

**Table N-3-48.**  
**Analysis of Estradiol**  
**(Discrete)**  
**Occupation Removed from Final Model**

<b>a) MODELS 4, 5, AND 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b>				
<b>Model<sup>a</sup></b>	<b>n</b>	<b>Analysis Results for <math>\log_2</math> (Current Dioxin + 1)</b>		
		<b>Adj. Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>	<b>Covariate Remarks</b>
4	894	1.12 (0.88,1.43)	0.363	RACE (p=0.033)
5	894	1.08 (0.87,1.35)	0.461	RACE (p=0.032)
6 <sup>c</sup>	893	1.05 (0.83,1.32)	0.702	RACE (p=0.027)

<sup>a</sup> Model 4:  $\log_2$  (lipid-adjusted current dioxin + 1).

Model 5:  $\log_2$  (whole-weight current dioxin + 1).

Model 6:  $\log_2$  (whole-weight current dioxin + 1), adjusted for  $\log_2$  total lipids.

<sup>b</sup> Relative risk for a twofold increase in current dioxin.

<sup>c</sup> Adjusted for  $\log_2$  total lipids in addition to covariates specified under "Covariate Remarks" column.

**Table N-3-49.**  
**Analysis of Luteinizing Hormone (LH) (mIU/ml)**  
**(Continuous)**  
**Occupation Removed from Final Model**

**a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED**

Dioxin Category	n	Adj. Mean <sup>a</sup>	Difference of Adj. Mean vs. Comparisons (95% C.I.)		p-Value	Covariate Remarks
Comparison	1,063	3.84				AGE*RACE (p=0.013)
Background RH	374	3.92	0.08	--	0.560	
Low RH	260	4.18	0.34	--	0.020	
High RH	260	3.83	-0.01	--	0.878	
Low plus High RH	520	4.00	0.16	--	0.160	

<sup>a</sup> Adjusted for percent body fat at the time of duty in SEA, change in percent body fat from the time of duty in SEA to the date of the blood draw for dioxin, and covariates specified under "Covariate Remarks" column.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

N-4-2	18-15	N-4-8	Diabetes Mellitus (Diabetes Mellitus)	1	Lifetime Diabetes Smoking History Lifetime Diabetes Smoking History
N-4-3	18-23	N-4-17	5-Year Postexposure Glucose (Postexposure (Continuous))	2	Family History Of Diabetes
N-4-4	18-25	N-4-18	5-Year Postexposure Glucose (Postexposure (Continuous))	3	Age Race Race Race Race
N-4-5	18-31	N-4-19	Feeding Urinary Glucose (All Participants)	3	Personality Type Personality Type
N-4-6	18-35	N-4-22	Seven Years (All Participants)	3	Age
N-4-7	18-37	N-4-23	Seven Years (All Participants)	3	Personality Type
N-4-8	18-39	N-4-24	Seven Years (Diabetes)	3	Age
N-4-9	18-41	N-4-25	Seven Years (Diabetes (Continuous))	3	Age
N-4-10	18-41	N-4-26	Seven Years (Postexposure)	3	Age

**Table N-3-50.**  
**Analysis of Luteinizing Hormone (LH)**  
**(Discrete)**  
**Occupation Removed from Final Model**

**a) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED**

Model <sup>a</sup>	Analysis Results for $\log_2$ (Current Dioxin + 1)			
	n	Adj. Relative Risk (95% C.I.) <sup>b</sup>	p-Value	Covariate Remarks
6 <sup>c</sup>	893	0.94 (0.65, 1.36)	0.739	AGE (p<0.001)

<sup>a</sup> Model 6:  $\log_2$  (whole-weight current dioxin + 1), adjusted for  $\log_2$  total lipids.

<sup>b</sup> Relative risk for a twofold increase in current dioxin.

<sup>c</sup> Adjusted for  $\log_2$  total lipids in addition to covariates specified under "Covariate Remarks" column.

\* Relative risk for a twofold increase in current dioxin.

\* Adjusted for age, total lipids in addition to covariates specified under "Covariate Remarks" column.

\*\* Adjusted for age, total lipids in addition to covariates specified under "Covariate Remarks" column.

