

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue)**

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted**

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a16) Minimal (n=521)	Low	130	0.0	--	--
	Medium	260	0.4		
	High	131	0.0		
b16) Maximal (n=742)	Low	185	0.0	0.84 (0.27,2.57)	0.745
	Medium	371	0.5		
	High	186	0.0		

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted**

Assumption	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
c16) Minimal (n=521)	--	--	--
d16) Maximal (n=742)	--	--	--

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

--: Relative risk, confidence interval, and p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Ear, Face, Head, and Neck)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e1) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f1) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g1) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h1) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Oral Cavity, Pharynx, and Larynx)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e2) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	0.0 --	-- --
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	0.0 --	-- --
f2) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	0.0 --	-- --
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	0.0 --	-- --

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g2) Minimal (n=521)	≤18.6	--	--	-- --
	>18.6	--	--	-- --
h2) Maximal (n=742)	≤18.6	--	--	-- --
	>18.6	--	--	-- --

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Brain)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e3) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f3) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	≤18.6	0.0 (79)	0.0 (179)	0.0 (104)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g3) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h3) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Thymus and Mediastinum)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e4) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	0.0 --	0.81> --
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	0.0 --	0.81< --
f4) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	0.0 --	0.81> --
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	0.0 --	0.81< --

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g4) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h4) Maximal (n=742)	≤18.6	--	--	0.81> 0.81<
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Thyroid Gland)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e5) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	0.0 (51)	-- --
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	0.0 (82)	-- --
f5) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	0.0 (81)	-- --
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	0.0 (87)	-- --

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g5) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h5) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Bronchus and Lung)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e6) Minimal (n=521)	≤18.6	0.0 (72)	0.8 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f6) Maximal (n=742)	≤18.6	0.0 (106)	0.5 (191)	0.0 (83)	--	--
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	--	--

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g6) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h6) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Colon and Rectum)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e7) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f7) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	--	--

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g7) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h7) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Kidney and Bladder)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e8) Minimal (n=521)	≤18.6	0.0 (72)	0.8 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	2.3 (132)	0.0 (77)	0.45 (0.10,1.94)	0.281 <sup>b</sup>
f8) Maximal (n=742)	≤18.6	0.0 (106)	0.5 (191)	0.0 (83)	--	--
	>18.6	1.3 (79)	1.7 (179)	0.0 (104)	0.67 (0.27,1.62)	0.372 <sup>b</sup>

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g8) Minimal (n=521)	≤18.6	--	--	AGE (p=0.149)
	>18.6	0.56 (0.13,2.41)	0.435 <sup>b</sup>	
h8) Maximal (n=742)	≤18.6	--	--	
	>18.6	0.67 (0.27,1.62)	0.372 <sup>b</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Prostate)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e9) Minimal (n=521)	≤18.6	0.0 (72)	0.8 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.8 (132)	0.0 (77)	--	--
f9) Maximal (n=742)	≤18.6	0.0 (106)	0.5 (191)	0.0 (83)	--	--
	>18.6	0.0 (79)	0.6 (179)	0.0 (104)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g9) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h9) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Testicles)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e10) Minimal (n=521)	≤18.6	1.4 (72)	0.8 (128)	0.0 (54)	0.63 (0.12,3.29)	0.581 <sup>b</sup>
	>18.6	0.0 (58)	0.8 (132)	0.0 (77)	--	--
f10) Maximal (n=742)	≤18.6	0.0 (106)	1.0 (191)	0.0 (83)	1.13 (0.39,3.28)	0.828 <sup>b</sup>
	>18.6	0.0 (79)	0.6 (179)	0.0 (104)	--	--

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g10) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	
h10) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	

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

<sup>b</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Ill-Defined Sites)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e11) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f11) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g11) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h11) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Carcinoma in Situ of Penis)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Current Dioxin	Low	Medium	High	
e12) Minimal (n=521)	$\leq 18.6$	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	$>18.6$	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f12) Maximal (n=742)	$\leq 18.6$	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	$>18.6$	0.0 (79)	0.0 (179)	0.0 (104)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g12) Minimal (n=521)	$\leq 18.6$	--	--	--
	$>18.6$	--	--	$0.812$ (122=n) $0.81<$
h12) Maximal (n=742)	$\leq 18.6$	--	--	--
	$>18.6$	--	--	$0.812$ (347=n) $0.81<$

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Carcinoma in Situ of Other and Unspecified Sites)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Current Dioxin Low	Medium	High		
e13) Minimal (n=521)	≤18.6	1.4 (72)	0.0 (128)	0.0 (54)	--	--
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	--	--
f13) Maximal (n=742)	≤18.6	0.0 (106)	0.5 (191)	0.0 (83)	--	--
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	--	--

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g13) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h13) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Hodgkin's Disease)Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e14) Minimal (n=521)	≤18.6	0.0 (72)	0.0 (128)	0.0 (54)	0.0 --	0.81> (128=n) --
	>18.6	0.0 (58)	0.0 (132)	0.0 (77)	0.0 --	0.81< --
f14) Maximal (n=742)	≤18.6	0.0 (106)	0.0 (191)	0.0 (83)	0.0 --	0.81> (191=n) --
	>18.6	0.0 (79)	0.0 (179)	0.0 (104)	0.0 --	0.81< 0.5380 --

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g14) Minimal (n=521)	≤18.6	--	--	--
	>18.6	--	--	--
h14) Maximal (n=742)	≤18.6	--	--	--
	>18.6	--	--	--

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms**  
**(Carcinoma (All Histologies))**  
**(Leukemia)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n)			Est. Relative Risk (95% C.I.)	p-Value
		Low	Medium	High		
e15) Minimal (n=521)	$\leq 18.6$	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	$>18.6$	0.0 (58)	0.8 (132)	0.0 (77)	--	--
f15) Maximal (n=742)	$\leq 18.6$	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	$>18.6$	0.0 (79)	0.6 (179)	0.0 (104)	--	--

