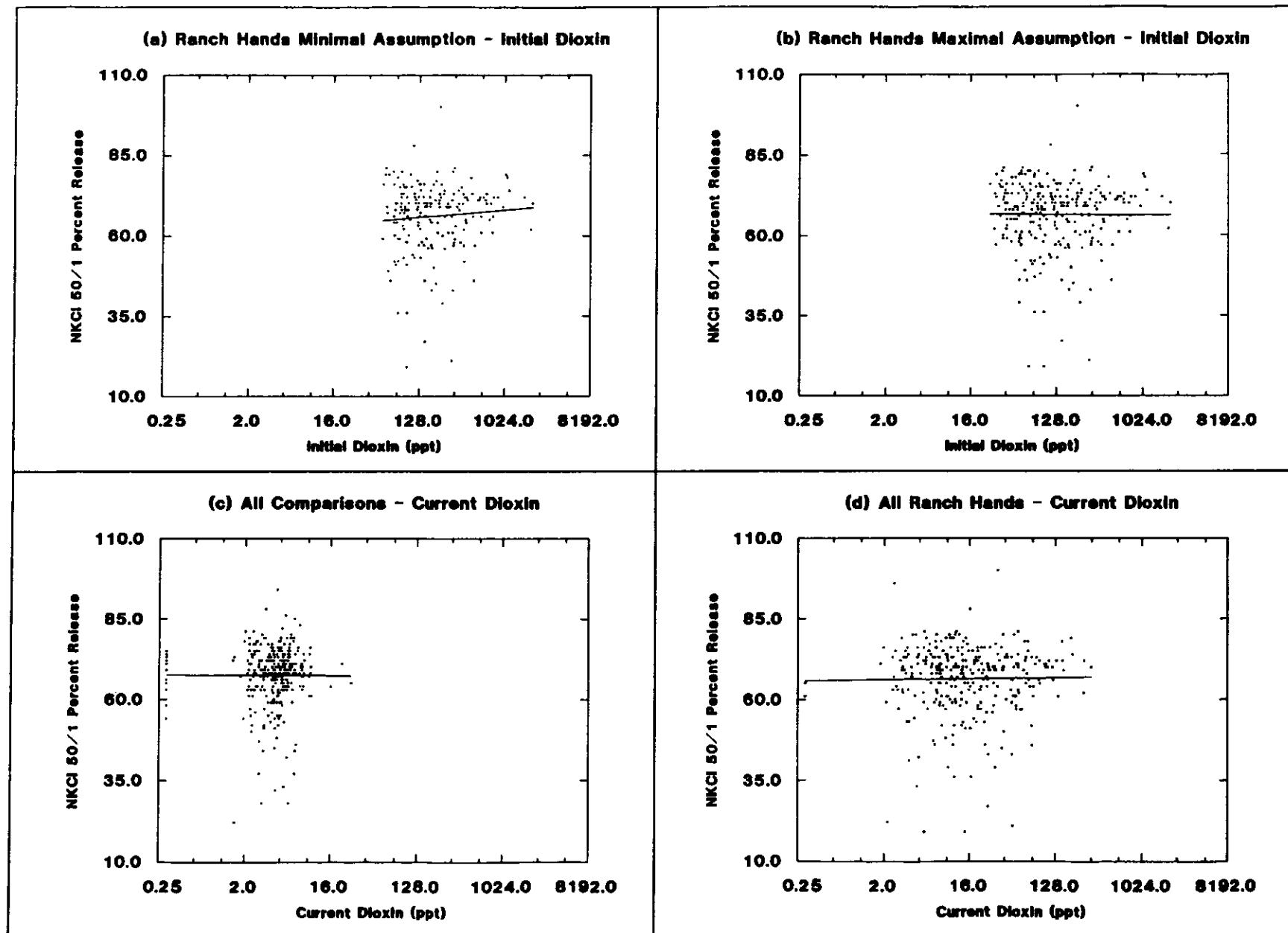


FIGURE O-1-19. NKCI 50/1 Percent Release versus Dioxin

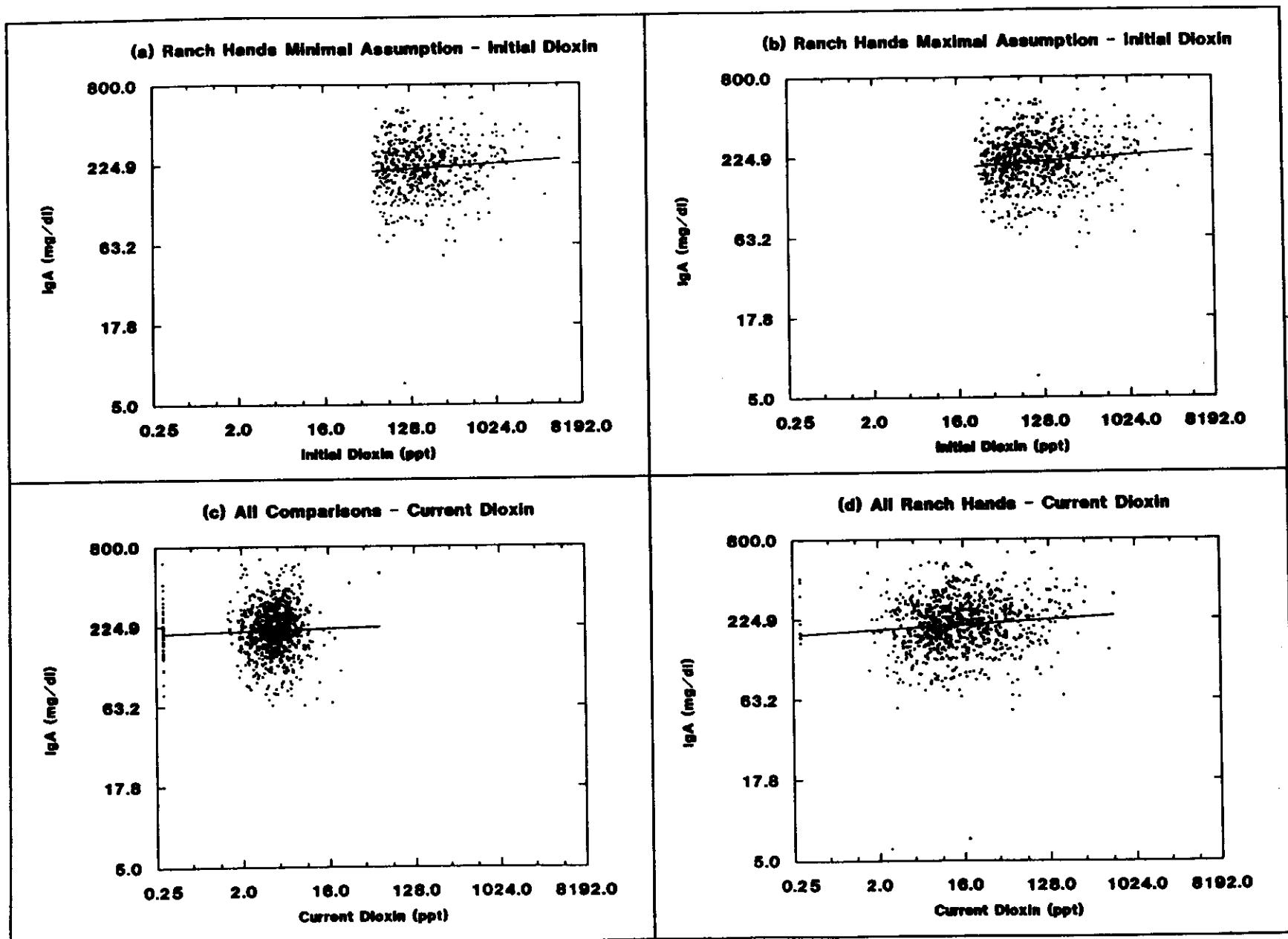


FIGURE O-1-20. IgA versus Dioxin

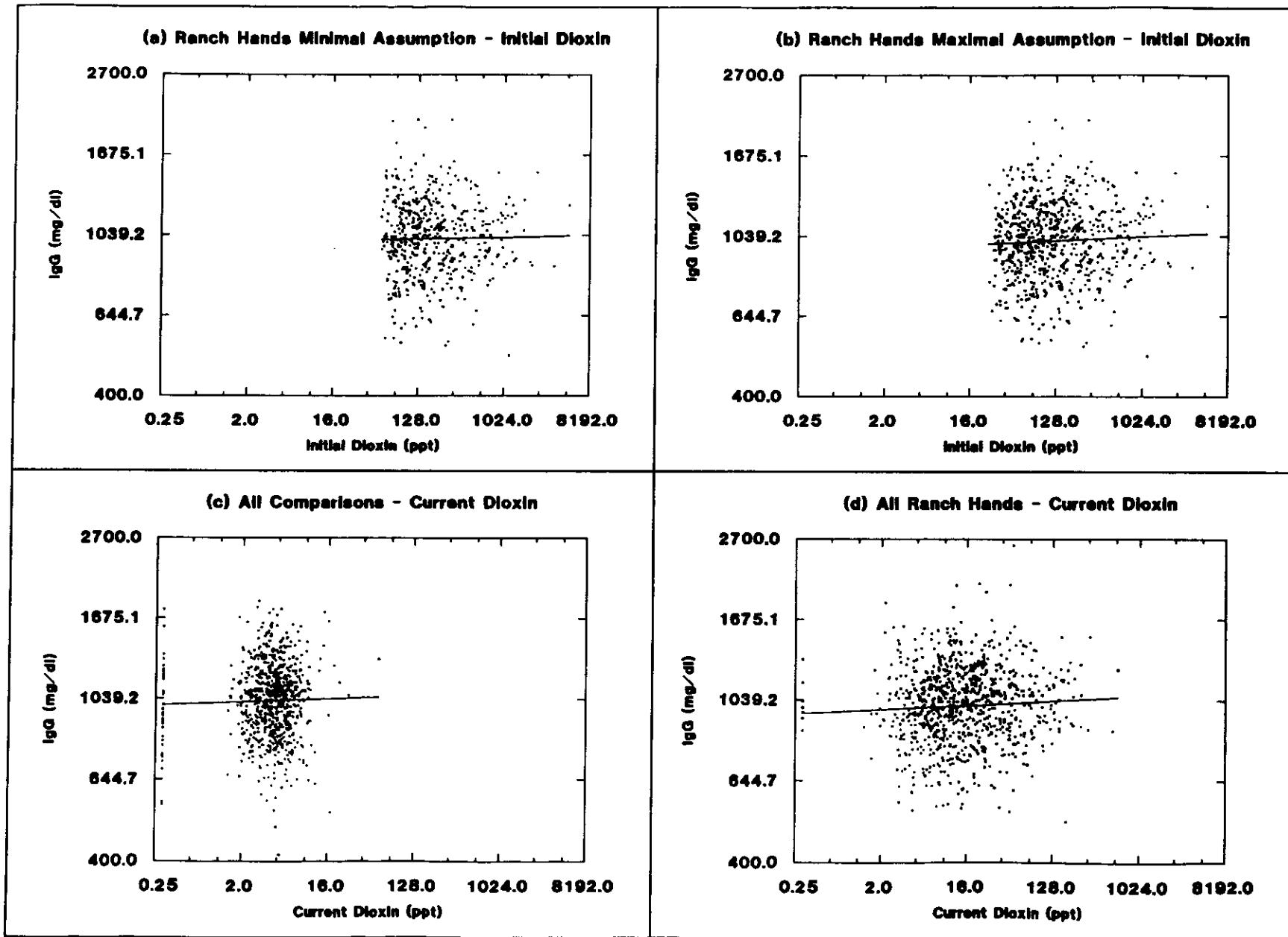


FIGURE O-1-21. IgG versus Dioxin

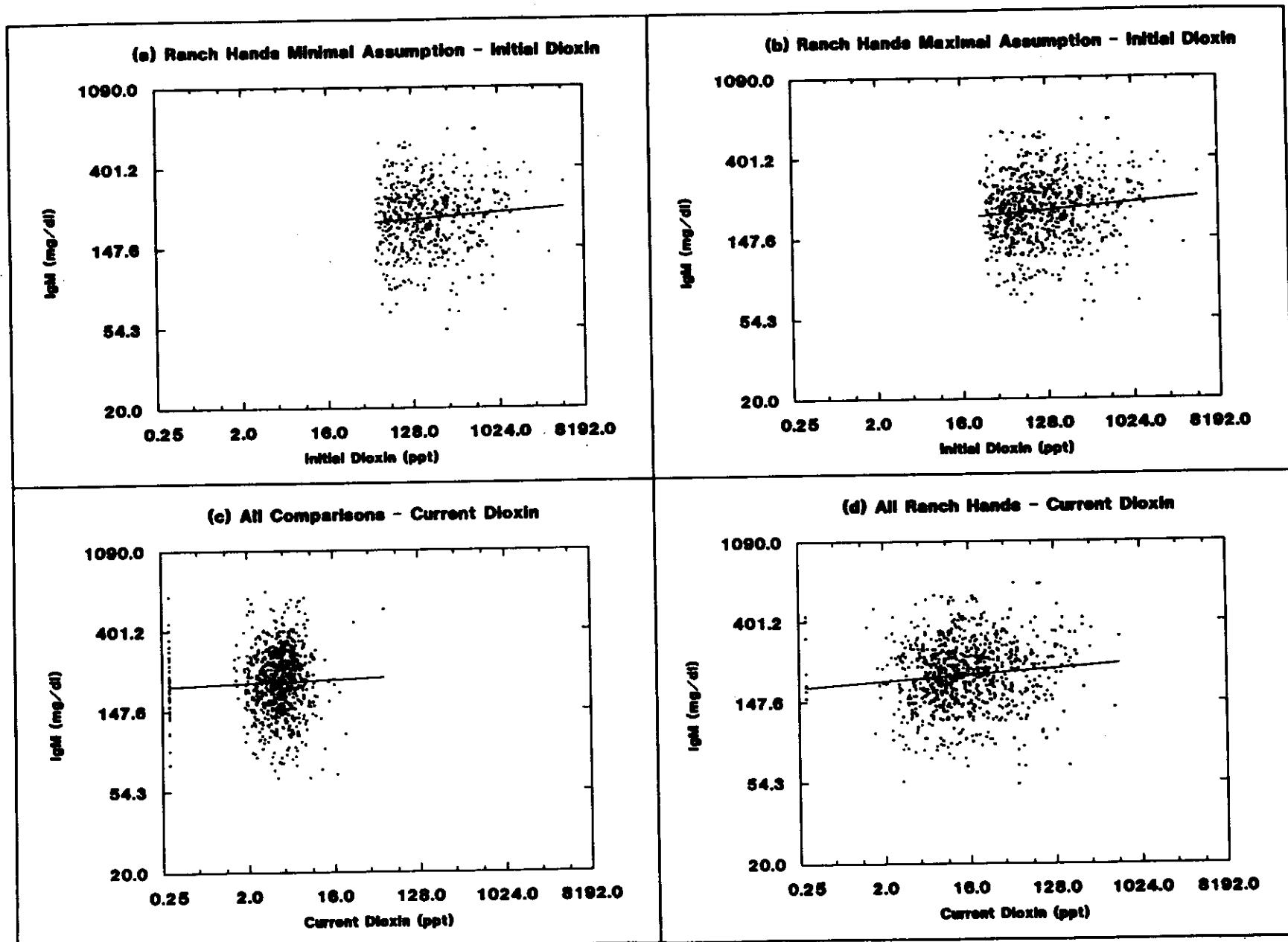


FIGURE O-1-22. IgM versus Dioxin

APPENDIX O-2.

Interaction Displays for the Immunologic Assessment

The following figures graphically display dioxin-by-covariate interactions that were found in the statistical analyses of the dependent variables in the immunologic assessment. For interactions with initial dioxin in the Ranch Hands involving continuous dependent variables, bivariate plots are presented with observations in each stratum represented by different symbols. Initial dioxin is shown in original units (ppt) but spacing of intervals is based on the logarithm (base 2) scale. The dependent variable is also displayed in original units but spacing is based on the scale used for analysis, as described in the chapter. The reference lines indicate the general relationship, unadjusted for any covariates, between the (transform of the) dependent variable and \log_2 (initial dioxin). For each stratum, the lines span the range of initial dioxin. Also, graphs for CD25 cells are based only on nonzero values, parallel to the statistical analyses pertaining to Chapter 16.

In the Ranch Hands, for current dioxin-by-time-by-covariate interactions with continuous dependent variables, separate bivariate plots (dependent variable versus current dioxin) are presented for each stratum of the covariate. Different symbols represent late tours (time since tour \leq 18.6 years) and early tours (time since tour $>$ 18.6 years) within each plot. The spacing for current dioxin and the dependent variable follows the same conventions as described above, as do the reference lines. For current dioxin-by-time-by-covariate interactions in the Ranch Hands with discrete dependent variables, a stratum-specific percentage of participants that exhibited an abnormal condition is displayed for low, medium, and high current dioxin. Different designs represent separate time since tour categories, and covariate strata are given on separate panels. Appendix Table O-1 provides the sample sizes for each bar on the graph.

For covariate interactions with current dioxin categorized within the Ranch Hand and Comparison groups involving continuous dependent variables, adjusted means for the background category in the Comparisons, and the unknown, low, and high categories in the Ranch Hands, are shown. Appendix Table O-1 presents the definition of these categories and the sample sizes for each mean. Different symbols distinguish the covariate categories and solid line segments connect the means to display a profile of the adjusted means.