## APPENDIX N-4.

### Interaction Tables for the Endocrine Assessment

#### Occupation, Body Fat, HDL Cholesterol, and Cholesterol Removed from Final Model

This appendix contains exposure analyses results of interactions between covariates and dioxin after occupation, body fat, high-density lipoprotein (HDL) cholesterol, and cholesterol have been removed from those final dioxin models (Models 2 through 6) that contained these covariates. These tables are supplements to tables in Appendix N-3, which are main effects results with these covariates removed from the model. Results are presented for separate strata of the covariate and include sample sizes, percent abnormal, relative risks, confidence intervals, and p-values. Chapter 7, Statistical Methods, provides further details on the analytical approaches used in the interaction analyses. The analysis model, covariate involved in the interaction, and a reference to the analysis table in Chapter 18 are given in the heading of each subtable. A summary of the interactions described in this appendix follows.

Appendix N-4 Table	Chapter 18 Table	Appendix N-3 Table	Dependent Variable	Model	Covariate
N-4-1	18-5	N-3-2	Diabetic Severity	6	Age
N-4-2	18-15	N-3-8	Dorsalis Pedis Pulses (Doppler) (Diabetics)	5	Lifetime Cigarette Smoking History
				6	Lifetime Cigarette Smoking History
N-4-3	18-30	N-3-17	2-Hour Postprandial Glucose (Nondiabetics) (Continuous)	3	Family History Of Diabetes
N-4-4	18-31	N-3-18	2-Hour Postprandial Glucose (Nondiabetics) (Discrete)	2	Race
				4	Race
				5	Race
				6	Race
N-4-5	18-32	N-3-19	Fasting Urinary Glucose (All Participants)	3	Personality Type
				5	Personality Type
N-4-6	18-36	N-3-22	Serum Insulin (All Participants) (Continuous)	3	Age
N-4-7	18-37	N-3-23	Serum Insulin (All Participants) (Discrete)	3	Personality Type
N-4-8	18-39	N-3-25	Serum Insulin (Diabetics) (Discrete)	3	Age
N-4-9	18-40	N-3-26	Serum Insulin (Nondiabetics) (Continuous)	3	Age
N-4-10	18-41	N-3-27	Serum Insulin (Nondiabetics) (Discrete)	6	Age

Appendix N-4 Table	Chapter 18 Table	Appendix N-3 Table	Dependent Variable	Model	Covariate
N-4-11	18-42	N-3-28	Serum Glucagon (All Participants) (Continuous)	3	Family History of Diabetes
				4	Family History of Diabetes
N-4-12	18-44	N-3-30	Serum Glucagon (Diabetics) (Continuous)	3	Diabetic Severity
N-4-13	18-56	N-3-40	Serum Proinsulin (Diabetics) (Discrete)	6	Diabetic Severity
N-4-14	18-58	N-3-42	Serum C Peptide (Diabetics) (Discrete)	3	Age
				5	Diabetic Severity
				6	Diabetic Severity
N-4-15	18-60	N-3-44	Total Testosterone (Discrete)	3	Personality Type

**Table N-4-1.**  
**Interaction Table for Diabetic Severity**  
**Body Fat Removed from Final Model**

**a) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED**  
 (Current Dioxin-by-Age: Tables 18-5 and N-3-2)

Stratum	Current Dioxin Category	Current Dioxin Category Summary Statistics						Analysis Results for $\log_2$ (Current Dioxin + 1)		
		n	Percent					Contrast vs. Nondiabetic	Est. Relative Risk (95% C.I.) <sup>b</sup>	p-Value
			Nondiabetic	No Treatment	Diet Only	Oral Hypoglycemic	Insulin Dependent			
Born $\geq 1942$	Low	102	95.1	2.9	1.0	0.0	1.0	No Treatment	1.16 (0.88,1.53)	0.297
	Medium	96	93.8	6.3	0.0	0.0	0.0	Diet Only	1.42 (0.96,2.10)	0.083
	High	163	88.3	4.9	4.3	2.5	0.0	Oral Hypoglycemic	2.60 (1.27,5.31)	0.009
Born $< 1942$	Low	193	90.2	5.7	1.0	0.0	3.1	Insulin Dependent	--	--
	Medium	194	75.8	12.9	7.2	2.1	2.1	No Treatment	1.30 (1.06,1.60)	0.010
	High	125	70.4	13.6	4.8	7.2	4.0	Diet Only	1.47 (1.10,1.99)	0.010
								Oral Hypoglycemic	2.75 (1.89,4.00)	<0.001
								Insulin Dependent	0.93 (0.67,1.28)	0.661

<sup>a</sup> Relative risk for a twofold increase in current dioxin.