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g15) Minimal (n=521)	$\leq 18.6$	--	--	--
	$>18.6$	--	--	--
h15) Maximal (n=742)	$\leq 18.6$	--	--	--
	$>18.6$	--	--	--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue)**

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted**

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e16) Minimal (n=521)	$\leq 18.6$	0.0 (72)	0.0 (128)	0.0 (54)	--	--
	$>18.6$	0.0 (58)	0.8 (132)	0.0 (77)	--	--
f16) Maximal (n=742)	$\leq 18.6$	0.0 (106)	0.0 (191)	0.0 (83)	--	--
	$>18.6$	1.3 (79)	0.6 (179)	0.0 (104)	0.46 (0.09,2.26)	0.338 <sup>b</sup>

**Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted**

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
g16) Minimal (n=521)	$\leq 18.6$	--	--	--
	$>18.6$	--	--	--
h16) Maximal (n=742)	$\leq 18.6$	--	--	--
	$>18.6$	--	--	--

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

<sup>b</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: 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.

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Ear, Face, Head, and Neck)**

**i1) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Percent Yes/(n)	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.1	0.1	All Categories	--	--
Unknown	345	0.0	0.0	Unknown vs. Background	--	0.999
Low	196	0.0	0.0	Low vs. Background	--	0.999
High	187	0.0	0.0	High vs. Background	--	0.999
Total	1,514					

**j1) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	
Low	196	Low vs. Background	--	--	
High	187	High vs. Background	--	--	
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq 10$  ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq 10$  ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin  $\leq 33.3$  ppt.

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

Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Minimal-Low: (Malignant systemic neoplasms) Low: Low vs. Background not contributing to test<sup>2</sup>

Low-Low: Low vs. Low not contributing to test<sup>2</sup>

Low-High: Low vs. High not contributing to test<sup>2</sup>

High-High: High vs. High not contributing to test<sup>2</sup>

High-Low: High vs. Low not contributing to test<sup>2</sup>

Low-High: Low vs. High not contributing to test<sup>2</sup>

High-High: High vs. High not contributing to test<sup>2</sup>

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Oral Cavity, Pharynx, and Larynx)

## j2) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.1	All Categories	0.1	--
Unknown	345	0.0	Unknown vs. Background	-- 0.0	0.999
Low	196	0.0	Low vs. Background	-- 0.0	0.999
High	187	0.0	High vs. Background	-- 0.0	0.999
Total	1,514				

## j2) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	-- 0.1	--	Background 0.10
Unknown	345	Unknown vs. Background	-- 0.0	--	Unknown 0.02
Low	196	Low vs. Background	-- 0.0	--	Low 0.06
High	187	High vs. Background	-- 0.0	--	High 0.12
Total	1,514				Total

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Brain)

## j3) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	--	--
Unknown	345	0.0	Unknown vs. Background	--	--
Low	196	0.0	Low vs. Background	--	--
High	187	0.0	High vs. Background	--	--
Total	1,514				

## j3) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	
Unknown	345	Unknown vs. Background	--	--	
Low	196	Low vs. Background	--	--	
High	187	High vs. Background	--	--	
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Thymus and Mediastinum)

## i4) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	0.0	--
Unknown	345	0.3	Unknown vs. Background	-- 0.0	0.610
Low	196	0.0	Low vs. Background	-- 0.0	--
High	187	0.0	High vs. Background	-- 0.0	--
Total	1,514				

## j4) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Thyroid Gland)**

**i5) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	--	--
Unknown	345	0.0	Unknown vs. Background	--	--
Low	196	0.0	Low vs. Background	--	--
High	187	0.0	High vs. Background	--	--
Total	1,514				

**j5) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Bronchus and Lung)

## i6) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	8.0	--
Unknown	345	0.6	Unknown vs. Background	--	0.186
Low	196	0.5	Low vs. Background	--	0.400
High	187	0.0	High vs. Background	--	--
Total	1,514				

## j6) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Colon and Rectum)

## j7) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.3	All Categories	--	--
Unknown	345	0.0	Unknown vs. Background	--	0.999
Low	196	0.0	Low vs. Background	--	0.999
High	187	0.0	High vs. Background	--	0.999
Total	1,514				

## j7) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Kidney and Bladder)**

**j8) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.3	All Categories		0.006
Unknown	345	0.3	Unknown vs. Background	1.14 (0.10,12.61)	0.999
Low	196	2.0	Low vs. Background	8.17 (1.49,44.91)	0.033
High	187	0.0	High vs. Background	--	0.999
Total	1,514				

**j8) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories		0.041	AGE (p=0.036)
Unknown	345	Unknown vs. Background	1.13 (0.10,12.55)	0.923	
Low	196	Low vs. Background	8.60 (1.55,47.71)	0.014	
High	187	High vs. Background	--	--	
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Prostate)**

**j9) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.5	All Categories	--	--
Unknown	345	0.0	Unknown vs. Background	--	0.466
Low	196	1.0	Low vs. Background	2.02 (0.37,11.08)	0.688
High	187	0.0	High vs. Background	--	0.850
Total	1,514				

**j9) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	AGE (p<0.001)
Unknown	345	Unknown vs. Background	--	--	
Low	196	Low vs. Background	2.28 (0.40,12.96)	0.353	
High	187	High vs. Background	--	--	
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

**TABLE 7-18. (Continued)**  
**Analysis of Malignant Systemic Neoplasms**  
**(Testicles)**

**i10) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	1.0	--
Unknown	345	0.0	Unknown vs. Background	--	--
Low	196	1.0	Low vs. Background	--	0.079
High	187	0.0	High vs. Background	--	--
Total	1,514				

**j10) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	1.0	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Ill-Defined Sites)

## i11) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	1.00	--
Unknown	345	0.0	Unknown vs. Background	--	--
Low	196	0.0	Low vs. Background	--	--
High	187	0.0	High vs. Background	--	--
Total	1,514				

## j11) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	1.00	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$  10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$  10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$  33.3 ppt.