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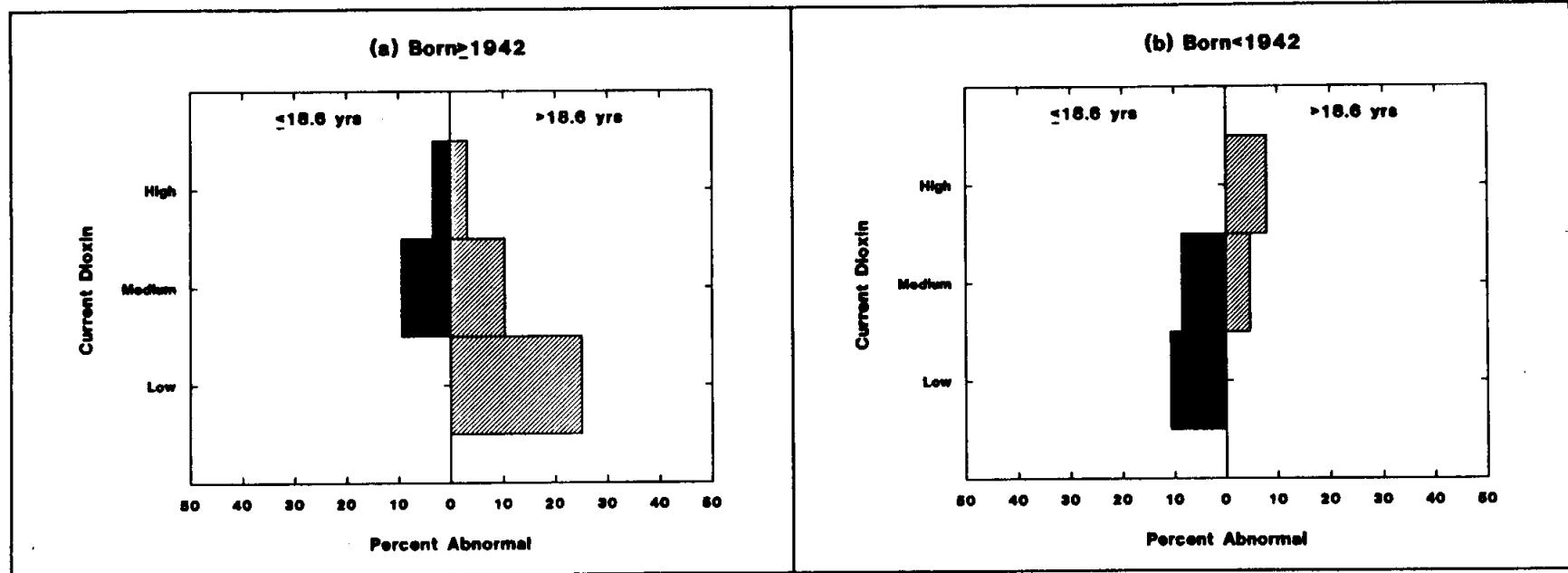


FIGURE O-2-1. Interaction of Current Dioxin, Time, and Age for the Composite Skin Test Diagnosis (Ranch Hands, Minimal Assumption)

O-23

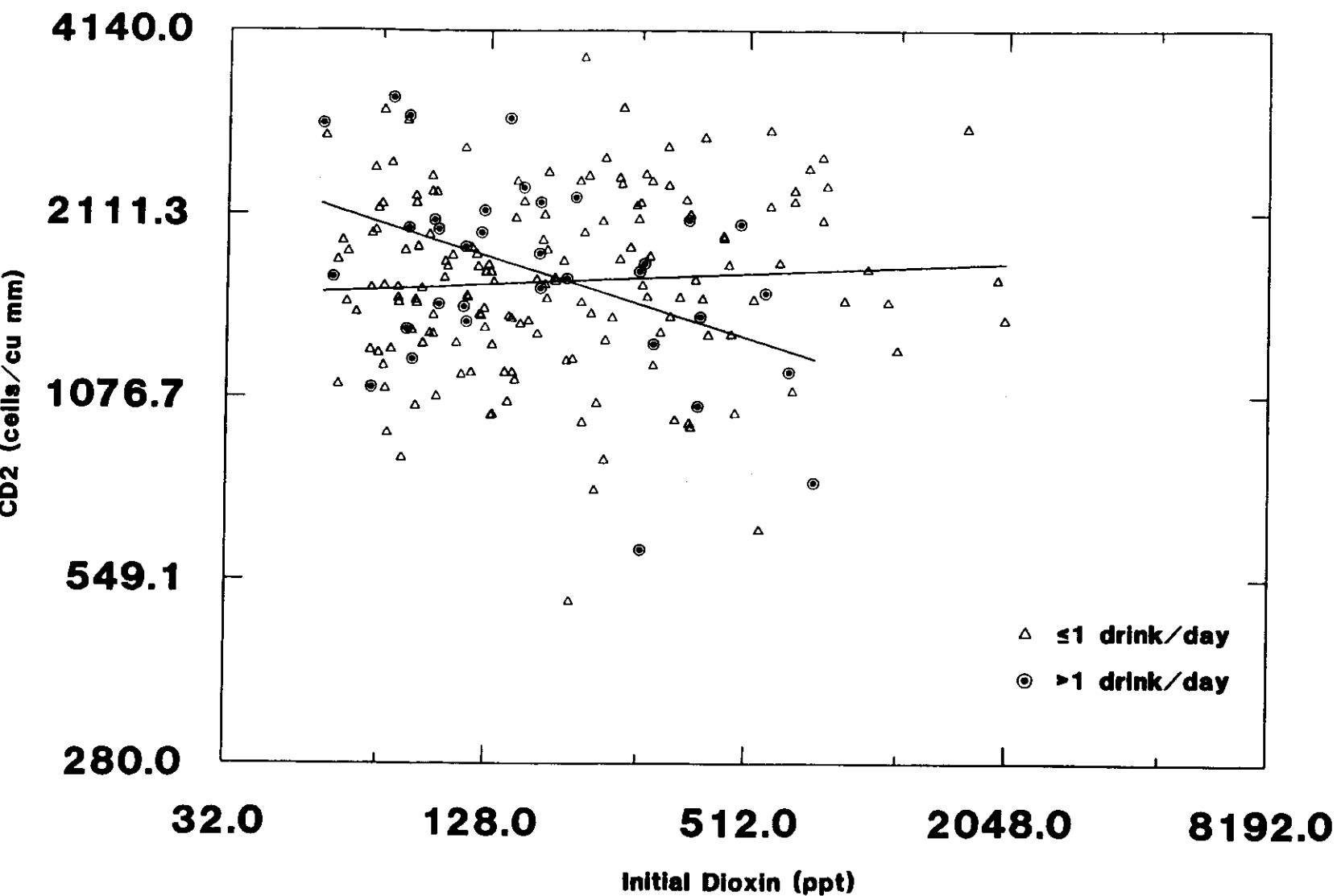


FIGURE O-2-2. Interaction of Initial Dioxin and Current Alcohol Use for CD2 Cells (Ranch Hands, Minimal Assumption)

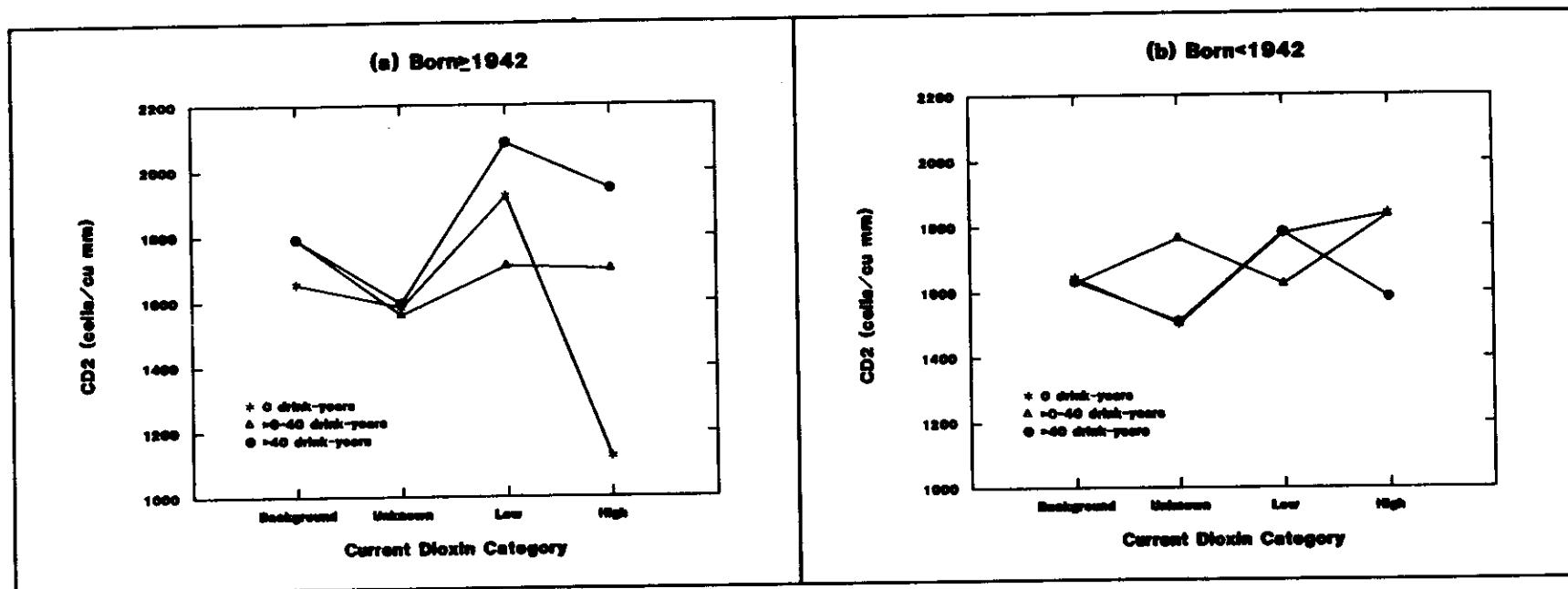


FIGURE O-2-3. Interaction of Categorized Current Dioxin, Age, and Lifetime Alcohol History for CD2 Cells

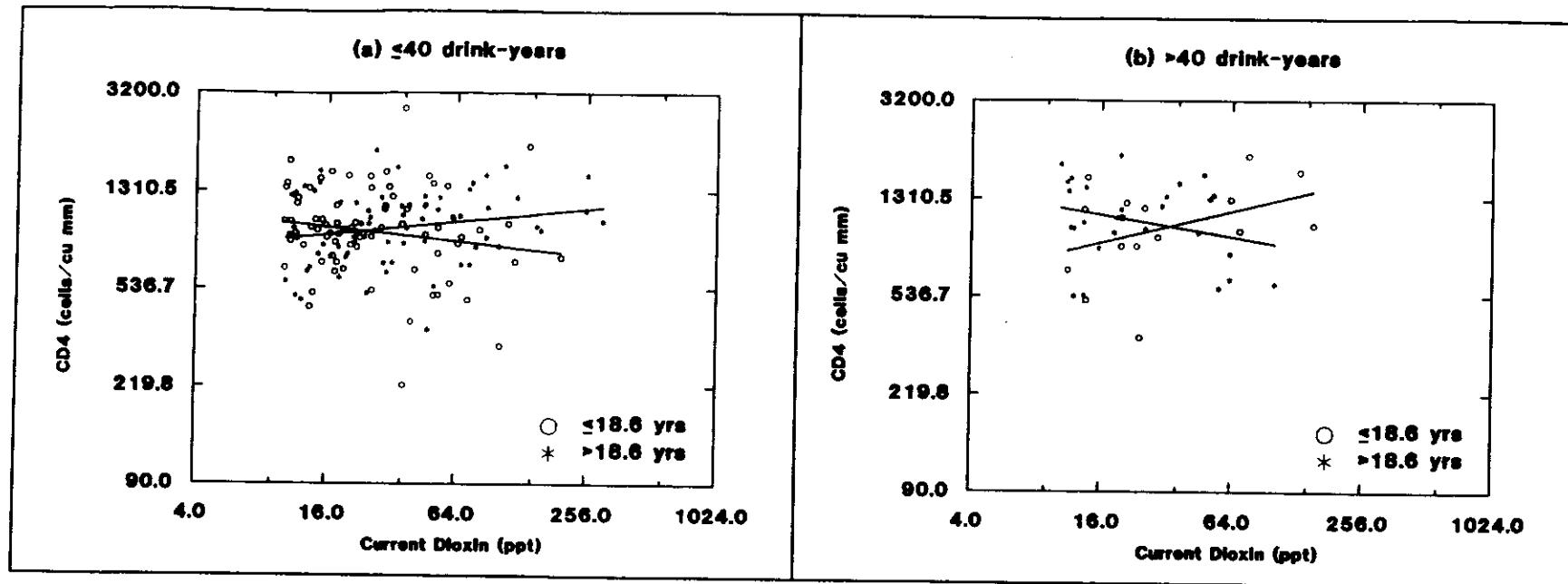
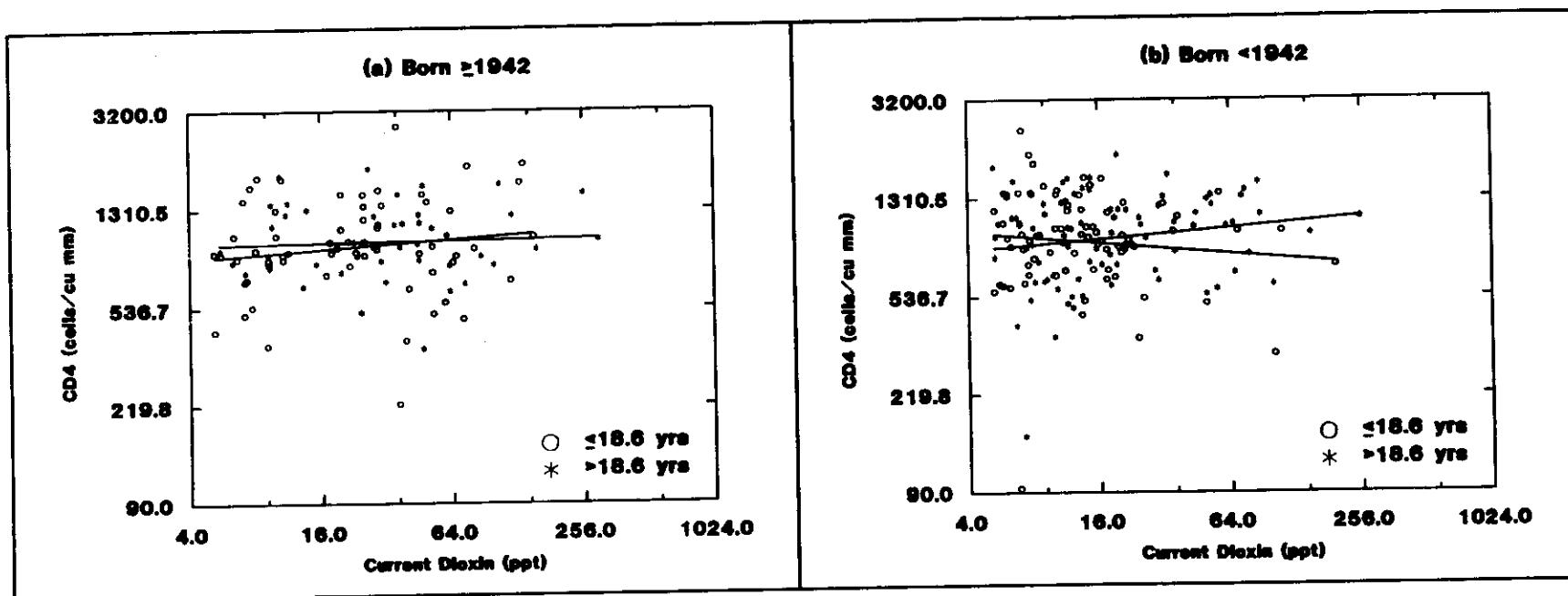


FIGURE O-2-4. Interaction of Current Dioxin, Time, and Lifetime Alcohol History for CD4 Cells (Ranch Hands, Minimal Assumption)



**FIGURE O-2-5. Interaction of Current Dioxin, Time, and Age
for CD4 Cells (Ranch Hands, Maximal Assumption)**

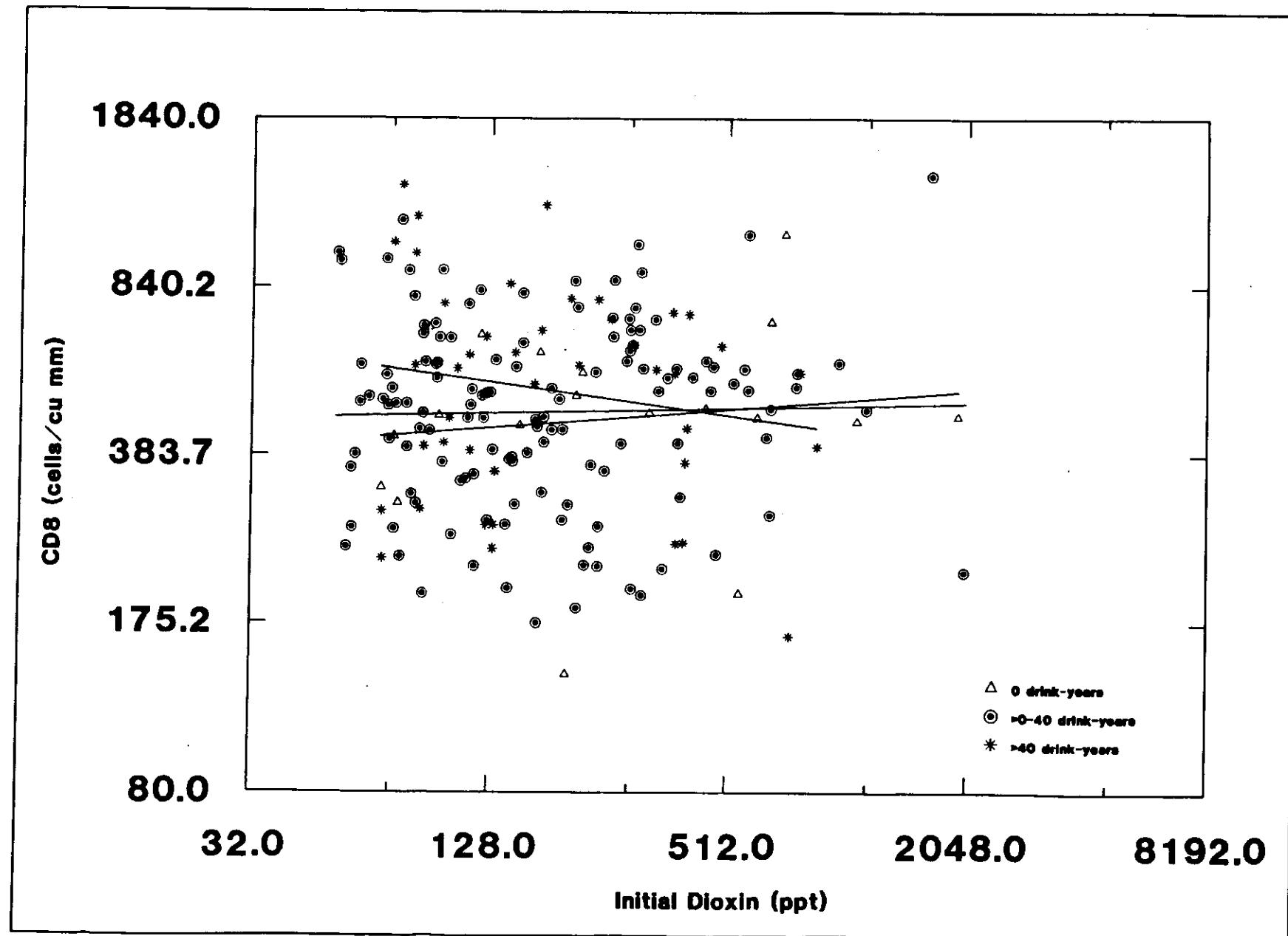


FIGURE O-2-6. Interaction of Initial Dioxin and Lifetime Alcohol History for CD8 Cells (Ranch Hands, Minimal Assumption)