--: Relative risk, confidence interval, and p-value not presented due to the sparse number of abnormalities.

Note: Model 6: Low =  $\leq 46$  ppq; Medium =  $> 46$ - $128$  ppq; High =  $> 128$  ppq.

**Table N-4-2.**  
**Interaction Table for Dorsalis Pedis Pulses (Doppler) (Diabetics)**  
**Cholesterol Removed from Final Model**

**a) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED**  
 (Current Dioxin-by-Lifetime Cigarette Smoking History: Tables 18-15 and N-3-8)

Current Dioxin Category Summary Statistics				Analysis Results for $\log_2$ (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Percent Abnormal	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
<b>0 Pack-years</b>	Low	8	0.0	2.02 (0.83,4.92)	0.121
	Medium	10	0.0		
	High	12	33.3		
<b>&gt;0-10 Pack-years</b>	Low	6	16.7	1.41 (0.84,2.36)	0.198
	Medium	13	0.0		
	High	18	22.2		
<b>&gt;10 Pack-years</b>	Low	11	36.4	1.00 (0.70,1.43)	0.997
	Medium	29	10.3		
	High	26	23.1		

**b) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED**  
 (Current Dioxin-by-Lifetime Cigarette Smoking History: Tables 18-15 and N-3-8)

Current Dioxin Category Summary Statistics				Analysis Results for $\log_2$ (Current Dioxin + 1)	
Stratum	Current Dioxin	n	Percent Abnormal	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
<b>0 Pack-years</b>	Low	8	0.0	2.00 (0.81,4.96)	0.134
	Medium	10	0.0		
	High	12	33.3		
<b>&gt;0-10 Pack-years</b>	Low	6	16.7	1.39 (0.79,2.44)	0.254
	Medium	13	0.0		
	High	18	22.2		
<b>&gt;10 Pack-years</b>	Low	11	36.4	0.99 (0.68,1.45)	0.964
	Medium	29	10.3		
	High	26	23.1		

<sup>a</sup> Relative risk for a twofold increase in current dioxin.

Note: Models 5 and 6: Low =  $\leq 46$  ppq; Medium =  $> 46-128$  ppq; High =  $> 128$  ppq.

**Table N-4-3.**  
**Interaction Table for 2-Hour Postprandial Glucose (mg/dl) (Nondiabetics)**  
**(Continuous)**  
**Body Fat Removed from Final Model**

**a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED**  
**(Dioxin Category-by-Family History of Diabetes: Tables 18-30 and N-3-17)**

Stratum	Dioxin Category	n	Adjusted Mean <sup>a</sup>	Difference of Adjusted Mean vs. Comparisons (95% C.I.) <sup>b</sup>		p-Value <sup>c</sup>
No	Comparison	695	101.17			
	Background RH	264	100.11	-1.06	--	0.569
	Low RH	162	103.21	2.04	--	0.368
	High RH	161	108.87	7.70	--	0.001
	Low plus High RH	323	106.00	4.83	--	0.007
Yes	Comparison	201	109.58			
	Background RH	64	105.46	-4.12	--	0.296
	Low RH	41	106.10	-3.48	--	0.460
	High RH	47	102.77	-6.81	--	0.121
	Low plus High RH	88	104.30	-5.28	--	0.131

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

<sup>c</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

**Table N-4-4.**  
**Interaction Table for 2-Hour Postprandial Glucose (Nondiabetics)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

**a) MODEL 2: RANCH HANDS — INITIAL DIOXIN — ADJUSTED**  
 (Initial Dioxin-by-Race: Tables 18-31 and N-3-18)

Stratum	Initial Dioxin Category Summary Statistics			Analysis Results for $\log_2$ (Initial Dioxin)	
	Initial Dioxin	n	Percent Impaired	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
Non-Black	Low	128	16.4	1.16 (0.94,1.43)	0.168
	Medium	133	18.1		
	High	133	20.3		
Black	Low	13	0.0	--	--
	Medium	8	0.0		
	High	6	16.7		