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

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Carcinoma in Situ of Penis)**

**i12) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.1	All Categories	--	--
Unknown	345	0.0	Unknown vs. Background	--	0.999
Low	196	0.0	Low vs. Background	--	0.999
High	187	0.0	High vs. Background	--	0.999
Total	1,514				

**j12) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	Unknown
Low	196	Low vs. Background	--	--	Low
High	187	High vs. Background	--	--	High
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Carcinoma in Situ on Other and Unspecified Sites)**

**j13) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	1.0	--
Unknown	345	0.0	Unknown vs. Background	--	--
Low	196	0.0	Low vs. Background	--	--
High	187	0.0	High vs. Background	--	--
Total	1,514				

**j13) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	
Unknown	345	Unknown vs. Background	--	--	
Low	196	Low vs. Background	--	--	Low
High	187	High vs. Background	--	--	High
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the absence of abnormalities; adjusted analysis not performed due to the absence of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

Analysis of Malignant Systemic Neoplasms  
(Hodgkin's Disease)

## b14) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.1	All Categories	1.0	--
Unknown	345	0.0	Unknown vs. Background	--	0.999
Low	196	0.0	Low vs. Background	--	0.999
High	187	0.0	High vs. Background	--	0.999
Total	1,514				

## b14) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	1.0	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

TABLE 7-18. (Continued)

**Analysis of Malignant Systemic Neoplasms  
(Cardiovascular System)**

**j15) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.0	All Categories	1.0	--
Unknown	345	0.0	Unknown vs. Background	--	--
Low	196	0.5	Low vs. Background	--	--
High	187	0.0	High vs. Background	--	0.400
Total	1,514				--

**j15) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories	--	--	--
Unknown	345	Unknown vs. Background	--	--	--
Low	196	Low vs. Background	--	--	--
High	187	High vs. Background	--	--	--
Total	1,514				--

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities; adjusted analysis not performed due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

**TABLE 7-18. (Continued)**

**Analysis of Malignant Systemic Neoplasms  
(Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue)**

**j16) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	0.1	All Categories		0.641
Unknown	345	0.3	Unknown vs. Background	2.28 (0.14,36.59)	0.999
Low	196	0.5	Low vs. Background	4.03 (0.25,64.65)	0.720
High	187	0.0	High vs. Background	--	0.999
Total	1,514				

**j16) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	786	All Categories		0.687	AGE (p=0.088)
Unknown	345	Unknown vs. Background	2.30 (0.14,37.13)	0.558	
Low	196	Low vs. Background	4.27 (0.26,69.08)	0.307	
High	187	High vs. Background	--	--	
Total	1,514				

--: Relative risk/confidence interval/p-value not given due to the sparse number of abnormalities.

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.

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

Four Comparisons to the background current dioxin category and two Ranch Hands in the low current dioxin category have been included. The background comparisons include the contrasts for the unknown, low, and high categories. The two comparisons for the Ranch Hands include the contrasts for the unknown and low categories. The high category is not included because there were no comparisons to the high category. The comparisons for the Ranch Hands are not included because there were no comparisons to the Ranch Hands.

### **Model 2: Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time**

Under the minimal and maximal assumptions, no Ranch Hands had a verified malignant systemic neoplasm for the ear, face, head, and neck (Table 7-18 [e1-h1]); oral cavity, pharynx, and larynx (Table 7-18 [e2-h2]); brain (Table 7-18 [e3-h3]); thymus and mediastinum (Table 7-18 [e4-h4]); thyroid gland (Table 7-18 [e5-h5]); colon and rectum (Table 7-18 [e7-h7]); ill-defined sites (Table 7-18 [e11-h11]); carcinoma in situ of penis (Table 7-18 [e12-h12]); and Hodgkin's disease (Table 7-18 [e14-h14]).

Under the minimal and maximal assumptions, only one Ranch Hand had a verified malignant systemic neoplasm of the bronchus and lung (Table 7-18 [e6-h6]); carcinoma in situ of other and unspecified sites (Table 7-18 [e13-h13]); and leukemia (Table 7-18 [e15-h15]).

Under the minimal assumption, four Ranch Hands had a verified malignant systemic neoplasm of the kidney and bladder. One Ranch Hand was in the later tour stratum (i.e.,  $\leq 18.6$  years) and three Ranch Hands were in the earlier tour stratum (i.e.,  $> 18.6$  years). Due to the sparse data in the later tour stratum, the relative risk was not evaluated for that stratum nor was the interaction between current dioxin and time since tour evaluated. For the earlier tour stratum, the relative risks were less than 1 and nonsignificant under both the minimal and the maximal assumptions (Table 7-18 [e8] and [f8]:  $p=0.281$  and  $p=0.372$ ). In the adjusted analyses, age was the only covariate considered due to the sparse data. Under the minimal assumption, the adjusted relative risk for the earlier tour stratum was less than 1 and nonsignificant (Table 7-18 [g8]:  $p=0.435$ ). Under the maximal assumption, age was not retained as a covariate; therefore, the unadjusted and adjusted results were the same (Table 7-18 [f8] and [h8]).

Under the minimal assumption and under the maximal assumption, the two Ranch Hands with a verified malignant systemic neoplasm of the prostate were split between the time strata. Because of the sparse number of neoplasms within each time stratum, only relative frequencies and sample sizes were presented (Table 7-18 [e9-h9]).

Under the minimal and maximal assumptions, three Ranch Hands had a verified malignant systemic neoplasm of the testicles. Two of the three Ranch Hands had later tours ( $\leq 18.6$  years). Under both assumptions, the relative risk for that time stratum was nonsignificant (Table 7-18 [e10] and [f10]:  $p=0.581$  and  $p=0.828$ ). Neither the interaction of current dioxin and time since tour nor the relative risk of the other time stratum was evaluated for significance. Because of the sparse data, adjusted analyses were not performed.