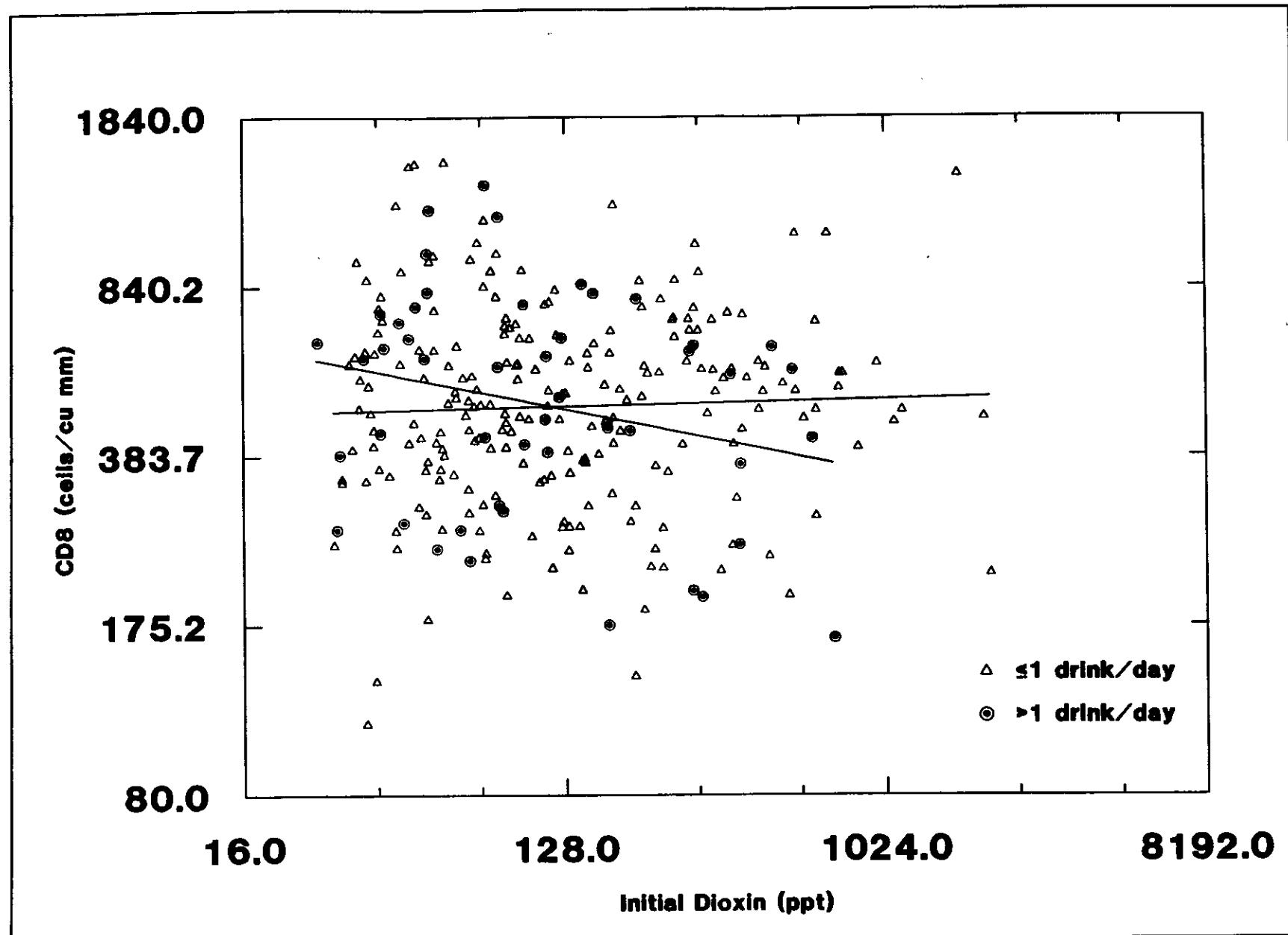
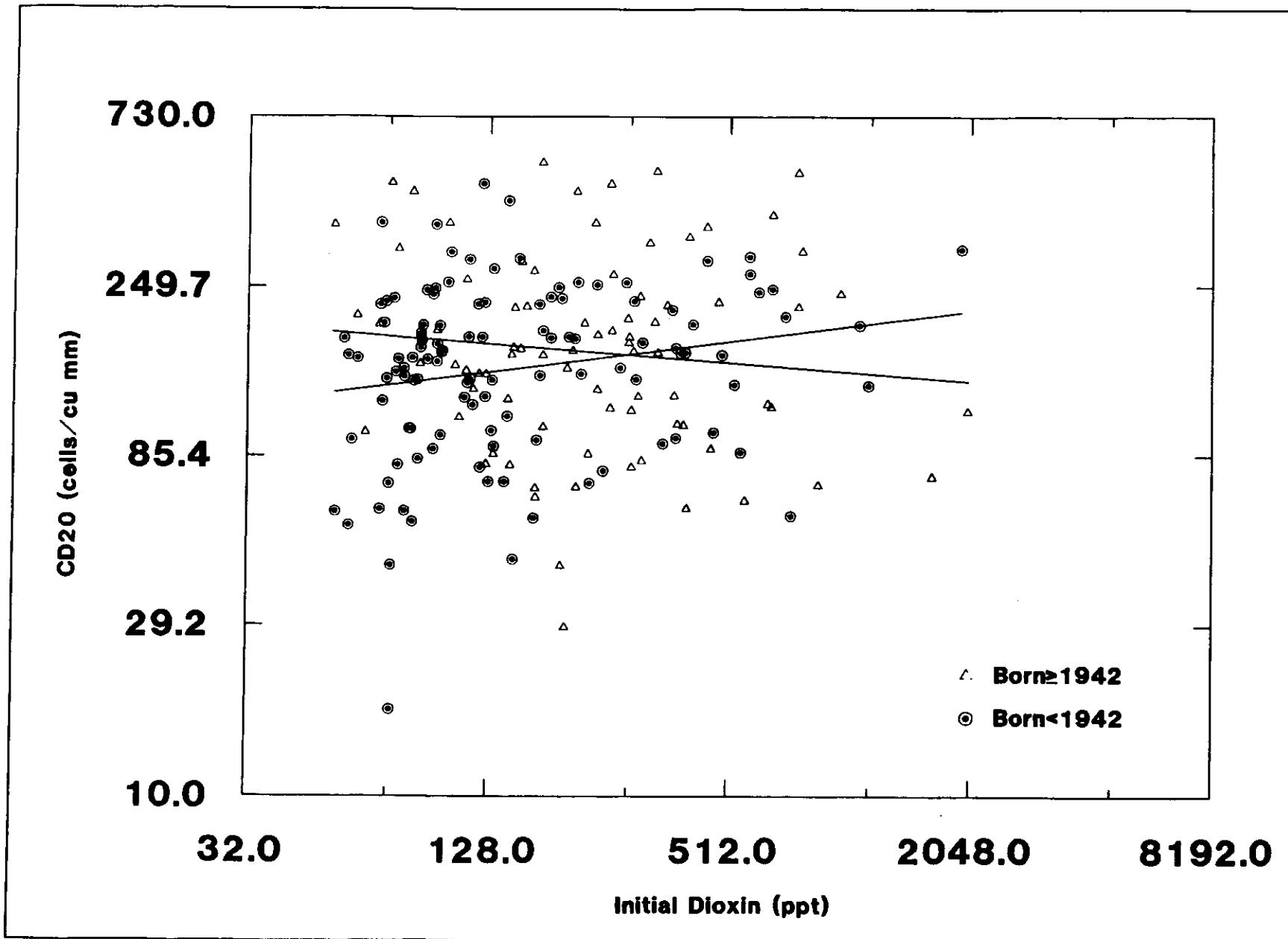


FIGURE O-2-7. Interaction of Initial Dioxin and Current Alcohol Use for CD8 Cells (Ranch Hands, Maximal Assumption)



**FIGURE O-2-8. Interaction of Initial Dioxin and Age for CD20 Cells
(Ranch Hands, Minimal Assumption)**

O-2-12

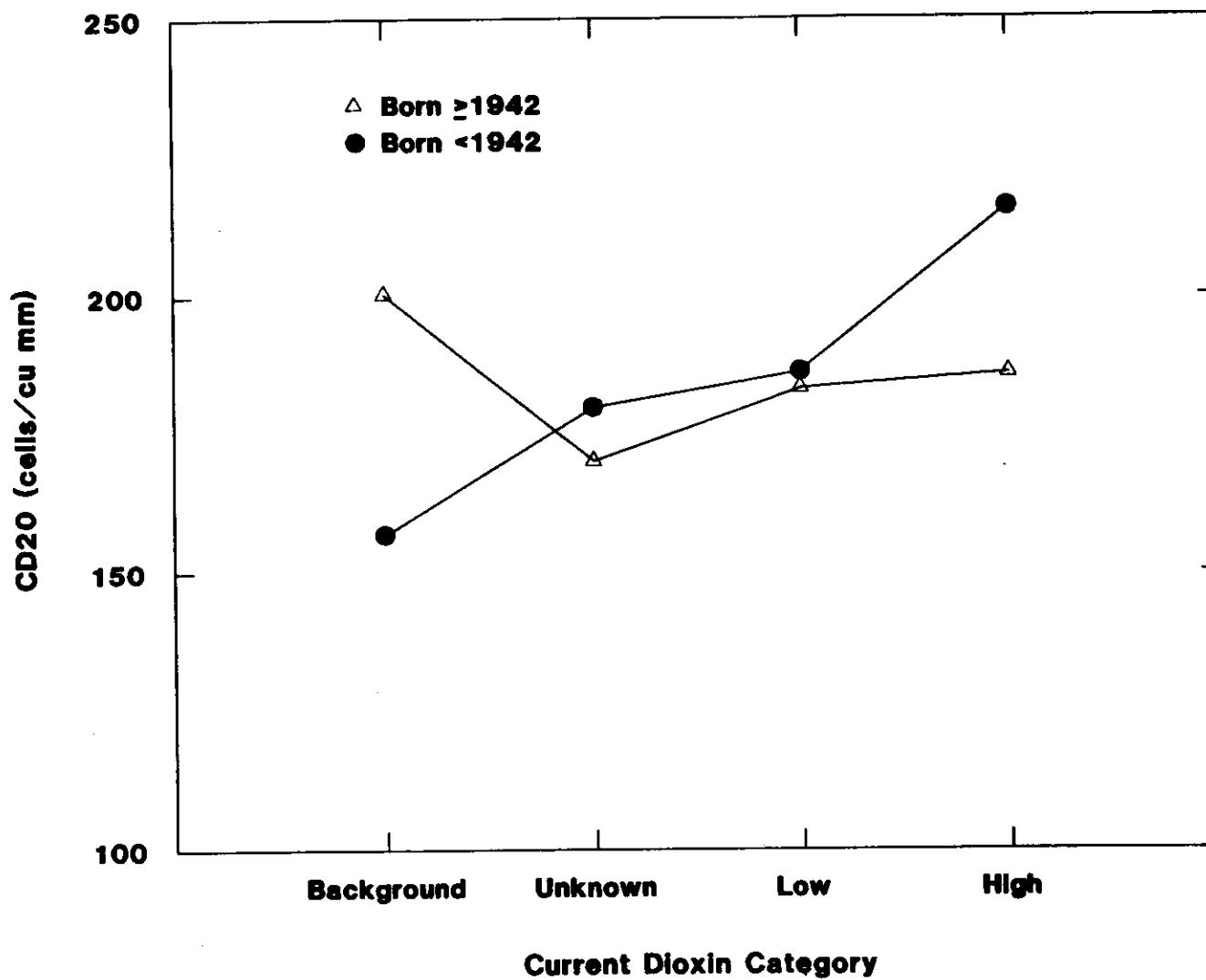


FIGURE O-2-9. Interaction of Categorized Current Dioxin and Age for CD20 Cells

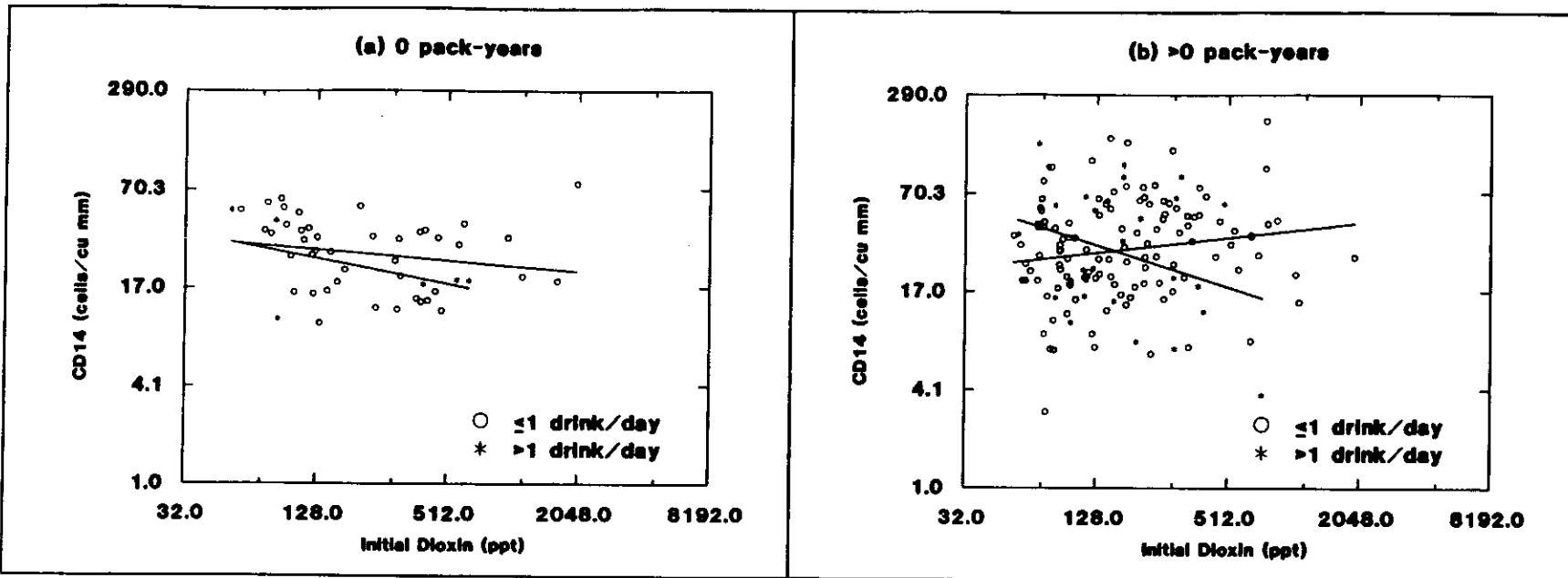


FIGURE O-2-10. Interaction of Initial Dioxin, Lifetime Cigarette Smoking History, and Current Alcohol Use for CD14 Cells (Ranch Hands, Minimal Assumption)

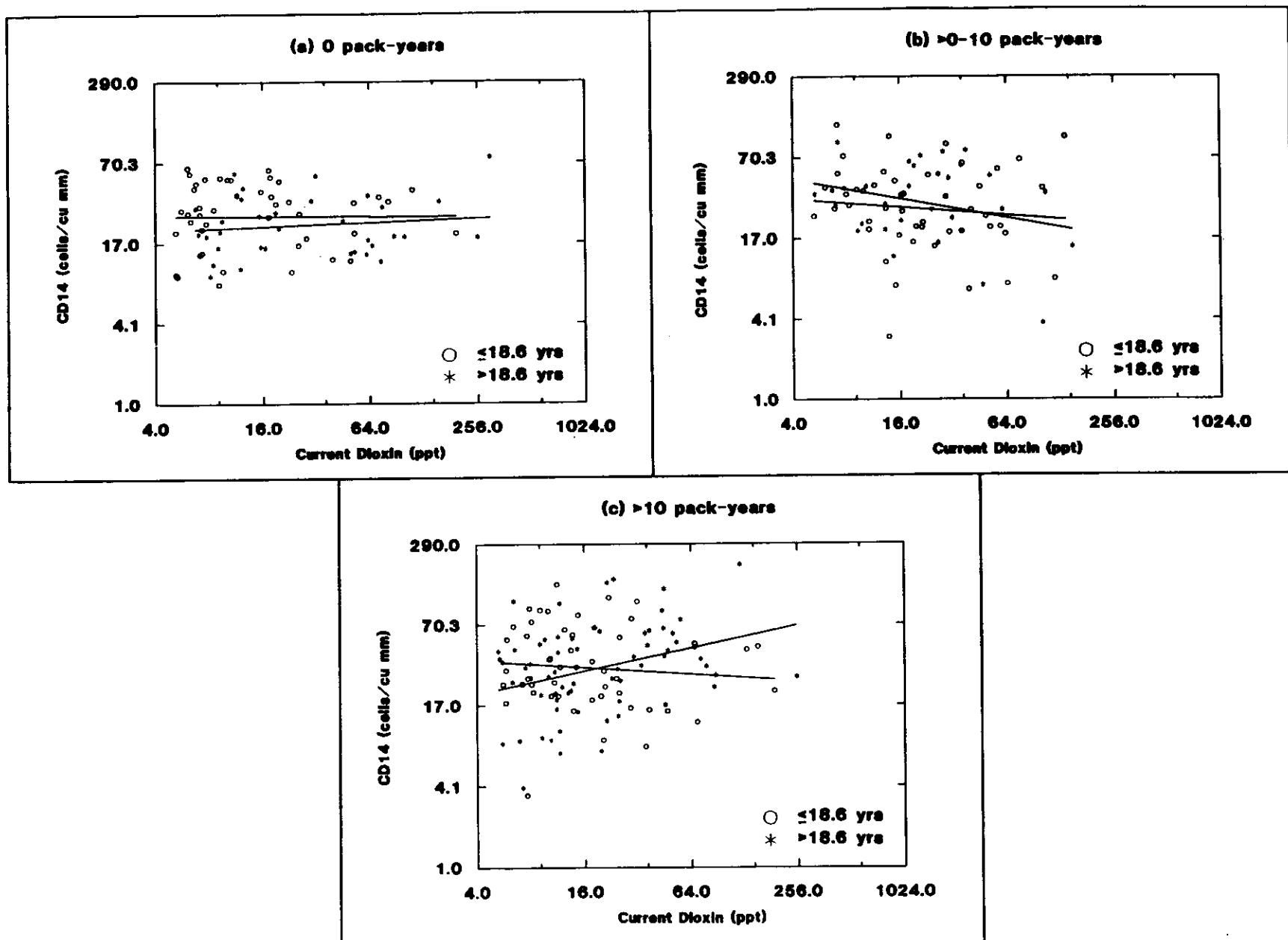


FIGURE O-2-11. Interaction of Current Dioxin, Time, and Lifetime Cigarette Smoking History for CD14 Cells (Ranch Hands, Maximal Assumption)