**b) MODEL 4: RANCH HANDS — CURRENT DIOXIN — ADJUSTED**  
 (Current Dioxin-by-Race: Tables 18-31 and N-3-18)

Stratum	Current Dioxin Category Summary Statistics			Analysis Results for $\log_2$ (Current Dioxin + 1)	
	Current Dioxin	n	Percent Impaired	Adjusted Relative Risk (95% C.I.) <sup>b</sup>	p-Value
Non-Black	Low	255	10.6	1.39 (1.19,1.62)	<0.001
	Medium	226	14.2		
	High	232	20.3		
Black	Low	11	0.0	--	--
	Medium	17	0.0		
	High	12	8.3		

**c) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED**  
 (Current Dioxin-by-Race: Tables 18-31 and N-3-18)

Stratum	Current Dioxin Category Summary Statistics			Analysis Results for $\log_2$ (Current Dioxin + 1)	
	Current Dioxin	n	Percent Impaired	Adjusted Relative Risk (95% C.I.) <sup>b</sup>	p-Value
Non-Black	Low	259	8.9	1.38 (1.20,1.59)	<0.001
	Medium	220	15.0		
	High	221	21.3		
Black	Low	12	0.0	--	--
	Medium	17	0.0		
	High	11	9.1		

**Table N-4-4. (Continued)**  
**Interaction Table for 2-Hour Postprandial Glucose (Nondiabetics)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

<b>d) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> <b>(Current Dioxin-by-Race: Tables 18-31 and N-3-18)</b>					
<b>Stratum</b>	<b>Current Dioxin Category Summary Statistics</b>			<b>Analysis Results for <math>\log_2</math> (Current Dioxin + 1)</b>	
	<b>Current Dioxin</b>	<b>n</b>	<b>Percent Impaired</b>	<b>Adjusted Relative Risk (95% C.I.)<sup>b</sup></b>	<b>p-Value</b>
<b>Non-Black</b>	Low	258	8.9	1.34 (1.16,1.56)	<0.001
	Medium	220	15.0		
	High	221	21.3		
<b>Black</b>	Low	12	0.0	--	--
	Medium	17	0.0		
	High	11	9.1		

<sup>a</sup> Relative risk for a twofold increase in initial dioxin.

<sup>b</sup> Relative risk for a twofold increase in current dioxin.

--: Adjusted relative risk, confidence interval, and p-value not presented due to the sparse number of abnormalities.

Note: Model 2: Low = 39-98 ppt; Medium = > 98-232 ppt; High = > 232 ppt.

Model 4: Low =  $\leq$  8.1 ppt; Medium = > 8.1-20.5 ppt; High = > 20.5 ppt.

Models 5 and 6: Low =  $\leq$  46 ppq; Medium = > 46-128 ppq; High = > 128 ppq.

**Table N-4-5.**  
**Interaction Table for Fasting Urinary Glucose (All Participants)**  
**Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b> (Dioxin Category-by-Personality Type: Tables 18-32 and N-3-19)					
Stratum	Dioxin Category	n	Percent Present	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
Type A	Comparison	443	3.4		
	Background RH	175	0.0	--	--
	Low RH	113	3.5	0.64 (0.10,4.07)	0.635
	High RH	99	6.1	2.05 (0.49,8.66)	0.327
	Low plus High RH	212	4.7	1.14 (0.35,3.72)	0.828
Type B	Comparison	615	2.9		
	Background RH	199	3.0	1.41 (0.54,3.70)	0.481
	Low RH	143	2.8	0.78 (0.26,2.38)	0.665
	High RH	160	5.6	1.70 (0.72,4.03)	0.227
	Low plus High RH	303	4.3	1.23 (0.58,2.61)	0.582

<b>b) MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> (Current Dioxin-by-Personality Type: Tables 18-32 and N-3-19)			
Current Dioxin Category Summary Statistics			Analysis Results for $\log_2$ (Current Dioxin + 1)
Stratum	Current Dioxin	n	Percent Present
Type A	Low	127	0.0
	Medium	139	0.7
	High	113	7.1
Type B	Low	169	2.4
	Medium	149	3.4
	High	174	5.8

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Relative risk for a twofold increase in current dioxin.

--: Adjusted relative risk, confidence interval, and p-value not presented due to the sparse number of abnormalities.