Under the minimal assumption, only one Ranch Hand within the earlier tour stratum ( $> 18.6$  years) had a verified malignant systemic neoplasm of lymphoid and histiocytic tissue. Therefore, only relative frequencies and sample sizes are presented (Table 7-18 [e16]). Under the maximal assumption, two Ranch Hands had verified malignant systemic neoplasm of lymphoid and histiocytic tissue within the earlier tour stratum; the associated relative risk was nonsignificant and less than 1 (Table 7-18 [f16]:  $p=0.338$ ). Due to sparse data, the interaction and other time stratum were not evaluated for significance and adjusted analyses were not performed.

### ***Model 3: Ranch Hands and Comparisons by Current Dioxin Category***

No Ranch Hands and no Comparisons had a verified malignant systemic neoplasm of the brain (Table 7-18 [i3-j3]); thyroid gland (Table 7-18 [i5-j5]), ill-defined sites (Table 7-18 [i11-j11]); and carcinoma in situ of other and unspecified sites (Table 7-18 [i13-j13]).

One Comparison and no Ranch Hands had a verified systemic neoplasm for the ear, face, head, and neck (Table 7-18 [i1-j1]); oral cavity, pharynx, and larynx (Table 7-18 [i2-j2]); carcinoma in situ of the penis (Table 7-18 [i12-j12]); and Hodgkin's disease (Table 7-18 [i14-j14]). Each of the Ranch Hand versus Comparison contrasts was nonsignificant.

Only one Ranch Hand in the unknown current dioxin category had a verified malignant systemic neoplasm of the thymus and mediastinum (Table 7-18 [i4-j4]). The associated Ranch Hand versus Comparison contrast was nonsignificant ( $p=0.610$ ).

Two Ranch Hands in the unknown current dioxin category and one Ranch Hand in the low current dioxin category had a verified malignant systemic neoplasm of the bronchus and lung (Table 7-18 [i6-j6]). The unknown versus background and the low versus background contrasts were nonsignificant in the unadjusted analysis ( $p>0.15$  for both contrasts).

Two Comparisons in the background current dioxin category and no Ranch Hands had a verified malignant systemic neoplasm of the colon and rectum (Table 7-18 [i7-j7]). Each of the Ranch Hand versus Comparison contrasts was nonsignificant ( $p=0.999$ ) in the unadjusted analysis.

Two Comparisons, one Ranch Hand in the unknown current dioxin category, and four Ranch Hands in the low current dioxin category had a verified malignant systemic neoplasm of the kidney and bladder. In the unadjusted analysis, the overall contrast of the relative frequencies was significant (Table 7-18 [i8]:  $p=0.006$ ). The relative frequencies of participants with a malignant systemic neoplasm of the kidney and bladder were 0.3, 0.3, 2.0, and 0.0 percent for the background, unknown, low, and high current dioxin categories. The contrast of Ranch Hands in the low current dioxin category with Comparisons in the background category was significant with a relative risk greater than 1 (Est. RR=8.17, 95% C.I.: [1.49,44.91],  $p=0.033$ ). The other two Ranch Hand versus Comparison contrasts were nonsignificant ( $p=0.999$  for both). An adjusted analysis also contained a significant overall contrast (Table 7-18 [j8]:  $p=0.041$ ). The low versus background contrast remained significant after adjusting for age (Adj. RR=8.60, 95% C.I.: [1.55, 47.71],  $p=0.014$ ). The unknown versus background contrast was nonsignificant ( $p=0.923$ ).

Four Comparisons in the background current dioxin category and two Ranch Hands in the low current dioxin category had a verified malignant systemic neoplasm of the prostate (Table 7-18 [i9-j9]). In the unadjusted analysis, the three Ranch Hand versus Comparison contrasts for malignant systemic neoplasms were nonsignificant ( $p>0.45$  for each contrast). An adjusted analysis with age in the model provided a nonsignificant low versus background contrast (Table 7-18 [j9]:  $p=0.353$ ).

Only two Ranch Hands in the low current dioxin category had a verified malignant systemic neoplasm of the testicles (Table 7-18 [i10-j10]). The individual contrast of low versus background was of borderline significance ( $p=0.079$ ).

One Ranch Hand in the low current dioxin category had a verified leukemia (Table 7-18 [i15-j15]). The contrast of low versus background was nonsignificant ( $p=0.400$ ) in the unadjusted analysis.

One Comparison, one Ranch Hand in the unknown current dioxin category, and one Ranch Hand in the low current dioxin category had a malignant systemic neoplasm of lymphoid and histiocytic tissue (Table 7-18 [i16]). In the unadjusted analysis, the overall contrast and the individual contrasts of the relative frequencies of Ranch Hands in the unknown, low, and high current dioxin categories versus Comparisons in the background category were nonsignificant ( $p>0.60$  for all). The adjusted analysis also produced a nonsignificant overall contrast ( $p=0.687$ ).

### All Skin and Systemic Neoplasms

#### *Model 1: Ranch Hands - Log<sub>2</sub> (Initial Dioxin)*

In the unadjusted analysis of the frequency of verified skin and systemic neoplasms combined, the relative risk associated with initial dioxin was nonsignificant under the minimal and maximal assumptions (Table 7-19 [a] and [b]:  $p=0.384$  and  $p=0.661$ ). The adjusted analyses also produced nonsignificant relative risks (Table 7-19 [c] and [d]:  $p=0.851$  and  $p=0.285$ , respectively).