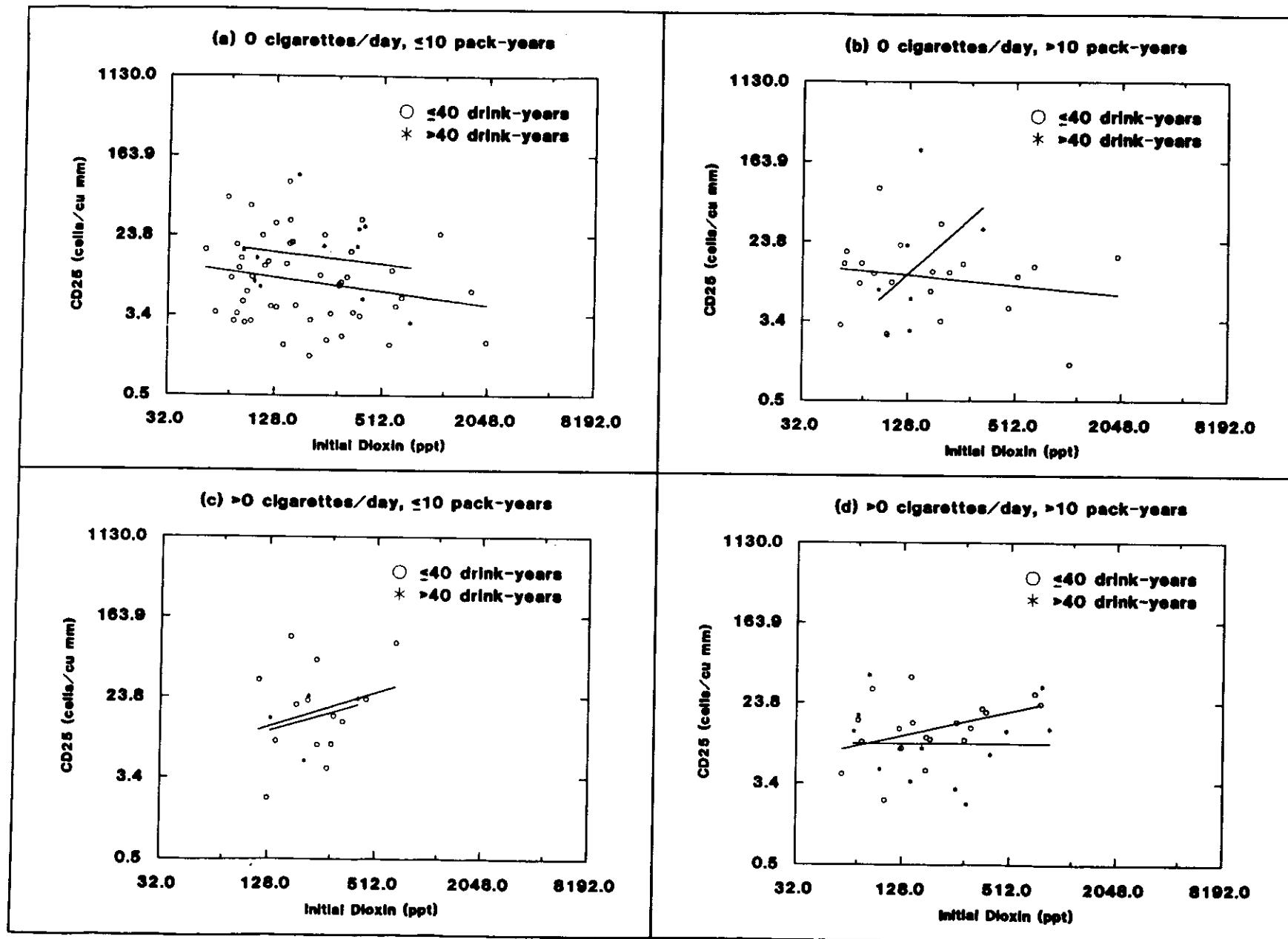


FIGURE O-2-12. Interaction of Initial Dioxin, Current Cigarette Smoking, Lifetime Cigarette Smoking History, and Lifetime Alcohol History for CD25 Cells (Ranch Hands, Minimal Assumption)

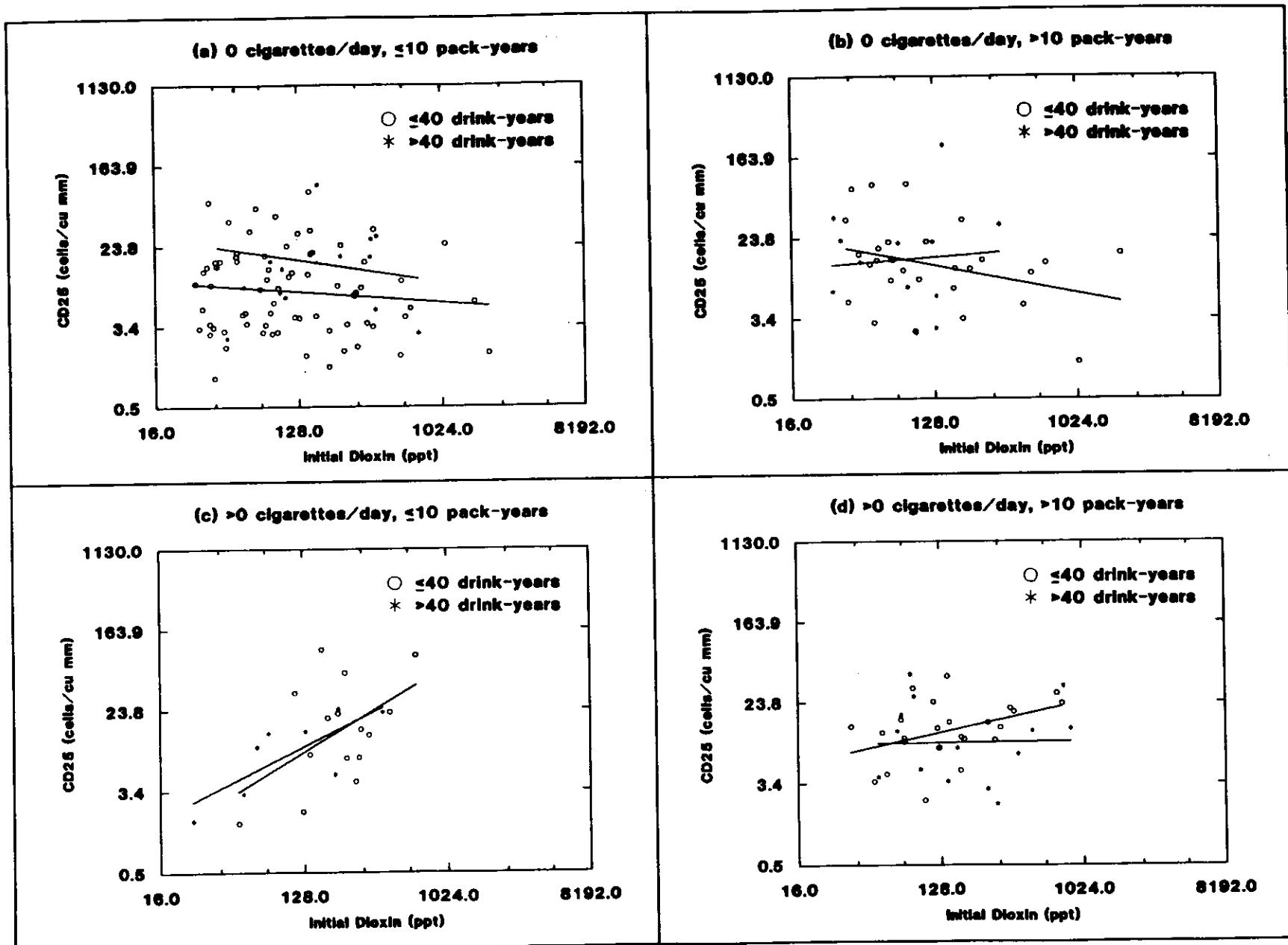


FIGURE O-2-13. Interaction of Initial Dioxin, Current Cigarette Smoking, Lifetime Cigarette Smoking History, and Lifetime Alcohol History for CD25 Cells (Ranch Hands, Maximal Assumption)

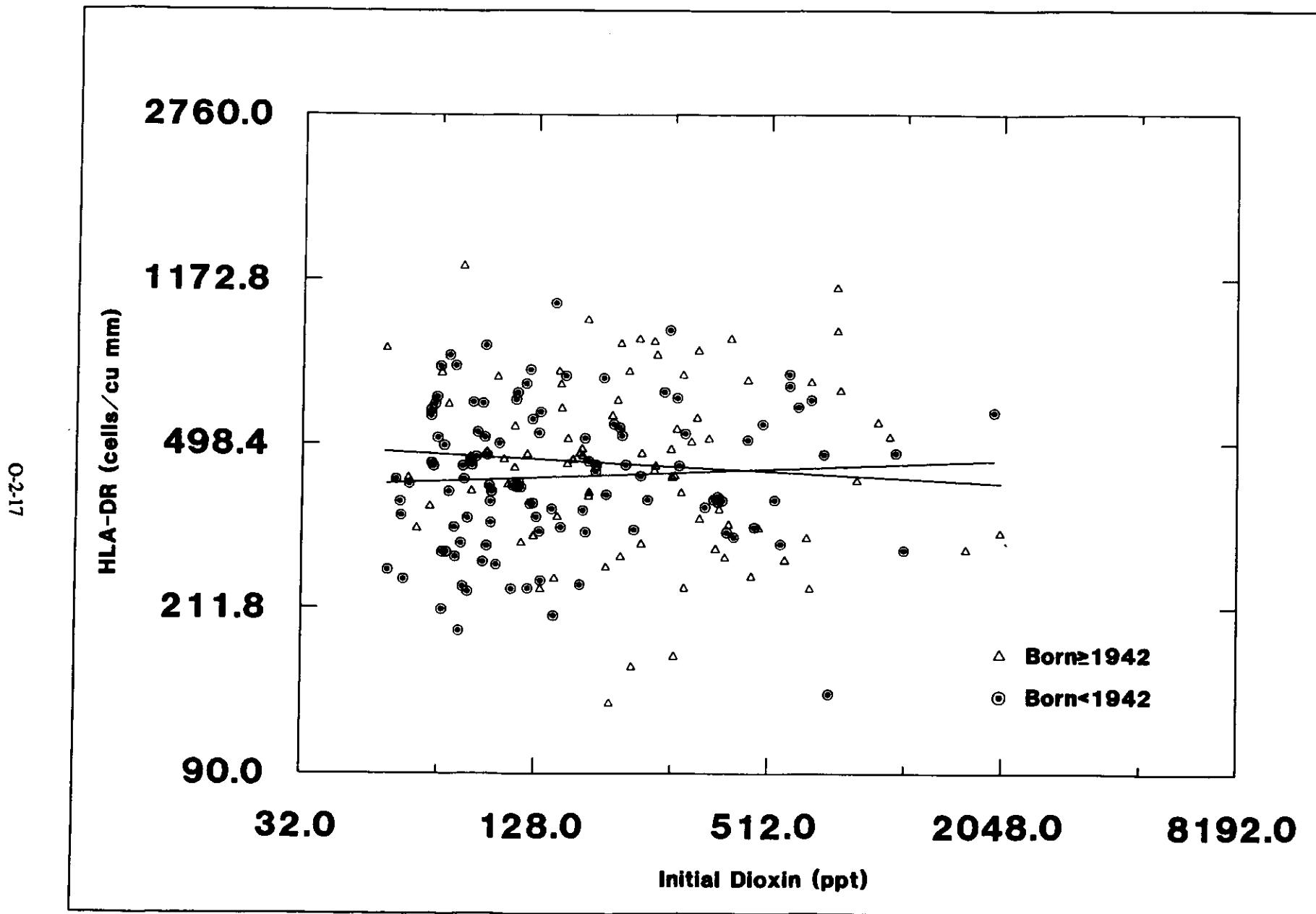


FIGURE O-2-14. Interaction of Initial Dioxin and Age for HLA-DR Cells (Ranch Hands, Minimal Assumption)

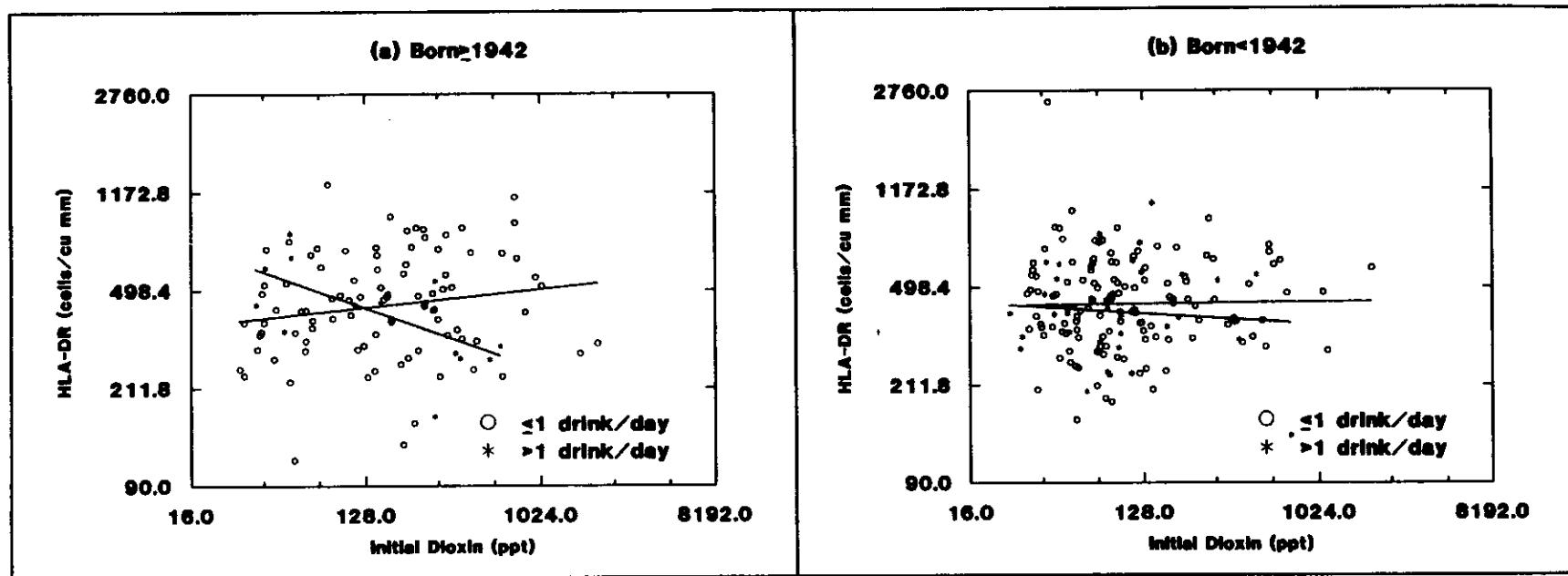


FIGURE O-2-15. Interaction of Initial Dioxin, Age, and Current Alcohol Use for HLA-DR Cells (Ranch Hands, Maximal Assumption)

O-2-19

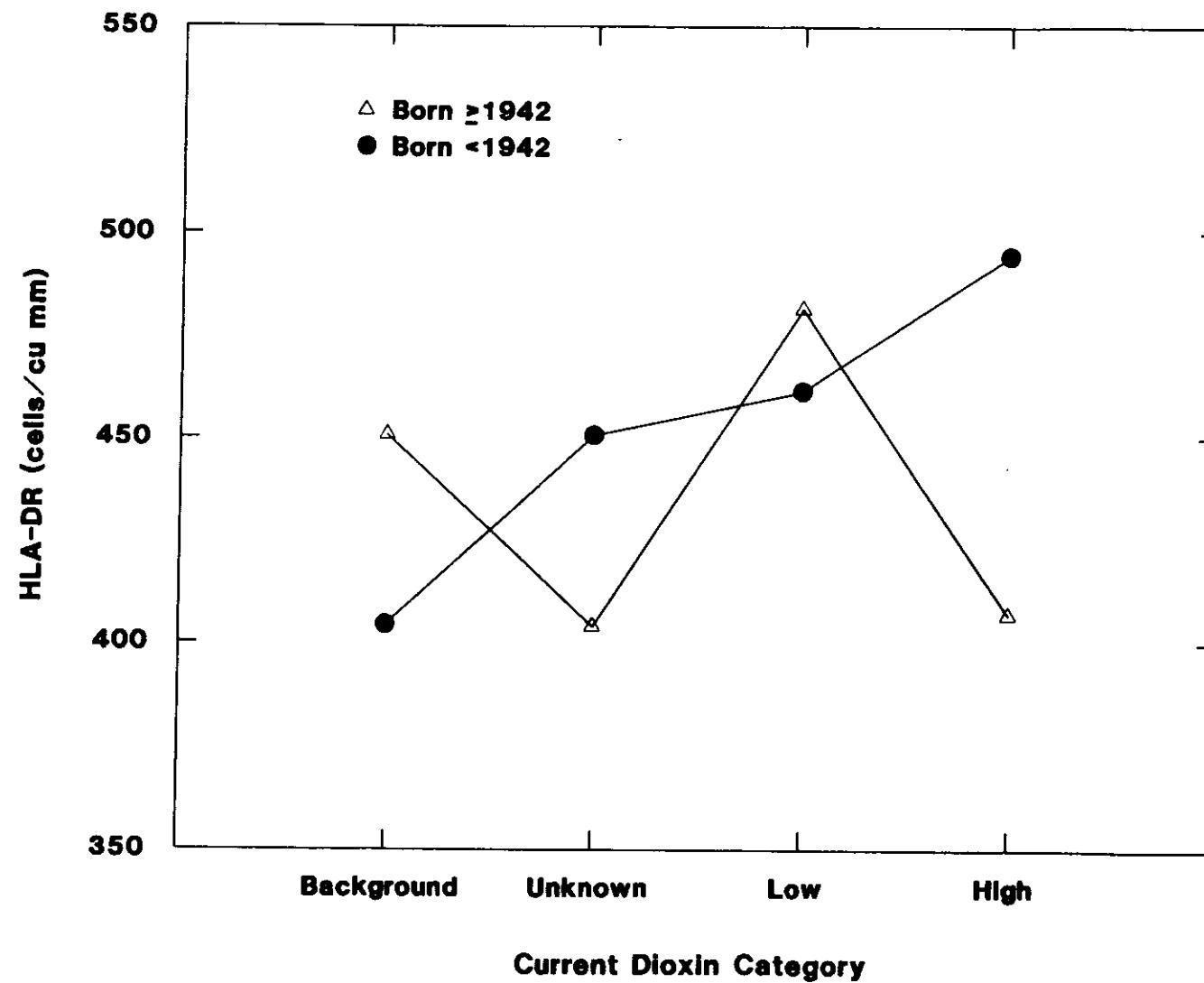


FIGURE O-2-16. Interaction of Categorized Current Dioxin and Age for HLA-DR Cells