Note: Model 3: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

Model 5: Low =  $\leq$  46 ppq; Medium =  $>46-128$  ppq; High =  $>128$  ppq.

**Table N-4-6.**  
**Interaction Table for Serum Insulin (mIU/ml) (All Participants)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b> <b>(Dioxin Category-by-Age: Tables 18-36 and N-3-22)</b>					
<b>Stratum</b>	<b>Dioxin Category</b>	<b>n</b>	<b>Adjusted Mean<sup>a</sup></b>	<b>Difference of Adjusted Mean vs. Comparisons (95% C.I.)<sup>b</sup></b>	<b>p-Value<sup>c</sup></b>
<b>Born ≥ 1942</b>	Comparison	446	32.92		
	Background RH	127	26.89	-6.03 --	0.013
	Low RH	83	32.63	-0.29 --	0.928
	High RH	151	36.55	3.63 --	0.169
	Low plus High RH	234	35.11	2.19 --	0.322
<b>Born &lt; 1942</b>	Comparison	598	40.18		
	Background RH	241	40.57	0.39 --	0.878
	Low RH	168	44.10	3.92 --	0.188
	High RH	103	43.29	3.11 --	0.388
	Low plus High RH	271	43.79	3.61 --	0.148

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

<sup>c</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

Background (Ranch Hand): Current Dioxin ≤ 10 ppt.

Low (Ranch Hand): Current Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 143 ppt.

High (Ranch Hand): Current Dioxin > 10 ppt, Initial Dioxin > 143 ppt.

**Table N-4-7.**  
**Interaction Table for Serum Insulin (All Participants)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED (Dioxin Category-by-Personality Type: Tables 18-37 and N-3-23)									
Stratum	Dioxin Category	n	Percent			Low vs. Normal		High vs. Normal	
			Abnormal Low	Normal	Abnormal High	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
Type A	Comparison	437	6.4	42.6	51.0				
	Background RH	172	5.2	46.5	48.3	0.81 (0.36,1.86)	0.626	0.69 (0.49,0.97)	0.034
	Low RH	111	6.3	32.4	61.3	0.42 (0.12,1.49)	0.178	0.68 (0.46,1.01)	0.057
	High RH	97	1.0	41.2	57.7	1.38 (0.56,3.36)	0.484	0.91 (0.61,1.35)	0.626
	Low plus High RH	208	3.9	36.5	59.6	0.86 (0.39,1.88)	0.707	0.79 (0.58,1.07)	0.125
Type B	Comparison	607	3.6	32.1	64.3				
	Background RH	196	4.6	44.4	51.0	0.82 (0.36,1.84)	0.626	0.89 (0.61,1.29)	0.531
	Low RH	140	2.1	40.0	57.9	1.41 (0.56,3.52)	0.467	1.56 (0.98,2.49)	0.060
	High RH	157	5.1	31.9	63.1	0.17 (0.02,1.28)	0.086	1.17 (0.73,1.87)	0.510
	Low plus High RH	297	3.7	35.7	60.6	0.73 (0.32,1.69)	0.466	1.35 (0.95,1.94)	0.095

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

Note: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

**Table N-4-8.**  
**Interaction Table for Serum Insulin (Diabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

**a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED**  
**(Dioxin Category-by-Age: Tables 18-39 and N-3-25)**

Stratum	Dioxin Category	n	Percent	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
			Abnormal High		
Born $\geq$ 1942	Comparison	36	52.8		
	Background RH	8	50.0	0.86 (0.15,4.83)	0.865
	Low RH	4	25.0	0.19 (0.01,2.45)	0.202
	High RH	19	52.6	1.49 (0.41,5.32)	0.543
	Low plus High RH	23	47.8	1.02 (0.32,3.28)	0.972
Born $<$ 1942	Comparison	112	59.8		
	Background RH	34	67.6	1.21 (0.49,2.98)	0.675
	Low RH	45	71.1	2.34 (1.02,5.39)	0.045
	High RH	28	42.9	0.44 (0.16,1.21)	0.111
	Low plus High RH	73	60.3	1.20 (0.60,2.39)	0.604

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

Note: Model 2: Low = 39-98 ppt; Medium = > 98-232 ppt; High = > 232 ppt.

Model 3: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin > 10 ppt, 10 ppt < Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin > 10 ppt, Initial Dioxin > 143 ppt.