#### *Model 2: Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time*

In the unadjusted analysis of the frequency of verified skin and systemic neoplasms combined, the interaction between current dioxin and time since tour was nonsignificant under the minimal and maximal assumptions (Table 7-19 [e] and [f]:  $p=0.414$  and  $p=0.355$ ). Under both assumptions, the adjusted analysis also contained a nonsignificant interaction (Table 7-19 [g] and [h]:  $p=0.625$  and  $p=0.387$ , respectively). Associations with current dioxin were nonsignificant within each time stratum.

#### *Model 3: Ranch Hands and Comparisons by Current Dioxin Category*

In the unadjusted analysis of the frequency of participants with a verified skin or systemic neoplasm, the overall contrast of Ranch Hands in the unknown, low, and high current dioxin categories and Comparisons in the background category was nonsignificant (Table 7-19 [i1]:  $p=0.679$ ). An adjusted analysis also exhibited a nonsignificant overall contrast (Table 7-19 [j1]:  $p=0.576$ ). The overall contrast of the unadjusted analysis remained nonsignificant after including suspected neoplasms (Table 7-19 [i2]:  $p=0.730$ ), as did the overall contrast in the adjusted analysis for verified and suspected neoplasms combined (Table 7-19 [j2]:  $p=0.629$ ). In the unadjusted and the adjusted analyses for the verified neoplasms, as well as the verified and suspected neoplasms, the individual Ranch Hand versus Comparison contrasts had relative risks greater than 1 but they were all nonsignificant ( $p>0.20$  for all).

**TABLE 7-19.**  
**Analysis of All Skin and Systemic Neoplasms**

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Unadjusted**

Assumption	Initial Dioxin	n	Percent Yes	Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
a) Minimal (n=521)	Low	130	26.2	0.93 (0.78,1.10)	0.384
	Medium	260	21.9		
	High	131	24.4		
b) Maximal (n=742)	Low	185	17.8	1.03 (0.91, 1.17)	0.661
	Medium	371	24.3		
	High	186	21.5		

**Ranch Hands - Log<sub>2</sub> (Initial Dioxin) - Adjusted**

Assumption	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
c) Minimal (n=515)	0.98 (0.82,1.18)	0.851	AGE (p=0.004) CARCIN (p=0.022)
d) Maximal (n=731)	1.08 (0.94,1.23)	0.285	AGE (p<0.001) CARCIN (p=0.033)

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

Note: 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.

TABLE 7-19. (Continued)

## Analysis of All Skin and Systemic Neoplasms

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Unadjusted

Assumption	Time (Yrs.)	Percent Yes/(n) Current Dioxin			Est. Relative Risk (95% C.I.) <sup>a</sup>	p-Value
		Low	Medium	High		
e) Minimal (n=521)	≤18.6	26.4 (72)	22.7 (128)	18.5 (54)	0.82 (0.61,1.10)	0.414 <sup>b</sup> 0.187 <sup>c</sup>
	>18.6	27.6 (58)	21.2 (132)	27.3 (77)	0.96 (0.77,1.20)	0.703 <sup>c</sup>
f) Maximal (n=742)	≤18.6	20.8 (106)	24.6 (191)	16.9 (83)	0.95 (0.78,1.16)	0.355 <sup>b</sup> 0.618 <sup>c</sup>
	>18.6	16.5 (79)	22.9 (179)	25.0 (104)	1.08 (0.91,1.28)	0.402 <sup>c</sup>

Ranch Hands - Log<sub>2</sub> (Current Dioxin) and Time - Adjusted

Assumption	Time (Yrs.)	Adj. Relative Risk (95% C.I.) <sup>a</sup>	p-Value	Covariate Remarks
g) Minimal (n=515)	≤18.6	0.92 (0.68,1.25)	0.625 <sup>b</sup> 0.579 <sup>c</sup>	AGE (p=0.008) CARCIN (p=0.024)
	>18.6	1.01 (0.80,1.27)	0.953 <sup>c</sup>	
h) Maximal (n=731)	≤18.6	1.02 (0.82,1.26)	0.387 <sup>b</sup> 0.872 <sup>c</sup>	AGE (p<0.001) CARCIN (p=0.036)
	>18.6	1.15 (0.96,1.37)	0.132 <sup>c</sup>	

<sup>a</sup>Relative risk for a twofold increase in dioxin.<sup>b</sup>Test of significance for homogeneity of relative risks (current dioxin continuous, time categorized).<sup>c</sup>Test of significance for relative risk equal to 1 (current dioxin continuous, time categorized).Note: 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.

**TABLE 7-19. (Continued)****Analysis of All Skin and Systemic Neoplasms  
(Verified)****i1) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted**

Current Dioxin Category	n	Percent Yes	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	19.6	All Categories		0.679
Unknown	345	20.6	Unknown vs. Background	1.06 (0.78,1.46)	0.702
Low	196	23.5	Low vs. Background	1.26 (0.87,1.83)	0.230
High	187	21.4	High vs. Background	1.12 (0.76,1.65)	0.580
Total	1,514				

**j1) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted**

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	779	All Categories		0.576	AGE (p<0.001) CARCIN (p=0.125)
Unknown	340	Unknown vs. Background	1.05 (0.77,1.44)	0.757	
Low	193	Low vs. Background	1.24 (0.84,1.81)	0.276	
High	185	High vs. Background	1.25 (0.84,1.87)	0.267	
Total	1,497				

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.

Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.

Low (Ranch Hands): 15 ppt < Current Dioxin  $\leq$ 33.3 ppt.