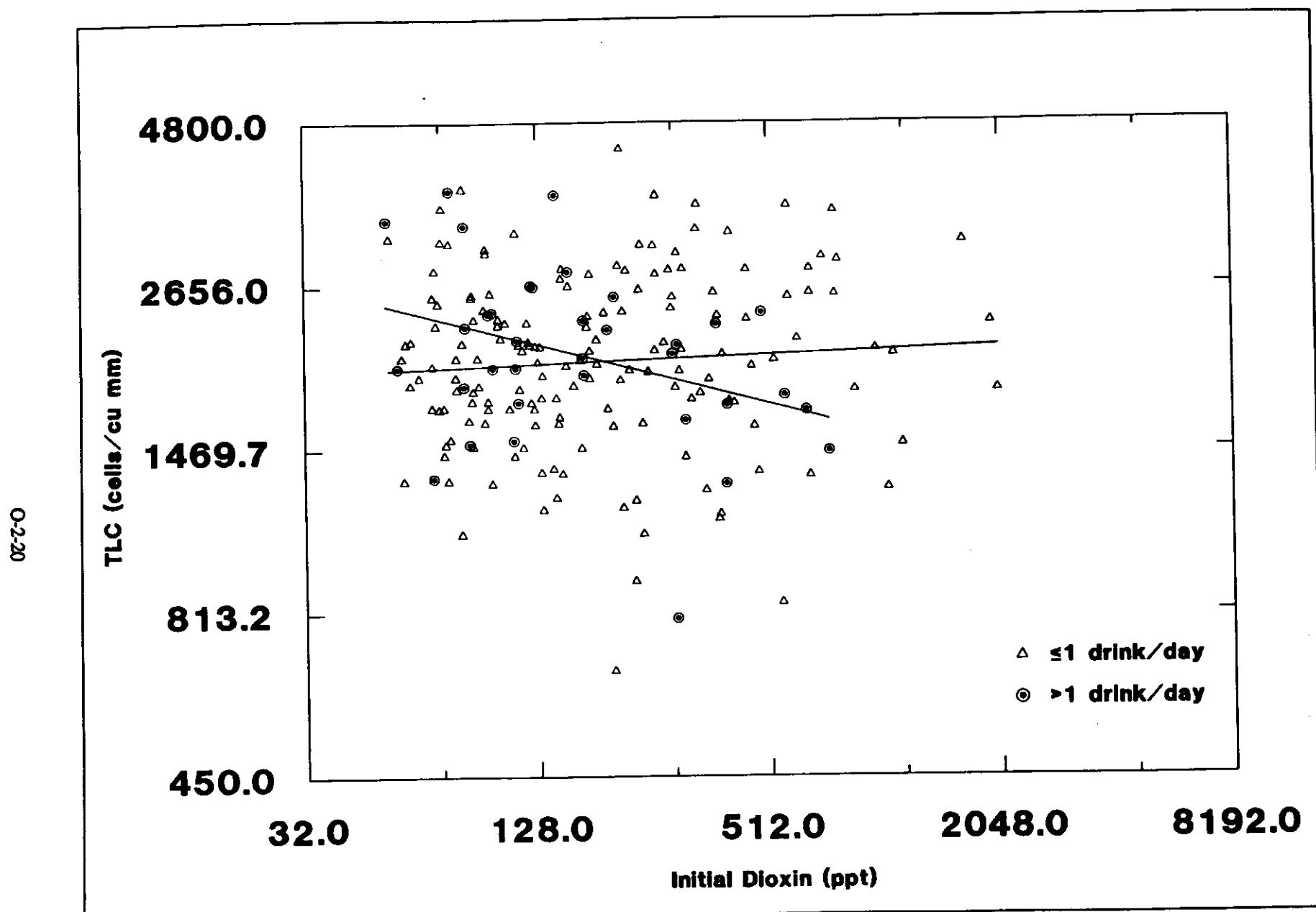


FIGURE O-2-17. Interaction of Initial Dioxin and Current Alcohol Use for TLC (Ranch Hands, Minimal Assumption)

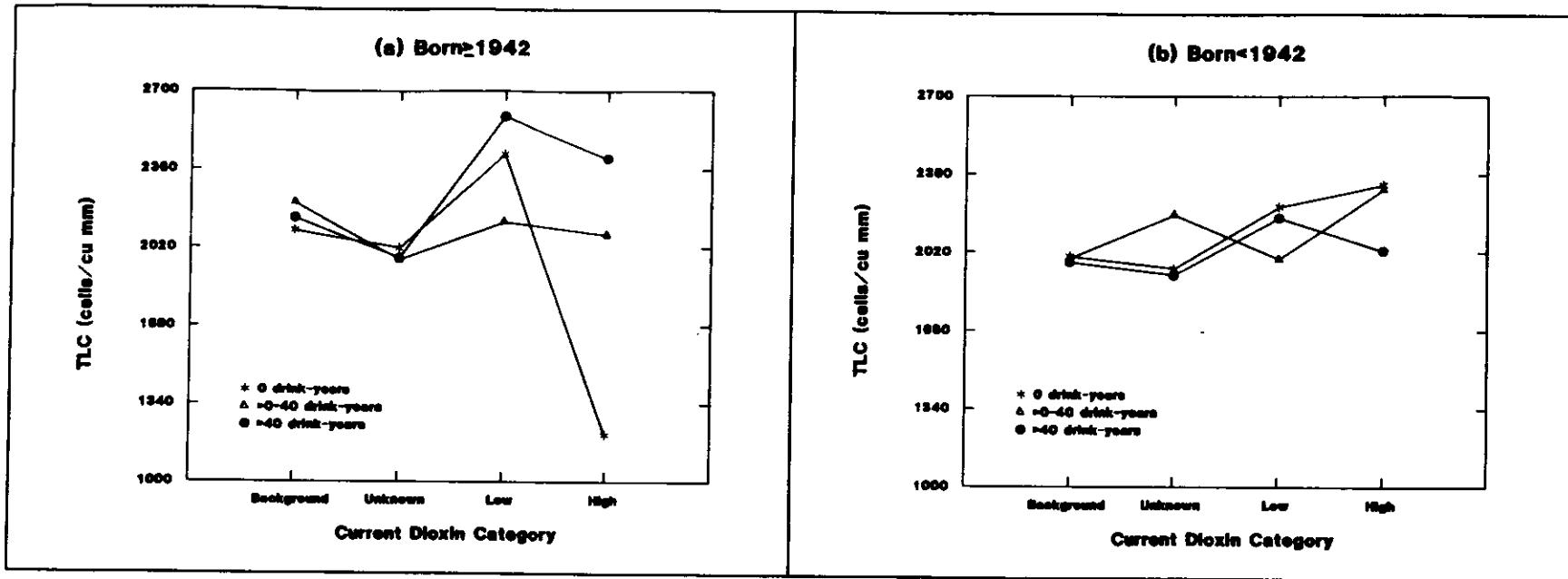


FIGURE O-2-18. Interaction of Categorized Current Dioxin, Age, and Lifetime Alcohol History for TLC

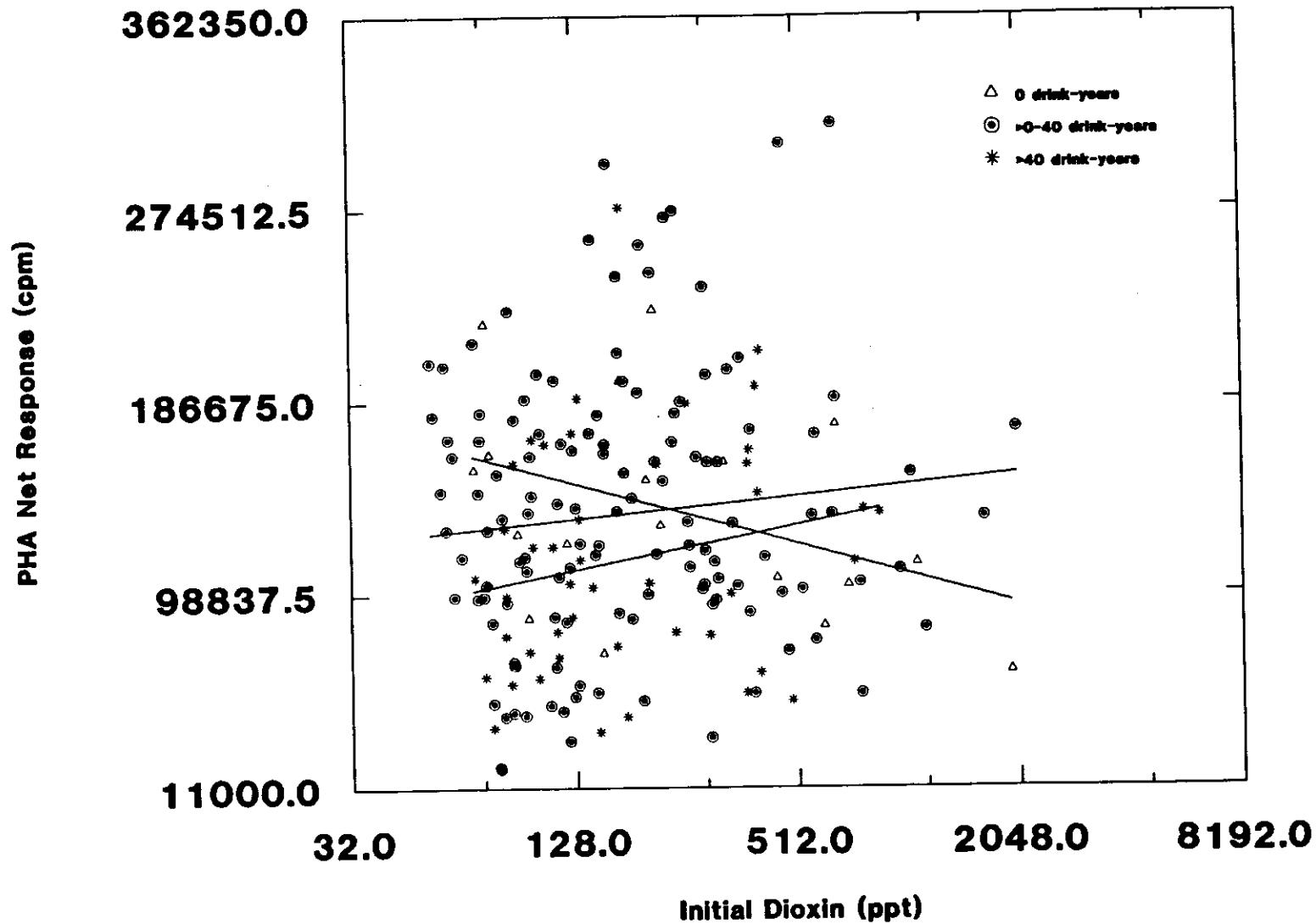


FIGURE O-2-19. Interaction of Initial Dioxin and Lifetime Alcohol History for PHA Net Response - Concentration 1 (Ranch Hands, Minimal Assumption)

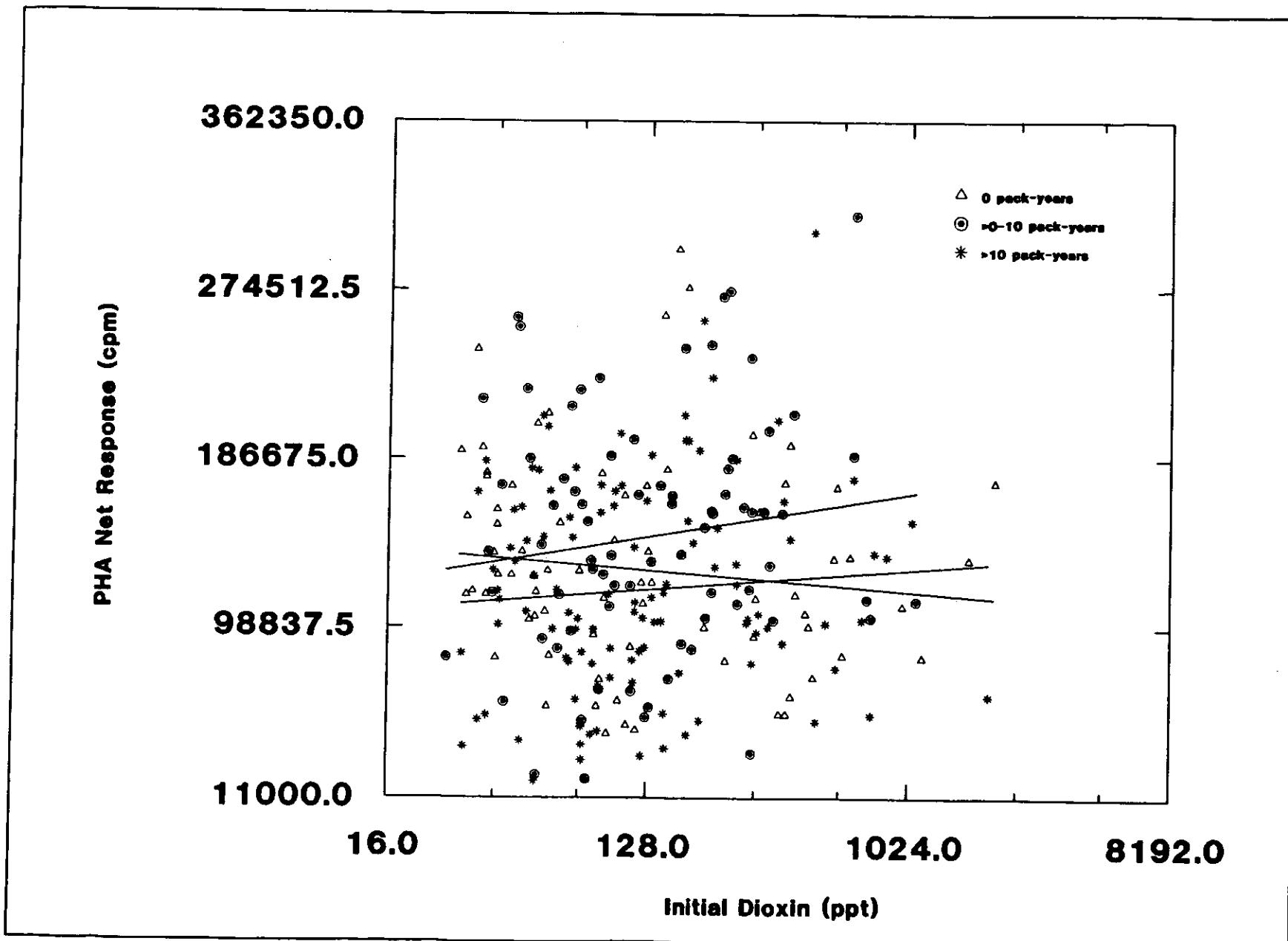


FIGURE O-2-20. Interaction of Initial Dioxin and Lifetime Cigarette Smoking History for PHA Net Response - Concentration 1 (Ranch Hands, Maximal Assumption)

O-2-24

PHA Net Response (cpm)

362350.0

274512.5

186675.0

98837.5

11000.0

16.0

128.0

1024.0

8192.0

Initial Dioxin (ppt)

◎ ≤1 drink/day
△ >1 drink/day

FIGURE O-2-21. Interaction of Initial Dioxin and Current Alcohol Use for PHA Net Response - Concentration 3 (Ranch Hands, Maximal Assumption)