**Table N-4-9.**  
**Interaction Table for Serum Insulin (mIU/ml) (Nondiabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

**a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED**  
**(Dioxin Category-by-Age: Tables 18-40 and N-3-26)**

Stratum	Dioxin Category	n	Adjusted Mean <sup>a</sup>	Difference of Adjusted Mean vs. Comparisons (95% C.I.) <sup>b</sup>	p-Value <sup>c</sup>
<b>Born ≥ 1942</b>	Comparison	410	59.30		
	Background RH	119	48.39	-10.91 --	0.013
	Low RH	80	57.71	-1.59 --	0.776
	High RH	132	64.94	5.64 --	0.248
	Low plus High RH	212	62.11	2.81 --	0.485
<b>Born &lt; 1942</b>	Comparison	487	71.33		
	Background RH	210	69.67	-1.66 --	0.717
	Low RH	123	72.54	1.21 --	0.832
	High RH	76	86.40	15.07 --	0.048
	Low plus High RH	199	77.55	6.22 --	0.206

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

<sup>c</sup> P-value is based on difference of means on natural logarithm scale.

Note: RH = Ranch Hand.

Comparison: Current Dioxin ≤ 10 ppt.

Background (Ranch Hand): Current Dioxin ≤ 10 ppt.

Low (Ranch Hand): Current Dioxin > 10 ppt, 10 ppt < Initial Dioxin ≤ 143 ppt.

High (Ranch Hand): Current Dioxin > 10 ppt, Initial Dioxin > 143 ppt.

**Table N-4-10.**  
**Interaction Table for Serum Insulin (Nondiabetics)**  
**(Discrete)**  
**Body Fat Removed from Final Model**

a) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Age: Tables 18-41 and N-3-27)									
Stratum	Current Dioxin	n	Percent			Low vs. Normal		High vs. Normal	
						Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
			Abnormal Low	Normal	Abnormal High				
Born ≥ 1942	Low	98	9.2	60.2	30.6	0.86 (0.67,1.12)	0.262	1.22 (1.06,1.39)	0.004
	Medium	90	6.7	40.0	53.3				
	High	148	5.4	40.5	54.1				
Born < 1942	Low	175	5.1	40.6	54.3	0.75 (0.55,1.03)	0.077	1.43 (1.22,1.68)	<0.001
	Medium	151	4.0	37.8	58.3				
	High	90	1.1	16.7	82.2				

<sup>a</sup> Relative risk for a twofold increase in current dioxin.

Note: Low = ≤ 46 ppq; Medium = > 46-128 ppq; High = > 128 ppq.

**Table N-4-11.**  
**Interaction Table for Serum Glucagon (pg/ml) (All Participants)**  
**(Continuous)**  
**Occupation Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b> (Dioxin Category-by-Family History of Diabetes: Tables 18-42 and N-3-28)					
Stratum	Dioxin Category	n	Adjusted Mean <sup>a</sup>	Difference of Adjusted Mean vs. Comparisons (95% C.I.) <sup>b</sup>	p-Value <sup>c</sup>
No	Comparison	709	61.22		
	Background RH	256	59.54	-1.68 --	0.135
	Low RH	175	59.89	-1.33 --	0.306
	High RH	162	63.93	2.71 --	0.052
	Low plus High RH	337	61.80	0.58 --	0.576
Yes	Comparison	235	62.06		
	Background RH	74	61.73	-0.33 --	0.875
	Low RH	48	61.64	-0.42 --	0.867
	High RH	56	56.74	-5.32 --	0.018
	Low plus High RH	104	58.96	-3.10 --	0.086

<b>b) MODEL 4: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> (Current Dioxin-by-Family History of Diabetes: Tables 18-42 and N-3-28)			
Current Dioxin Category Summary Statistics			Analysis Results for $\log_2$ (Current Dioxin + 1)
Stratum	Current Dioxin	n	Adjusted Mean <sup>a</sup>
No	Low	204	57.70
	Medium	201	57.91
	High	188	62.88
Yes	Low	54	58.49
	Medium	61	60.20
	High	63	58.25

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

<sup>c</sup> P-value is based on difference of means on natural logarithm scale.

<sup>d</sup> Slope and standard error based on natural logarithm of serum glucagon versus  $\log_2$  dioxin.