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

In the current report, the data analyzed can be divided into two broad categories: cutaneous and systemic neoplasms of benign or malignant nature. Except for the occupation-specific analyses, there was no increased risk for the development of any malignant skin neoplasm related to the body burden of dioxin. The analyses by occupation were performed because different occupational duties resulted in different degrees of exposure. In association with the current and extrapolated initial levels of serum dioxin, a statistically significant increase in the incidence of basal cell skin cancers of other sites (excluding ear, face, head,

In the current report, the data analyzed can be divided into two broad categories: cutaneous and systemic neoplasms of benign or malignant nature. Except for the occupation-specific analyses, there was no increased risk for the development of any malignant skin neoplasm related to the body burden of dioxin. The analyses by occupation were performed because different occupational duties resulted in different degrees of exposure. In association with the current and extrapolated initial levels of serum dioxin, a statistically significant increase in the incidence of basal cell skin cancers of other sites (excluding ear, face, head,

TABLE 7-19. (Continued)

Analysis of All Skin and Systemic Neoplasms  
(Verified and Suspected)

## j2) Ranch Hands and Comparisons by Current Dioxin Category - Unadjusted

Current Dioxin Category	n	Percent Yes	Percent Current Dioxin	Contrast	Est. Relative Risk (95% C.I.)	p-Value
Background	786	19.8	21.2	All Categories		0.730
Unknown	345	20.6	21.3	Unknown vs. Background	1.05 (0.76,1.43)	0.777
Low	196	23.5	21.3	Low vs. Background	1.24 (0.85,1.80)	0.263
High	187	21.4	21.3	High vs. Background	1.10 (0.74,1.63)	0.636
Total	1,514					

## j2) Ranch Hands and Comparisons by Current Dioxin Category - Adjusted

Current Dioxin Category	n	Contrast	Adj. Relative Risk (95% C.I.)	p-Value	Covariate Remarks
Background	779	All Categories		0.629	AGE (p<0.001)
Unknown	340	Unknown vs. Background	1.03 (0.75,1.42)	0.833	CARCIN (p=0.143)
Low	193	Low vs. Background	1.22 (0.83,1.78)	0.313	
High	185	High vs. Background	1.23 (0.83,1.84)	0.303	
Total	1,497				

Note: Background (Comparisons): Current Dioxin  $\leq$ 10 ppt.Unknown (Ranch Hands): Current Dioxin  $\leq$ 10 ppt.Low (Ranch Hands): 15 ppt  $<$  Current Dioxin  $\leq$ 33.3 ppt.High (Ranch Hands): Current Dioxin  $>$ 33.3 ppt.

## DISCUSSION

In ambulatory medicine, the recommendation that asymptomatic individuals undergo periodic physical examinations is based largely on the assumption that such screening will reveal occult malignancy. Although the guidelines for the frequency and content of such examinations are subject to debate, there is no doubt that early detection affords the best and, in most forms of cancer, the only chance for cure. While no one screening test is absolutely reliable, the scope and depth of the protocol employed in this longitudinal study far exceed what would be considered routine in clinical practice.

As the anatomic point of contact with industrial toxins and as the only organ system with a clearly defined clinical endpoint (chloracne) for TCDD exposure, the skin deserves the special emphasis it has received in this study. Though there is no other epidemiologic evidence that TCDD exposure causes—or that chloracne is associated with—basal cell carcinoma, an increased incidence of these skin cancers in the Ranch Hand cohort has been documented in each of the three physical examination cycles.

At the Baseline examination, a significantly higher rate of verified basal cell carcinoma was found in the Ranch Hand cohort in the unadjusted analysis. After the Baseline, heightened efforts were made to clarify the contribution of risk factors such as cumulative sun exposure; skin tannability; eye, skin, and hair color; parental ethnicity; and lifetime cigarette smoking history. In the 1985 examination, the adjusted analysis of verified basal cell carcinoma again displayed a significant group difference. In the 1987 examination, which included biopsies from 19 Ranch Hands and 20 Comparisons, the adjusted group contrast for the verified basal cell carcinoma history was significant ( $p=0.030$ ); the adjusted group contrast for the verified and suspected set of basal cell carcinomas was marginally significant ( $p=0.053$ ). In contrast to the significant group differences reported for the 1985 and 1987 examinations, the relative risks for basal cell carcinoma and sun exposure-related malignant skin neoplasms often were less than 1 in these serum dioxin analyses.

With reference to systemic neoplasms, the frequency of systemic cancer in Ranch Hands and Comparisons was similar for the 1987 examination of AFHS. Though the statistical power for detecting group differences in the incidence of specific rare systemic neoplasms is low, the Ranch Hand and Comparison group frequencies have not differed over time and no significant group differences in cancer-related mortality have been found. For the 1985 examination, one Ranch Hand and one Comparison had verified STS (fibrous histiocytoma and fibrosarcoma, respectively). The Ranch Hand was not part of the 1987 study because he died; the Comparison with the fibrosarcoma was part of the 1987 examination. At the 1985 examination, one Ranch Hand was classified as having suspected leukemia, HD, or NHL. He was diagnosed as a verified leukemia by the time of the 1987 examination. At the 1987 examination, there was one verified case of NHL in a Ranch Hand.

In the current report, the data analyzed can be divided into two broad categories: cutaneous and systemic neoplasms of benign or malignant nature. Except for the occupation-specific analyses, there was no increased risk for the development of any malignant skin neoplasm related to the body burden of dioxin. The analyses by occupation were performed because different occupational duties resulted in different degrees of exposure. In association with the current and extrapolated initial levels of serum dioxin, a statistically significant increase in the incidence of basal cell skin cancers of other sites (excluding ear, face, head,

and neck) was noted in the enlisted flyer category but not in the enlisted groundcrew category, which, on the whole, was more heavily exposed to TCDD. Furthermore, in a pattern consistent with a dose-response effect, a significantly higher incidence (4/32, 12.5%) of basal cell skin cancers was noted in Ranch Hand enlisted flyers with high levels of serum dioxin ( $p=0.020$ ) when contrasted with Comparisons (1/108, 0.9%); a higher but nonsignificant incidence also was found for Ranch Hands with low levels (1/50, 2.0%) versus Comparisons. The importance of these positive associations is uncertain, however, because the isolated findings were limited to one occupational cohort.