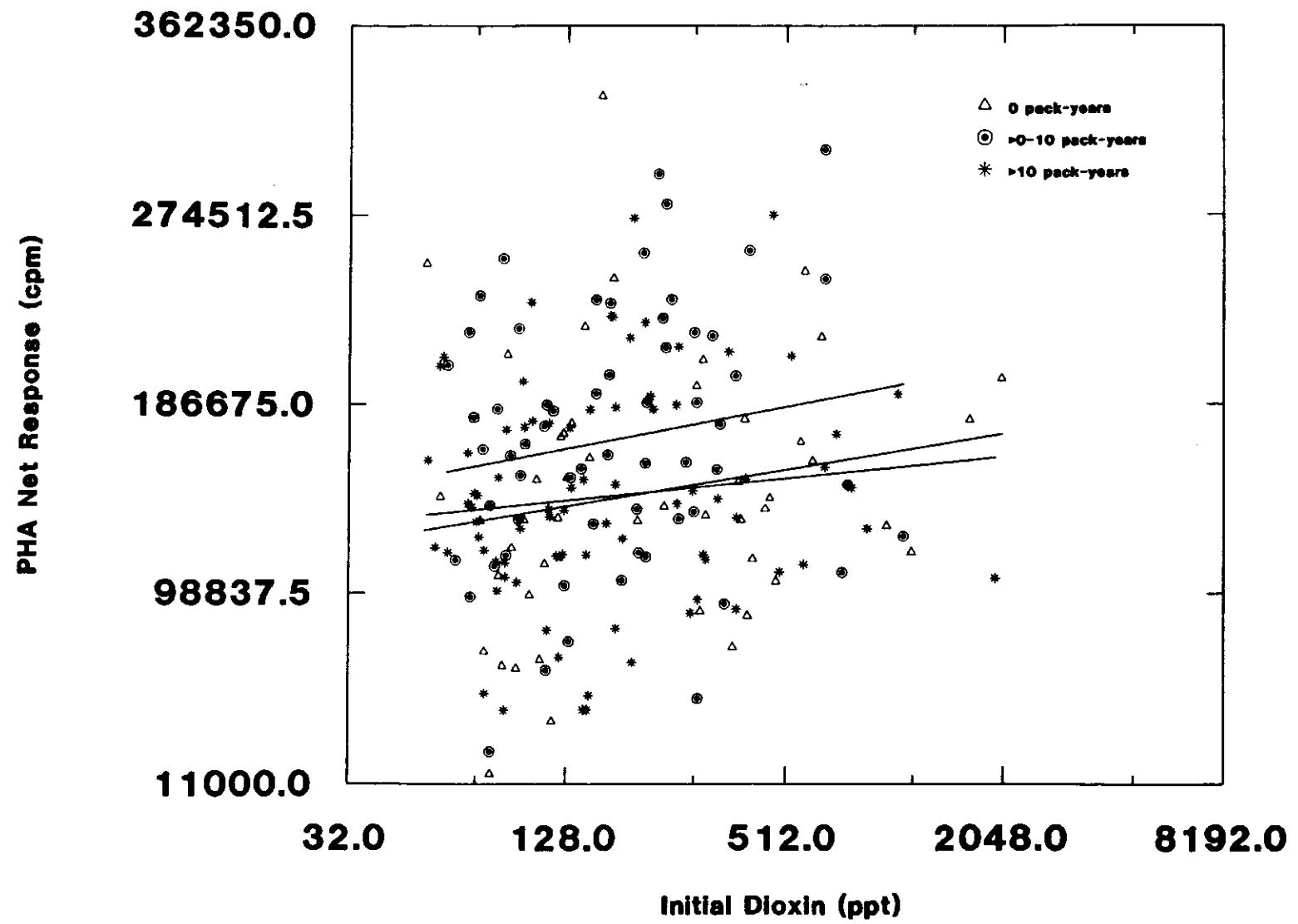


FIGURE O-2-22. Interaction of Initial Dioxin and Lifetime Cigarette Smoking History for PHA Net Response (Ranch Hands, Minimal Assumption)

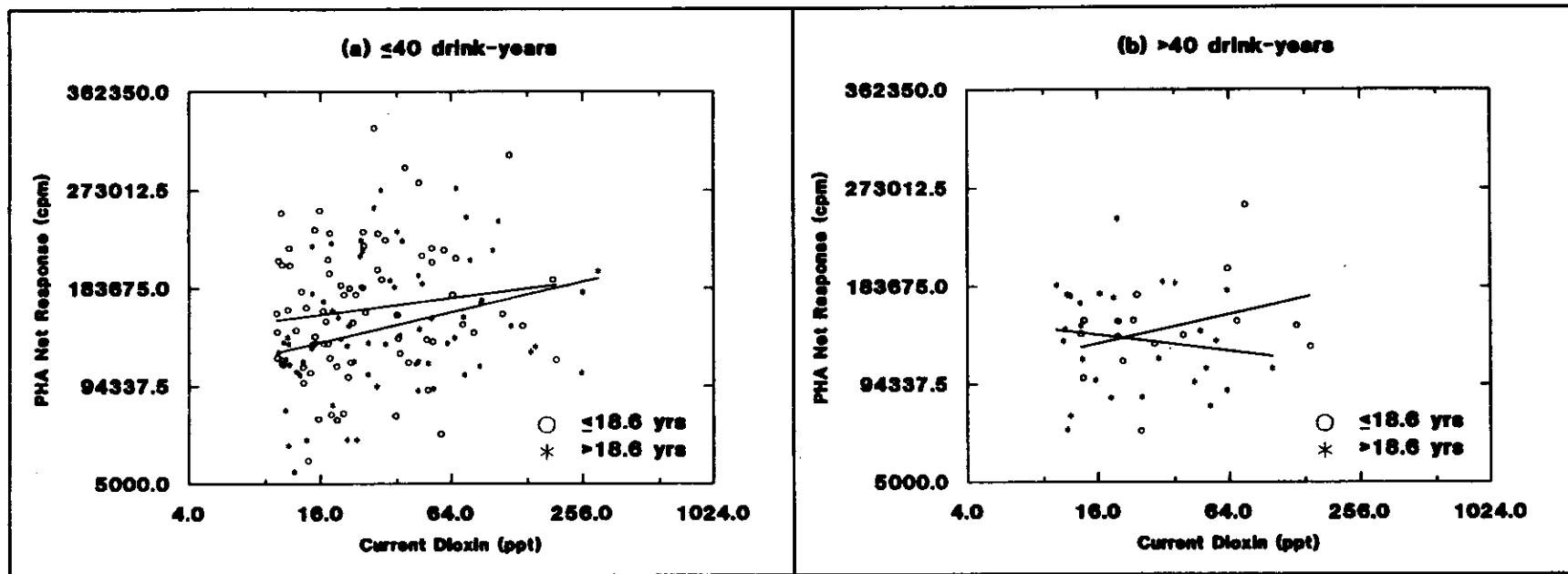


FIGURE O-2-23. Interaction of Current Dioxin, Time, and Lifetime Alcohol History for PHA Net Response (Ranch Hands, Minimal Assumption)

Overall PHA Net Response (cpm)

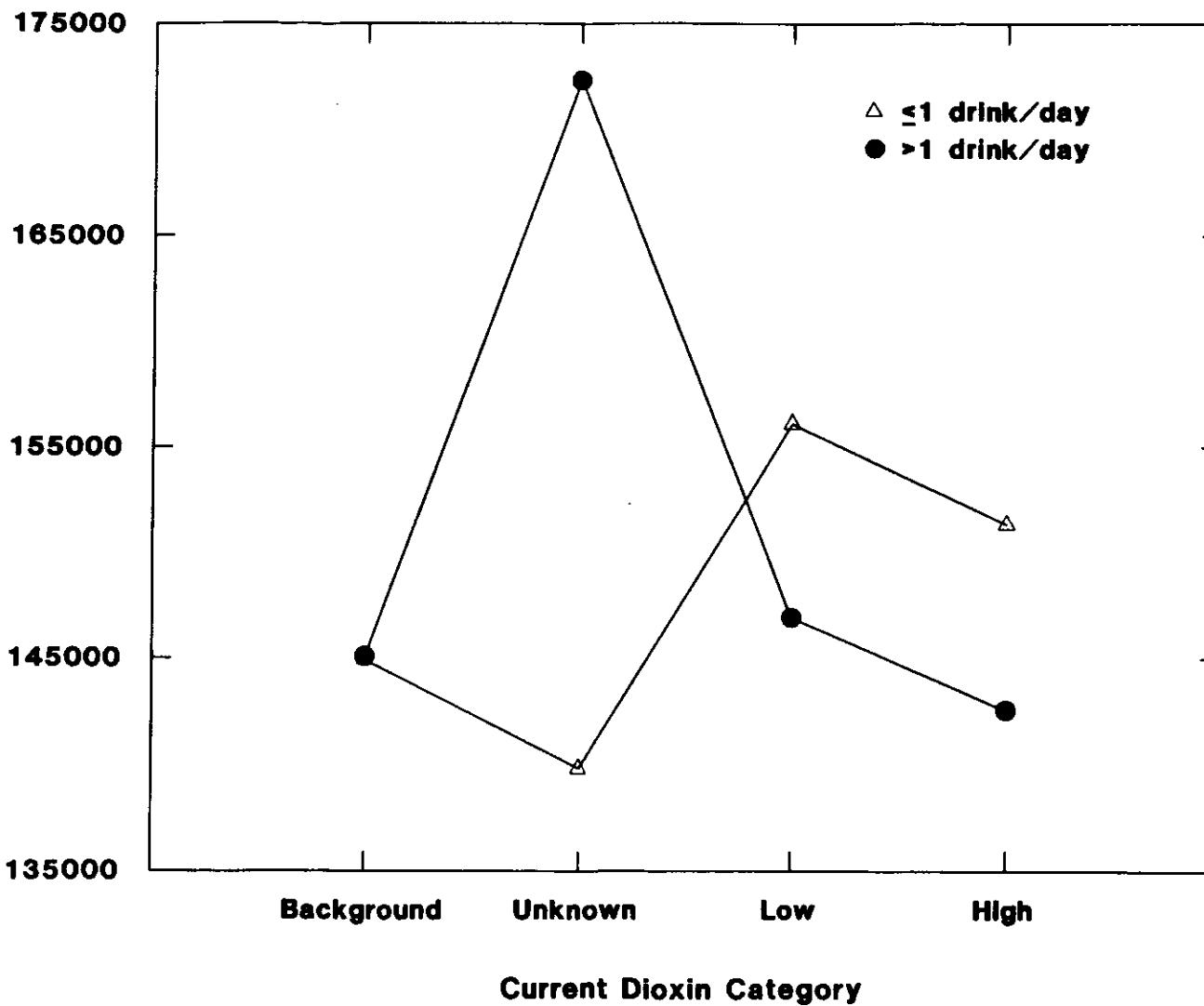


FIGURE O-2-24. Interaction of Categorized Current Dioxin and Current Alcohol Use for Overall PHA Net Response - Concentration 3

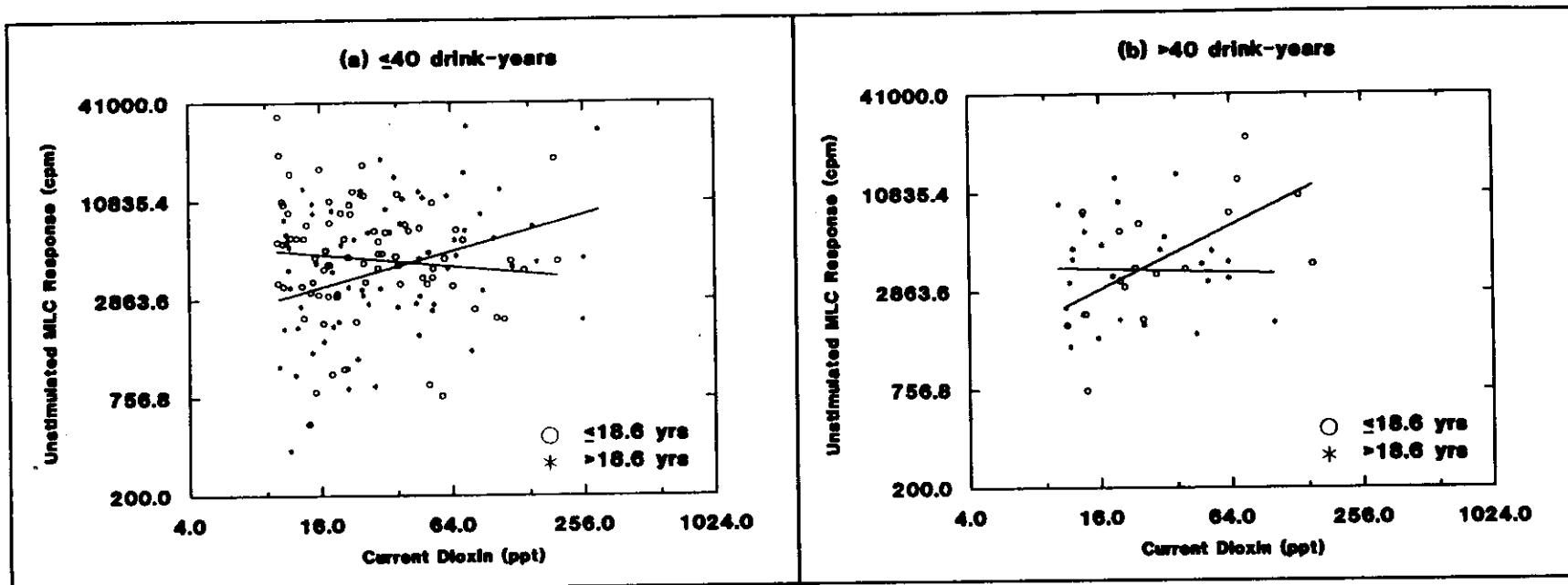


FIGURE O-2-25. Interaction of Current Dioxin, Time, and Lifetime Alcohol History for Unstimulated MLC Response (Ranch Hands, Minimal Assumption)

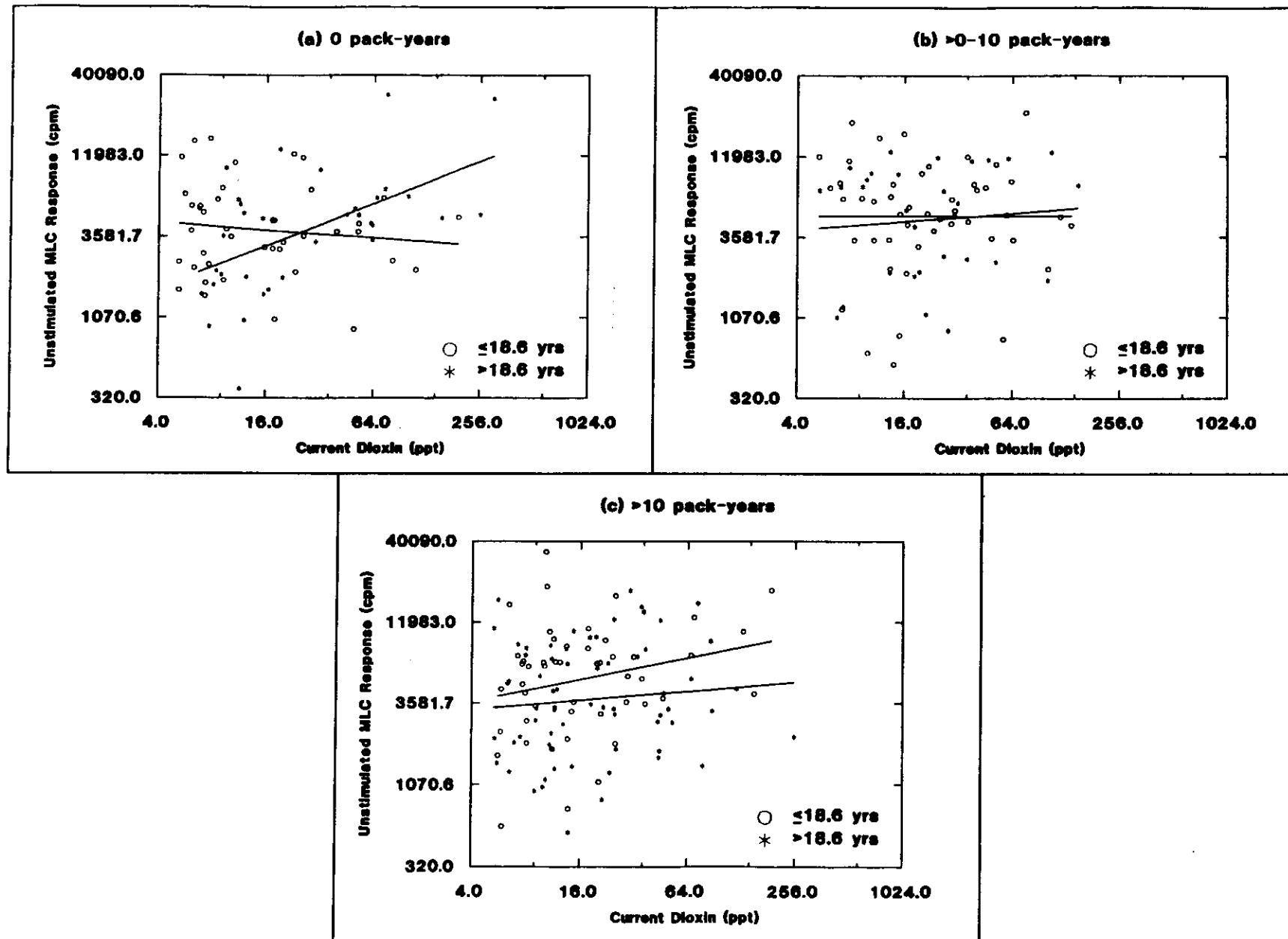


FIGURE O-2-26. Interaction of Current Dioxin, Time, and Lifetime Cigarette Smoking History for Unstimulated MLC Response (Ranch Hands, Maximal Assumption)