Note: Model 3: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

Model 4: Low =  $\leq$  8.1 ppt; Medium =  $>$  8.1-20.5 ppt; High =  $>$  20.5 ppt.

**Table N-4-12.**  
**Interaction Table for Serum Glucagon (pg/ml) (Diabetics)**  
**(Continuous)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED (Dioxin Category-by-Diabetic Severity: Tables 18-44 and N-3-30)					
Stratum	Dioxin Category	n	Adjusted Mean <sup>a</sup>	Difference of Adjusted Mean vs. Comparisons (95% C.I.) <sup>b</sup>	p-Value <sup>c</sup>
No Treatment/ Diet Only	Comparison	103	61.38		
	Background RH	30	66.17	4.79 --	0.251
	Low RH	35	64.29	2.91 --	0.450
	High RH	23	69.26	7.88 --	0.098
	Low plus High RH	58	66.22	4.84 --	0.140
Oral Hypo- glycemics/ Insulin Dependent	Comparison	29	84.41		
	Background RH	8	75.43	-8.98 --	0.381
	Low RH	10	70.12	-14.29 --	0.115
	High RH	15	57.52	-26.89 --	<0.001
	Low plus High RH	25	62.26	-22.15 --	<0.001

<sup>a</sup> Transformed from natural logarithm scale.

<sup>b</sup> Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

<sup>c</sup> P-value is based on difference of means on natural logarithm scale.

Note: Model 3: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

**Table N-4-13.**  
**Interaction Table for Serum Proinsulin (Diabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

a) MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED (Current Dioxin-by-Diabetic Severity: Tables 18-56 and N-3-40)					
Stratum	Current Dioxin	Current Dioxin Category Summary Statistics		Analysis Results for $\log_2$ (Current Dioxin + 1)	
		n	Percent Abnormal High	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
No Treatment	Low	14	7.1	1.60 (1.03,2.50)	0.037
	Medium	28	10.7		
	High	24	50.0		
Diet Only	Low	3	66.7	0.74 (0.41,1.31)	0.298
	Medium	14	50.0		
	High	13	53.9		
Oral Hypoglycemic	Low	0	0.0	0.68 (0.35,1.31)	0.246
	Medium	4	75.0		
	High	13	76.9		
Insulin Dependent	Low	7	42.9	0.87 (0.58,1.32)	0.516
	Medium	4	75.0		
	High	6	33.3		

<sup>a</sup> Relative risk for a twofold increase in current dioxin.

Note: Model 6: Low =  $\leq 46$  ppq; Medium =  $> 46-128$  ppq; High =  $> 128$  ppq.

Stratum	Treatment	Current Dioxin		Mean	S.E.
		Low	Medium		
No	Low	704	57.79	57.79	0.00
	Medium	291	57.95		
	High	112	57.91		
Yes	Low	492	57.74	57.74	0.00
	Medium	61	60.30		
	High	63	58.25		

\* Transformed from natural logarithm scale.

<sup>a</sup> Difference of means after transformation to original scale; confidence interval on difference of means not presented because analysis was performed on natural logarithm scale.

<sup>b</sup> P-value is based on difference of means on natural logarithm scale.

<sup>c</sup> Slope and standard error based on natural logarithm of serum proinsulin (mean 1.25, S.E. 0.001).

Note: Model 6: RHD = Ranch Hand.

Occupation: Current Dioxin  $\leq 46$  ppq.

Background (Ranch Hand): Current Dioxin  $\leq 46$  ppq.

Low (Ranch Hand): Current Dioxin  $> 46$  ppq,  $\leq 128$  ppq; High (Ranch Hand): Current Dioxin  $> 128$  ppq.

Model 6: Low =  $\leq 8.1$  ppq; Medium =  $> 8.1-16.6$  ppq; High =  $> 16.6$  ppq.