In the analysis of systemic neoplasms, a few statistically significant positive associations were found; however, this was due to an increased incidence of benign (but not malignant) neoplasms in the Ranch Hand group. Lipomas are one example of a benign systemic neoplasm. Under the maximal assumption, in a pattern consistent with a dose-response, Ranch Hand participants with high levels of extrapolated initial serum dioxin had a greater incidence (9.7%) of benign systemic neoplasms than did Ranch Hands with medium or low levels (5.7% and 1.6%). In the adjusted analysis, the relative risk remained significant ( $p<0.001$ ). In the analysis of current serum dioxin by time since tour, this positive association was stronger in participants with more than 18.6 years since service in SEA. Furthermore, Ranch Hands with the highest levels of current serum dioxin (>33.3 ppt) had a significantly higher incidence (10.2%) of benign systemic neoplasms ( $p=0.043$ ) versus the Comparisons (4.1%).

In contrast, there was no evidence for any positive association between the current or extrapolated initial body burden of dioxin and the incidence of any malignant systemic neoplasm. Relative to the Comparisons (1.7%), Ranch Hands with low serum dioxin levels (15 ppt to 33.3 ppt) had a significantly higher frequency (5.1%) of malignant systemic neoplasms ( $p=0.016$ ), but Ranch Hands with high serum dioxin (over 33.3 ppt) had a lower frequency (0.0%) that was not significant ( $p=0.122$ ). The study provides no evidence of increased incidence for the neoplasms most commonly associated with exposure to chlorophenols (HD, NHL, and STS). However, the number of participants with these specific neoplasms was very small; therefore, the statistical power to detect relative risks and group differences was low.

In summary, the increased incidence of basal cell skin cancers in Ranch Hands documented in previous examination cycles was not associated significantly with serum dioxin, except within the enlisted flyers at sites other than ear, face, head, and neck. In the analysis of systemic neoplasms, in a pattern consistent with a dose-response, an increased incidence of benign neoplasms was noted in the Ranch Hand cohort, particularly in those participants most removed from Vietnam. Finally, relative to the Comparisons, there was no increased incidence of any malignant systemic neoplasm in Ranch Hands with the highest serum dioxin levels.

## SUMMARY

For the malignancy assessment, Tables 7-20, 7-21, and 7-22 summarize the results from analyses based on initial dioxin, current dioxin and time since tour, and categorized current dioxin. All variables were discrete.

TABLE 7-20

**Summary of Initial Dioxin Analyses for Malignancy Variables  
Based on Minimal and Maximal Assumptions  
(Ranch Hands Only)**

Variable	Unadjusted		Adjusted	
	Minimal	Maximal	Minimal	Maximal
<b>Skin Neoplasms</b>				
<u>Behavior</u>				
All	-0.014	ns*	-0.021	ns
Malignant, Hand, and Neck	-0.014	ns	** (ns)	ns
Benign (Non-Blacks Only)	ns	ns	ns	ns
Benign (Blacks Included)	ns	ns	ns	ns
Uncertain Behavior or Unspecified Nature	--	--	--	--
<u>Cell Type</u>				
Basal Cell Carcinoma				0.049
All Sites Combined	-0.037	ns	ns	ns
Ear, Face, Head, and Neck	-0.002	-0.017	-0.025	ns*
Trunk	ns	NS	NS	NS
Upper Extremities	ns	ns	--	ns
Lower Extremities	--	--	--	--
Other Sites and NOS	NS	NS	NS	NS
<u>Sun Exposure-Related Malignant Skin Neoplasms</u>				
All Sites Combined	-0.014	ns	** (ns)	ns
Ear, Face, Head, and Neck	-0.003	-0.031	-0.047	ns
Trunk	ns	ns	ns	ns
Upper Extremities	NS	ns	--	ns
Lower Extremities	--	--	--	--
Other Sites and NOS	NS	NS	NS	NS
<u>Malignant Systemic Neoplasms by Location/Site</u>				
Ear, Face, Head, and Neck	--	--	--	--
Oral Cavity, Pharynx, and Larynx	--	--	--	--

TABLE 7-20. (Continued)

**Summary of Initial Dioxin Analyses for Malignancy Variables  
Based on Minimal and Maximal Assumptions  
(Ranch Hands Only)**

Variable	Unadjusted		Adjusted	
	Minimal	Maximal	Minimal	Maximal
<b>Melanoma</b>				
All Sites Combined	--	ns	--	ns
Ear, Face, Head, and Neck	--	--	--	--
Trunk	-0.011	ns	--	--
Upper Extremities	--	--	--	--
Lower Extremities	--	--	--	--
Other Sites and NOS	--	--	--	--
<b>Squamous Cell Carcinoma</b>				
	ns	NS	ns	NS
<b>Basal Cell Carcinoma</b>				
<u>by Occupation</u>				
Officer -				
Ear, Face, Head, and Neck vs. None	NS	NS	NS	NS
Officer -				
Other Sites vs. None	--	ns	--	ns
Enlisted Flyer -				
Ear, Face, Head, and Neck vs. None	ns	ns	ns	ns
Enlisted Flyer -				
Other Sites vs. None	+0.050	+0.015	NS	+0.039
Enlisted Groundcrew -				
Ear, Face, Head, and Neck vs. None	-0.005	ns*	-0.021	ns
Enlisted Groundcrew -				
Other Sites vs. None	ns*	ns	ns	ns

**SUMMARY**

For the malignancy assessments, Tables 7-20, 7-21, and 7-22 summarize the results from analyses based on initial dioxin, current dioxin and time since tour, and  $\text{Ca}^{2+}$ -corrected current dioxin. All variables were discrete.