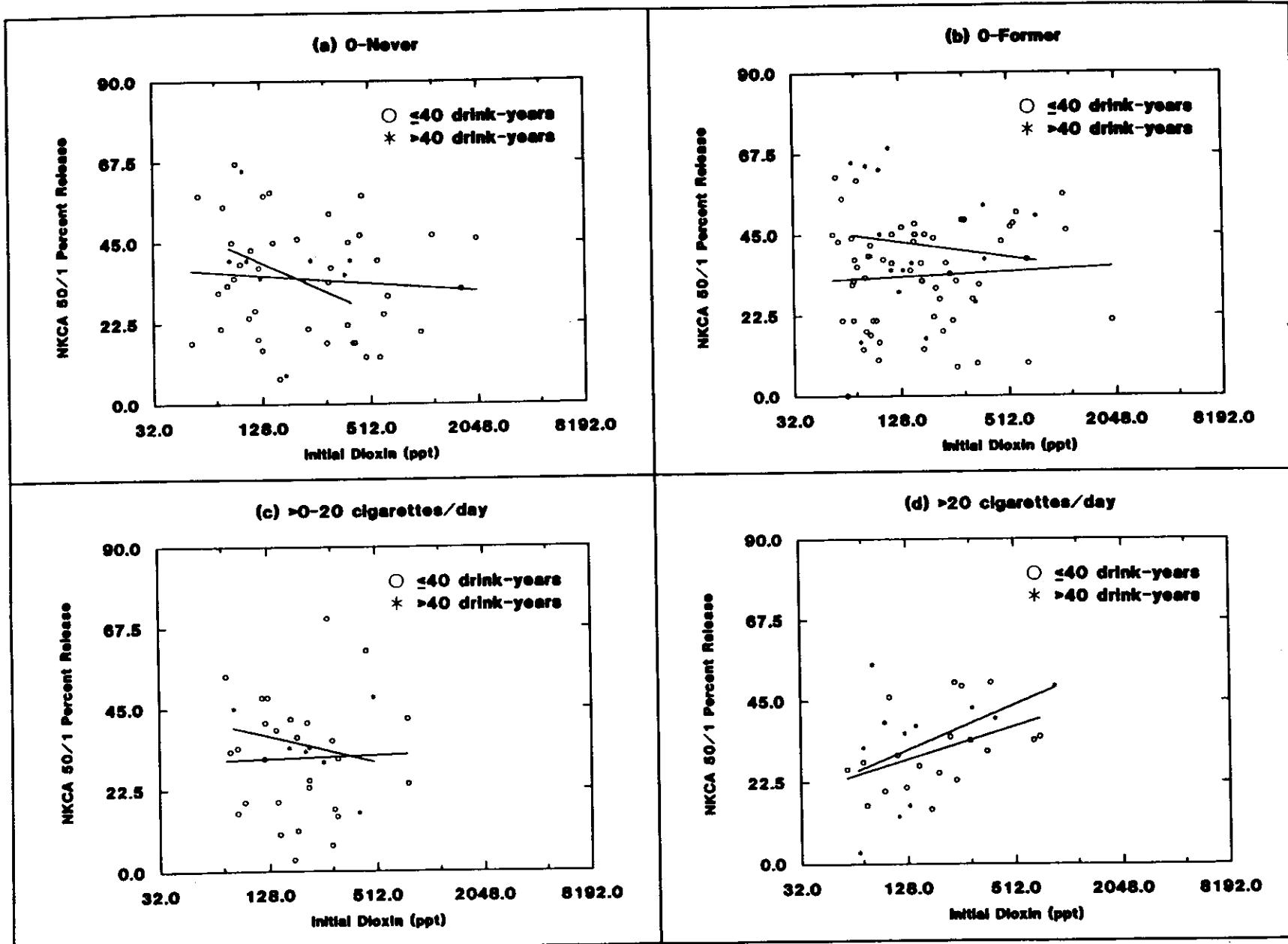
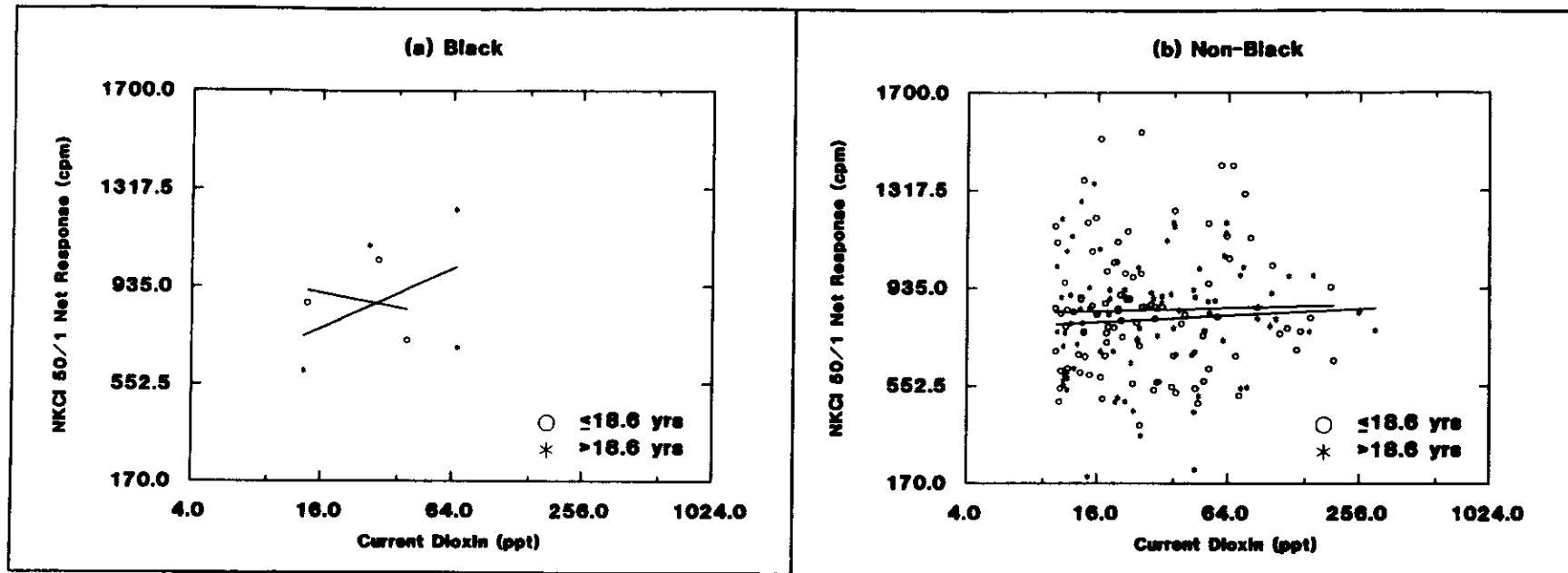


FIGURE O-2-27. Interaction of Initial Dioxin, Current Cigarette Smoking, and Lifetime Alcohol History for NKCA 50/1 Percent Release (Ranch Hands, Minimal Assumption)



**FIGURE O-2-28. Interaction of Current Dioxin, Time, and Race
for NKCl 50/1 Net Response (Ranch Hands, Minimal Assumption)**

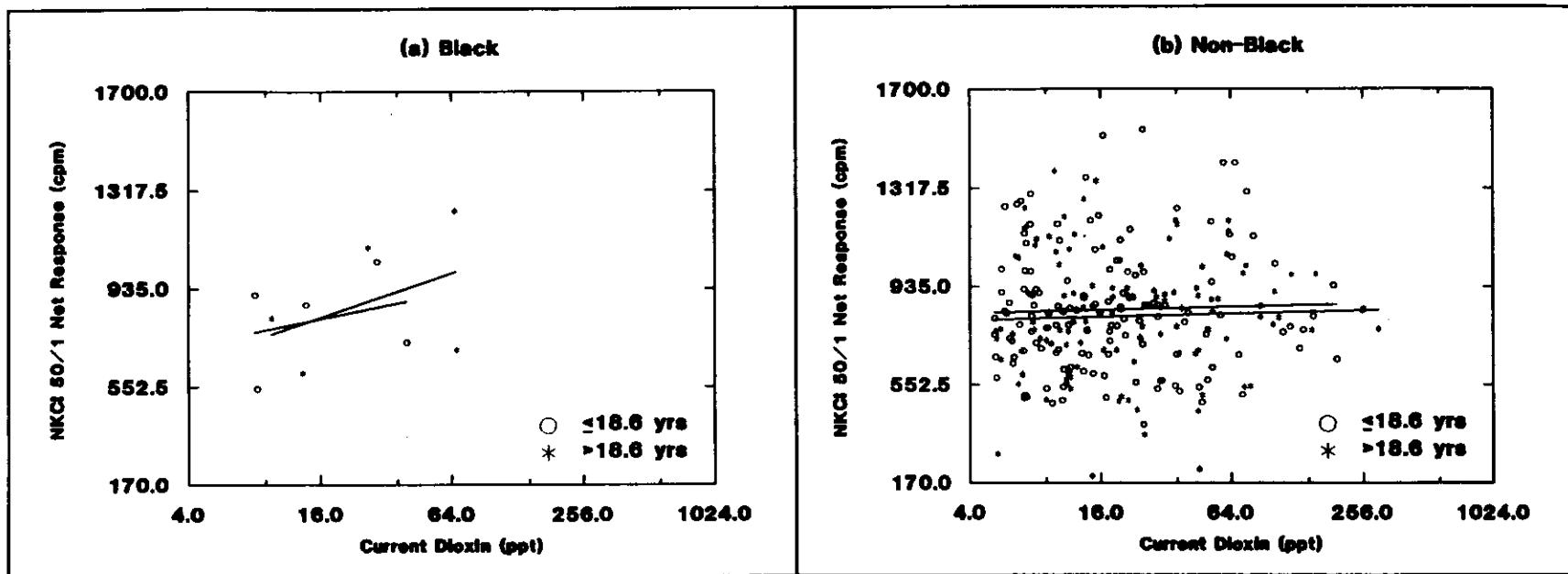


FIGURE O-2-29. Interaction of Current Dioxin, Time, and Race for NKCI 50/1 Net Response (Ranch Hands, Maximal Assumption)

O-2-33

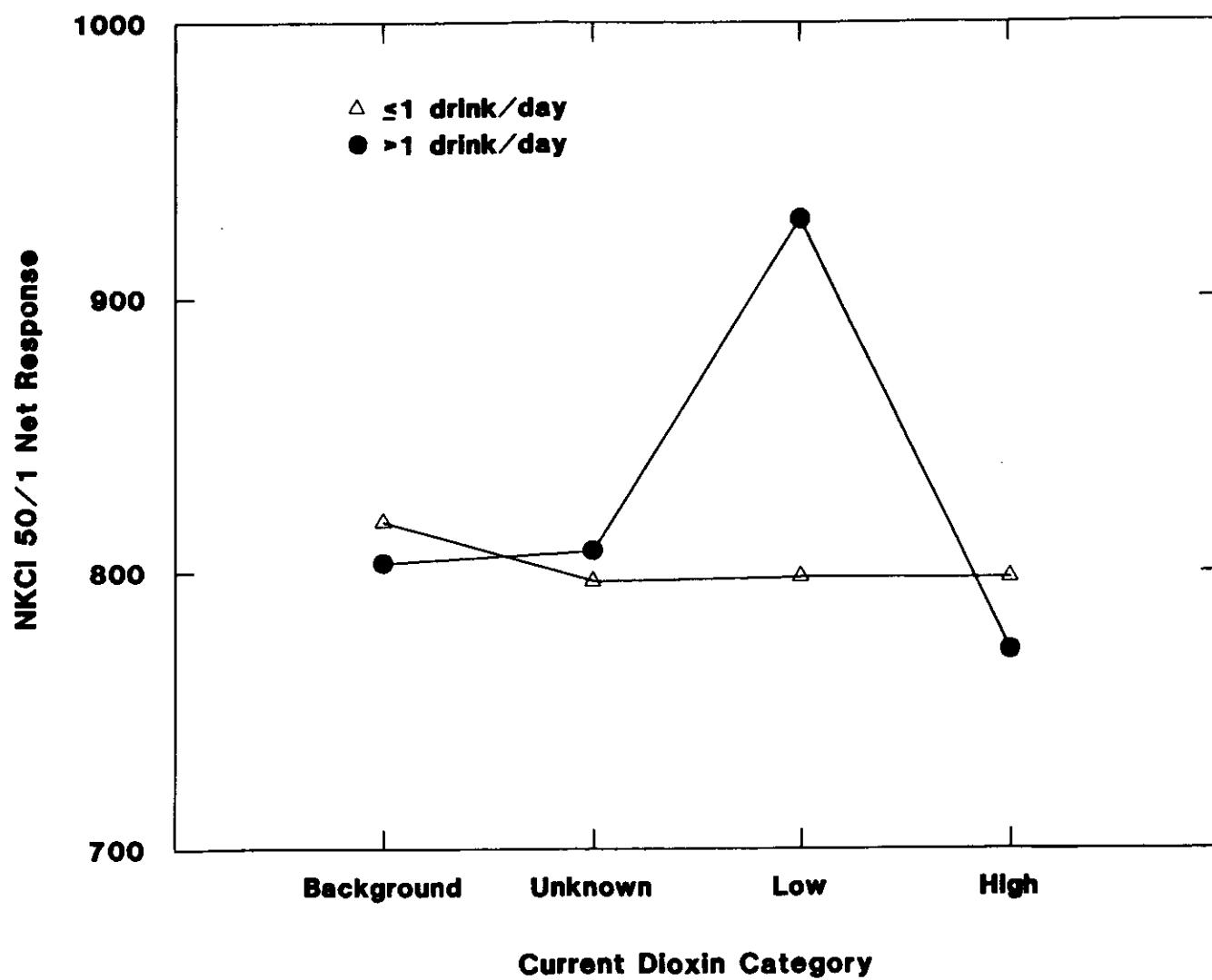
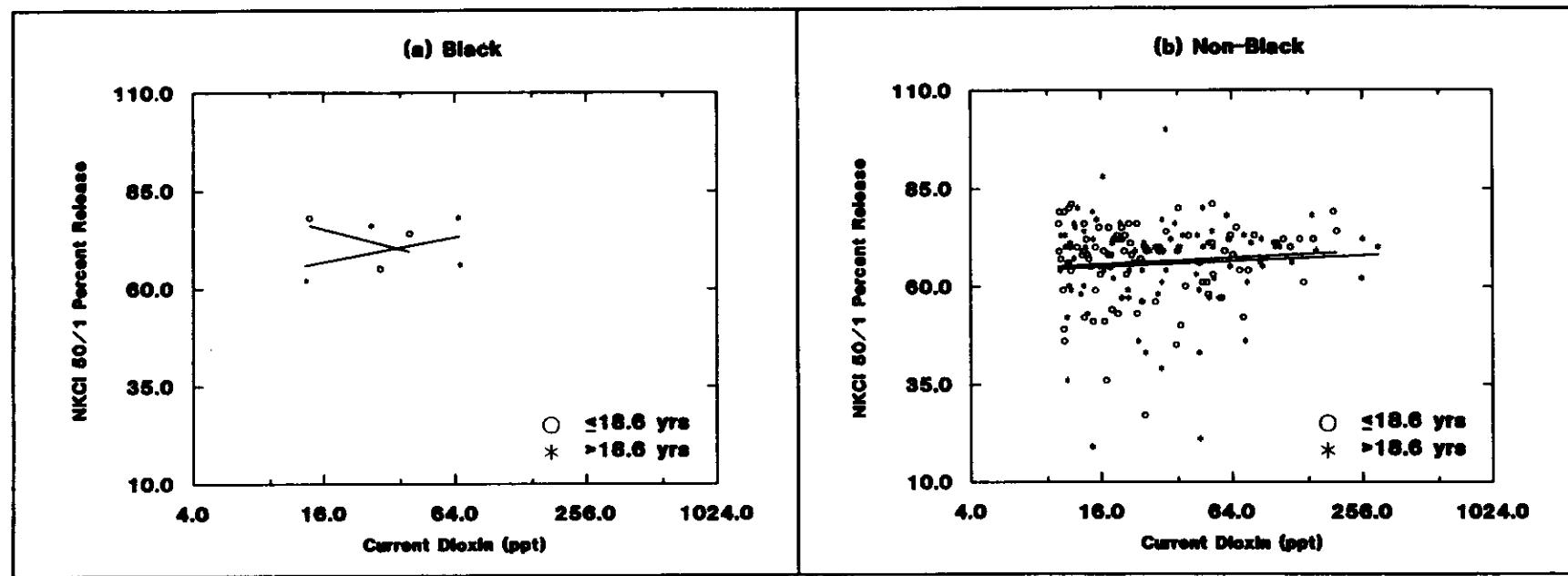
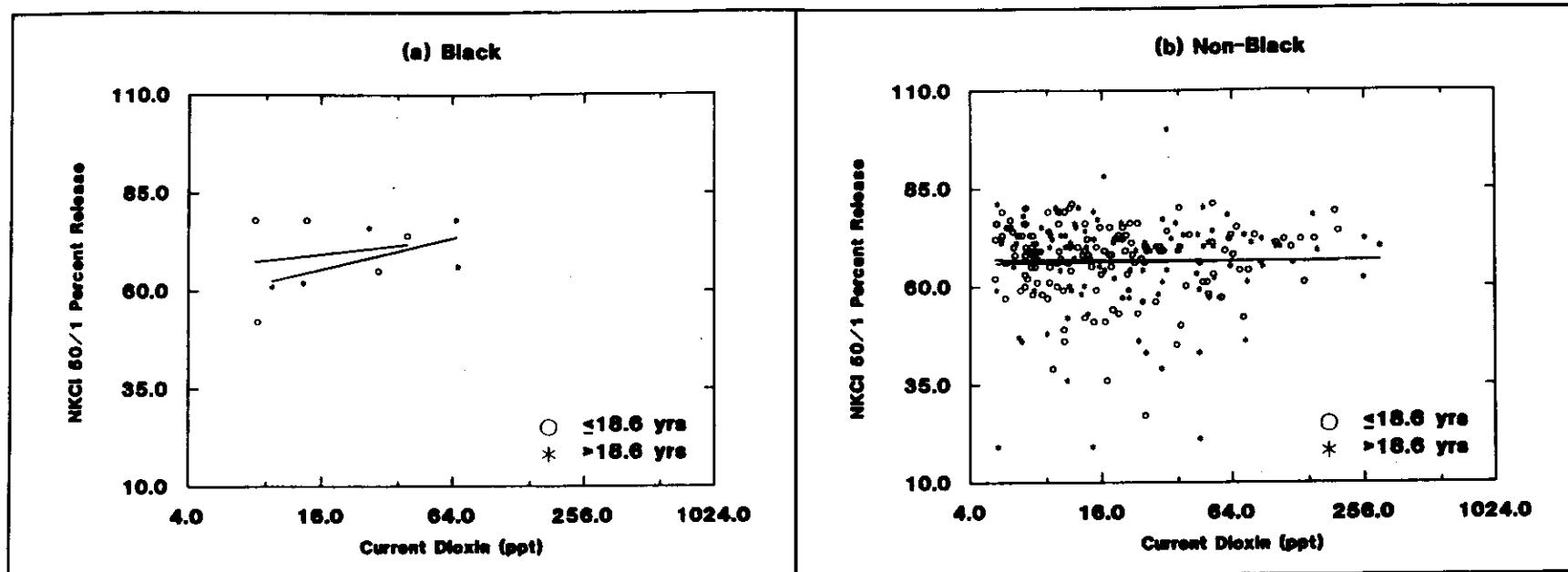


FIGURE O-2-30. Interaction of Categorized Current Dioxin and Current Alcohol Use for NKCl 50/1 Net Response (Non-Blacks only)



**FIGURE O-2-31. Interaction of Current Dioxin, Time, and Race
for NKCI 50/1 Percent Release (Ranch Hands, Minimal Assumption)**



**FIGURE O-2-32. Interaction of Current Dioxin, Time, and Race
for NKCI 50/1 Percent Release (Ranch Hands, Maximal Assumption)**