**Table N-4-14.**  
**Interaction Table for Serum C Peptide (Diabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b> (Dioxin Category-by-Age: Tables 18-58 and N-3-42)					
Stratum	Dioxin Category	n	Percent	Adjusted Relative Risk (95% C.I.) <sup>a</sup>	p-Value
			Abnormal		
Born ≥ 1942	Comparison	34	58.8		
	Background RH	7	14.3	0.08 (0.01,0.92)	0.042
	Low RH	3	66.7	0.82 (0.06,11.83)	0.886
	High RH	19	68.4	3.77 (0.89,16.05)	0.073
	Low plus High RH	22	68.2	2.85 (0.76,10.70)	0.120
Born < 1942	Comparison	109	65.1		
	Background RH	32	65.6	1.37 (0.44,4.27)	0.588
	Low RH	43	69.8	1.85 (0.71,4.78)	0.205
	High RH	26	42.3	0.40 (0.13,1.19)	0.099
	Low plus High RH	69	59.4	0.99 (0.46,2.14)	0.976

<b>MODEL 5: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> (Current Dioxin-by-Diabetic Severity: Tables 18-58 and N-3-42)					
Stratum	Current Dioxin Category Summary Statistics			Analysis Results for $\log_2$ (Current Dioxin + 1)	
	Current Dioxin	n	Percent Abnormal High	Adjusted Relative Risk (95% C.I.) <sup>b</sup>	p-Value
No Treatment or Diet Only	Low	15	73.3	0.79 (0.57,1.09)	0.154
	Medium	41	75.6		
	High	36	66.7		
Oral Hypoglycemic or Insulin Dependent	Low	7	0.0	1.38 (0.92,2.08)	0.122
	Medium	8	12.5		
	High	18	44.4		

**Table N-4-14. (Continued)**  
**Interaction Table for Serum C Peptide (Diabetics)**  
**(Discrete)**  
**Occupation and Body Fat Removed from Final Model**

<b>MODEL 6: RANCH HANDS — CURRENT DIOXIN — ADJUSTED</b> <b>(Current Dioxin-by-Diabetic Severity: Tables 18-58 and N-3-42)</b>				
<b>Stratum</b>	<b>Current Dioxin Category Summary Statistics</b>			<b>Analysis Results for <math>\log_2</math> (Current Dioxin + 1)</b>
	<b>Current Dioxin</b>	<b>n</b>	<b>Percent Abnormal High</b>	
<b>No Treatment or Diet Only</b>	Low	15	73.3	0.82 (0.58,1.17)
	Medium	41	75.6	
	High	36	66.7	
<b>Oral Hypoglycemic or Insulin Dependent</b>	Low	7	0.0	1.42 (0.94,2.15)
	Medium	8	12.5	
	High	18	44.4	

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

<sup>b</sup> Relative risk for a twofold increase in current dioxin.

Note: Model 3: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.

Models 5 and 6: Low =  $\leq$  46 ppq; Medium =  $>$  46-128 ppq; High =  $>$  128 ppq.

**Table N-4-15.**  
**Interaction Table for Total Testosterone**  
**(Discrete)**  
**Body Fat Removed from Final Model**

<b>a) MODEL 3: RANCH HANDS AND COMPARISONS BY DIOXIN CATEGORY — ADJUSTED</b> (Dioxin Category-by-Personality Type: Tables 18-60 and N-3-44)					
<b>Stratum</b>	<b>Dioxin Category</b>	<b>n</b>	<b>Percent Abnormal Low</b>	<b>Adjusted Relative Risk (95% C.I.)<sup>a</sup></b>	<b>p-Value</b>
<b>Type A</b>	Comparison	441	3.2		
	Background RH	168	4.2	1.61 (0.62,4.17)	0.326
	Low RH	113	6.2	1.76 (0.66,4.70)	0.263
	High RH	100	7.0	2.40 (0.91,6.31)	0.075
	Low plus High RH	213	6.6	2.04 (0.93,4.49)	0.075
<b>Type B</b>	Comparison	614	6.7		
	Background RH	196	1.5	0.29 (0.09,0.95)	0.042
	Low RH	142	2.8	0.32 (0.11,0.93)	0.036
	High RH	159	7.5	0.88 (0.43,1.80)	0.729
	Low plus High RH	301	5.3	0.61 (0.32,1.13)	0.116

<sup>a</sup> Relative risk and confidence interval relative to Comparisons.

Note: Model 3: RH = Ranch Hand.

Comparison: Current Dioxin  $\leq$  10 ppt.

Background (Ranch Hand): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hand): Current Dioxin  $>$  10 ppt, 10 ppt  $<$  Initial Dioxin  $\leq$  143 ppt.

High (Ranch Hand): Current Dioxin  $>$  10 ppt, Initial Dioxin  $>$  143 ppt.