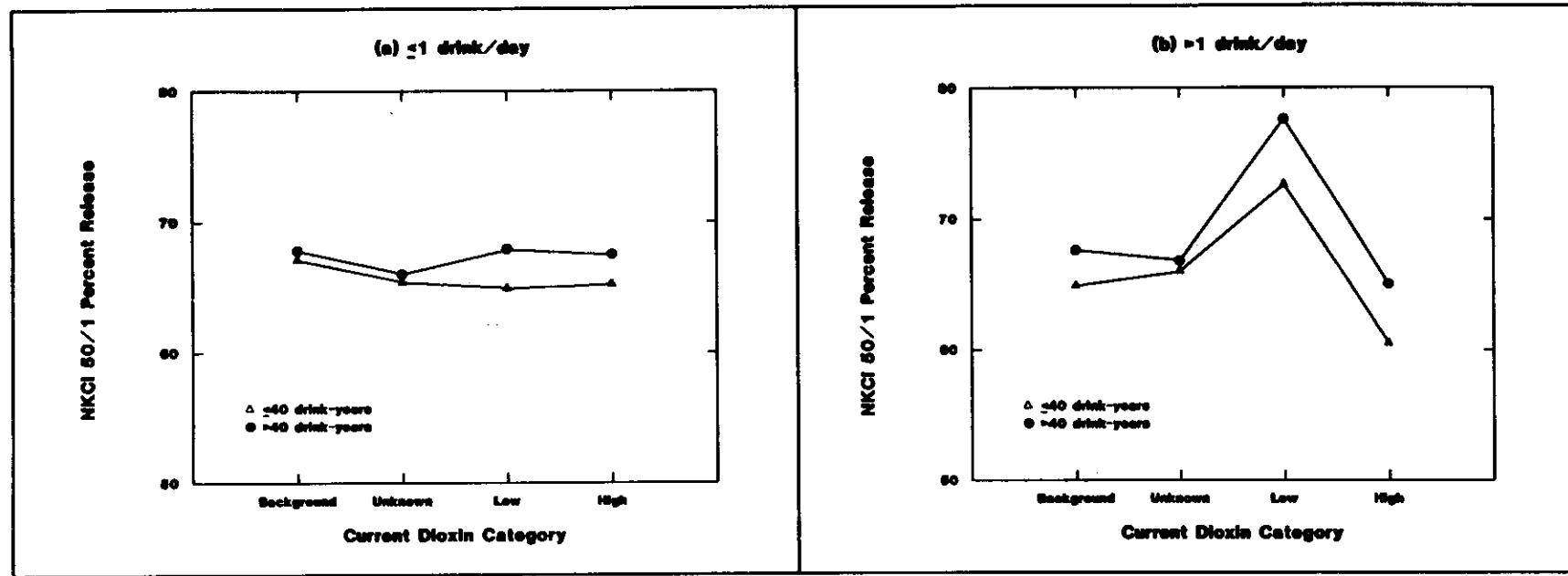


FIGURE O-2-33. Interaction of Categorized Current Dioxin, Current Alcohol Use, and Lifetime Alcohol History for NKCl 50/1 Percent Release (Non-Blacks only)

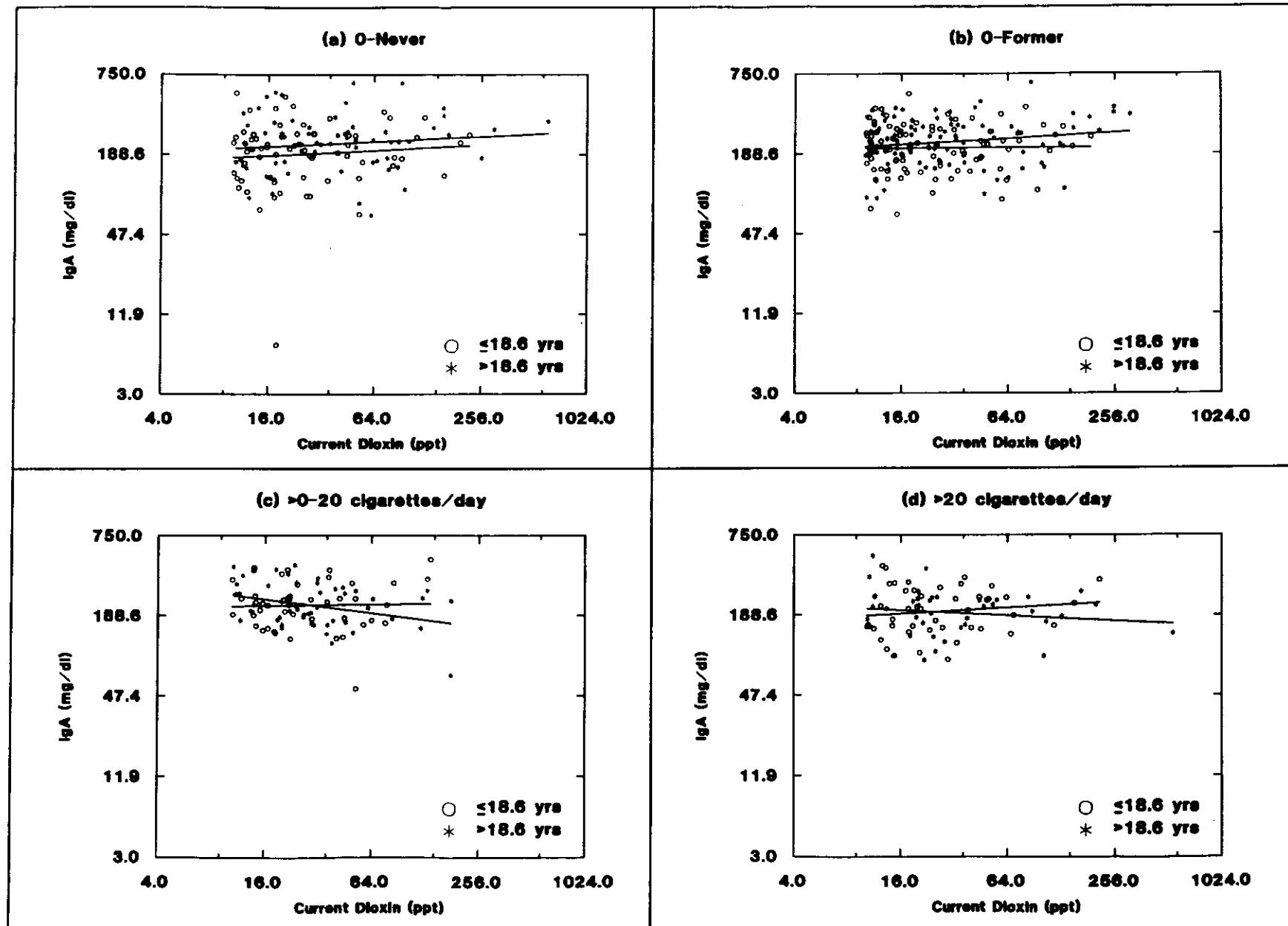


FIGURE O-2-34. Interaction of Current Dioxin, Time, and Current Cigarette Smoking for IgA (Ranch Hands, Minimal Assumption)

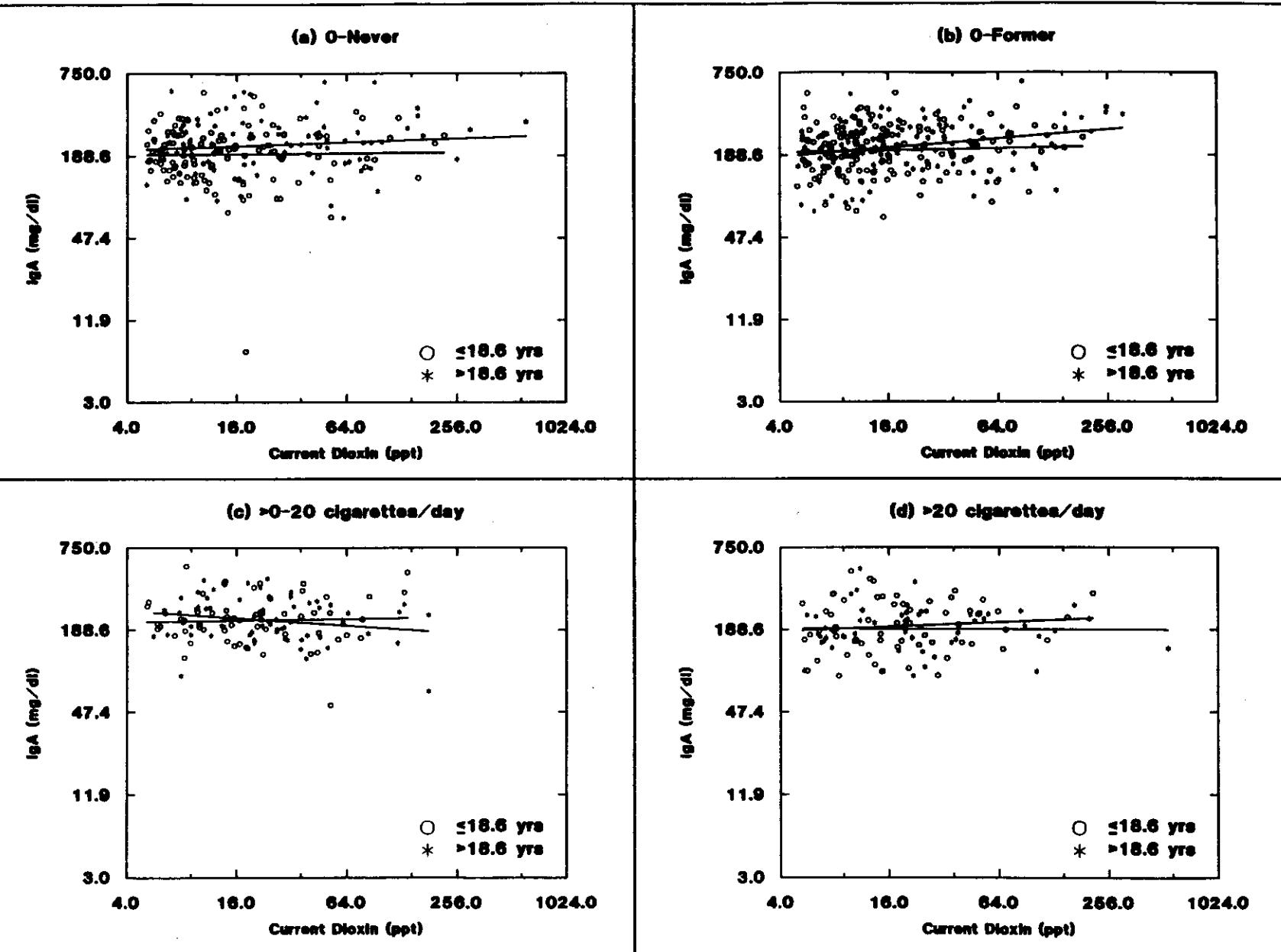


FIGURE O-2-35. Interaction of Current Dioxin, Time, and Current Cigarette Smoking for IgA (Ranch Hands, Maximal Assumption)

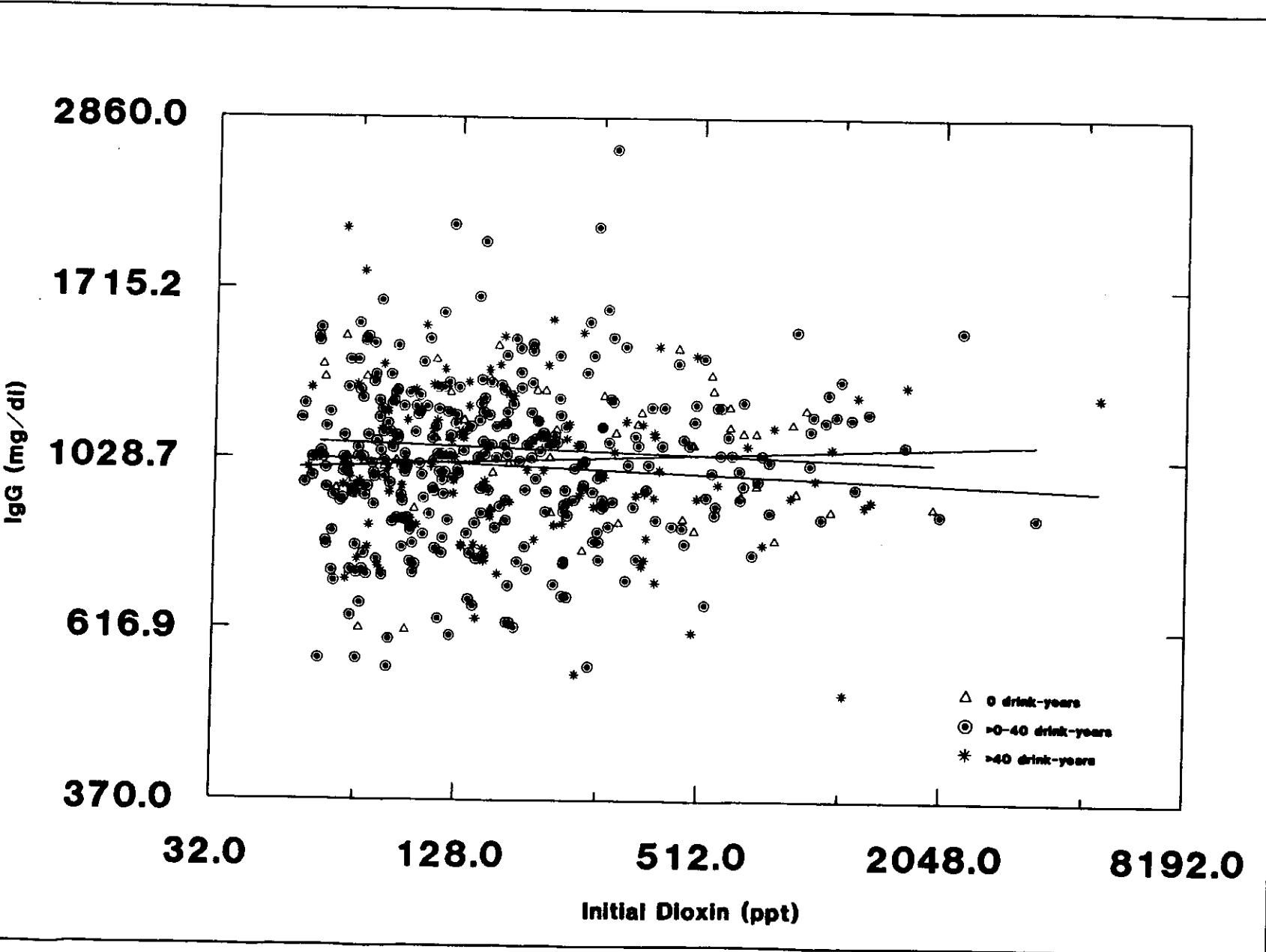


FIGURE O-2-36. Interaction of Initial Dioxin and Lifetime Alcohol History for IgG (Ranch Hands, Minimal Assumption)

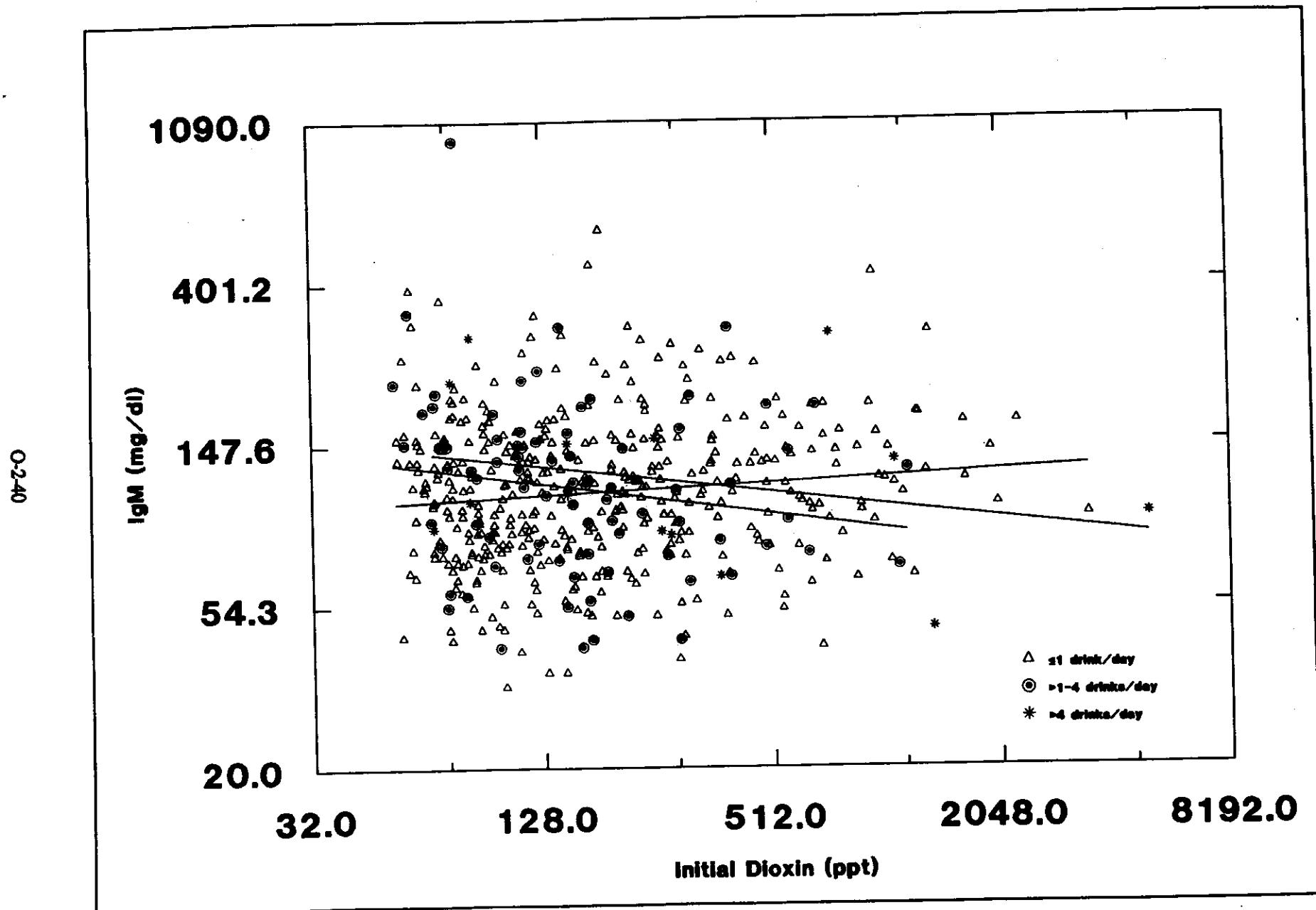


FIGURE O-2-37. Interaction of Initial Dioxin and Current Alcohol Use for IgM (Ranch Hands, Minimal Assumption)