TABLE 7-20. (Continued)

**Summary of Initial Dioxin Analyses for Malignancy Variables  
Based on Minimal and Maximal Assumptions  
(Ranch Hands Only)**

Variable	Unadjusted		Adjusted	
	Minimal	Maximal	Minimal	Maximal
<b><u>Sun Exposure-Related</u></b>				
<b><u>Malignant Skin</u></b>				
<b><u>Neoplasm by Occupation</u></b>				
Officer -				
Ear, Face, Head, and Neck vs. None	ns	NS	ns	NS
Officer -				
Other Sites vs. None	ns	ns	ns	ns
Enlisted Flyer -				
Ear, Face, Head, and Neck vs. None	ns	ns	ns	ns
Enlisted Flyer -				
Other Sites vs. None	NS*	+0.015	NS	+0.049
Enlisted Groundcrew -				
Ear, Face, Head, and Neck vs. None	-0.022	ns	ns*	ns
Enlisted Groundcrew -				
Other Sites vs. None	ns*	ns	ns	ns
<b><u>Basal Cell Carcinoma</u></b>				
<b><u>(Number)</u></b>				
One vs. None	ns	ns	ns	ns
Multiple vs. None	-0.026	ns	ns	ns
<b><u>Systemic Neoplasms</u></b>				
All	NS	ns*	+0.009	NS
Malignant	-0.048	ns	ns	ns
Benign	+0.022	+0.001	+0.015	+<0.001
Uncertain Behavior or Unspecified Nature	ns	NS	ns	NS
<b><u>Malignant Systemic Neoplasms</u></b>				
<b><u>by Location/Site</u></b>				
Ear, Face, Head, and Neck	--	--	--	--
Oral Cavity, Pharynx, and Larynx	--	--	--	--

TABLE 7-20. (Continued)

**Summary of Initial Dioxin Analyses for Malignancy Variables  
Based on Minimal and Maximal Assumptions  
(Ranch Hands Only)**

Variable	Unadjusted		Adjusted	
	Minimal	Maximal	Minimal	Maximal
<b>Malignant Systemic Neoplasms by Location/Site (continued)</b>				
Brain				
Thymus and Mediastinum	--	--	--	--
Thyroid Gland	--	--	--	--
Bronchus and Lung	--	--	--	--
Colon and Rectum	--	--	--	--
Kidney and Bladder	ns	ns	ns	ns
Prostate	ns	NS	--	--
Testicles	ns	NS	ns	NS
Ill-Defined Sites	--	--	--	--
Carcinoma In Situ of Penis	--	--	--	--
Carcinoma In Situ of Other and Unspecified Sites	--	--	--	--
Hodgkin's Disease	--	--	--	--
Leukemia	--	--	--	--
Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue	--	ns	--	--
<b>Skin and Systemic Neoplasms</b>				
All	ns	NS	ns	NS

+: Relative risk 1.00 or greater.

-: Relative risk less than 1.00.

NS/ns: Not significant ( $p>0.10$ ).NS\*/ns\*: Marginally significant ( $0.05 < p \leq 0.10$ ).

--: Analysis not performed due to sparse data.

\*\* (ns):  $\log_2$  (initial dioxin)-by-covariate interaction ( $0.01 < p \leq 0.05$ ); not significant when interaction is deleted; refer to Table F-1 for a detailed description of this interaction.Note: P-value given if  $p \leq 0.05$ .

A capital "NS" denotes relative risk 1.00 or greater; a lower case "ns" denotes relative risk less than 1.00.

TABLE 7-21.

**Summary of Current Dioxin and Time Analyses for Malignancy  
Variables Based on Minimal and Maximal Assumptions  
(Ranch Hands Only)**

Variable	C*T	Unadjusted		C*T	Maximal			
		Minimal	Maximal		Minimal	Maximal		
<b>Skin Neoplasms</b>								
<u>Behavior</u>								
All	NS	ns*	ns*	NS	ns*	ns		
Malignant	NS	-0.046	ns	NS	ns	ns		
Benign (Non-Blacks only)	NS	ns	ns	NS	ns	NS		
Benign (Blacks Included)	NS	ns	ns	NS	ns	NS		
Uncertain Behavior or Unspecified Nature	--	--	--	--	--	--		
<u>Cell Type</u>								
<b>Basal Cell Carcinoma</b>								
All Sites Combined	ns	ns	ns	NS	ns	ns		
Ear, Face, Head, and Neck	ns	ns	-0.011	ns	ns	ns*		
Trunk	ns	ns	ns	NS	ns	NS		
Upper Extremities	--	--	--	--	--	--		
Lower Extremities	--	--	--	--	--	--		
Other Sites and NOS	--	--	NS	--	--	NS		
<b>Sun Exposure-Related Malignant Skin Neoplasms</b>								
All Sites Combined	NS	ns*	ns	NS	ns	ns		
Ear, Face, Head, and Neck	ns	ns*	-0.029	ns	ns	ns		
Trunk	NS	ns	ns	NS	ns	ns		
Upper Extremities	--	--	NS	--	--	ns		
Lower Extremities	--	--	--	--	--	--		
Other Sites and NOS	--	--	NS	--	--	NS		

TABLE 7-21. (Continued)

**Summary of Current Dioxin and Time Analyses for Malignancy**  
**Variables Based on Minimal and Maximal Assumptions**  
**(Ranch Hands Only)**

Variable	C*T	Unadjusted		C*T	Unadjusted	
		Minimal	Maximal		Minimal	Maximal
<b>Melanoma</b>						
All Sites Combined	--	--	--	--	--	--
Ear, Face, Head, and Neck	2.1	--	--	2.1	--	ns
Trunk	2.1	--	--	2.1	--	--
Upper Extremities	2.1	ns	--	2.1	--	--
Lower Extremities	2.1	ns	--	2.1	--	--
Other Sites and NOS	--	ns	--	--	--	--
<b>Squamous Cell Carcinoma</b>						
ns	--	--	--	--	ns	--
<b>Basal Cell Carcinoma</b>						
<u>by Occupation</u>						
Officer -						
Ear, Face, Head, and Neck vs. None	NS	-1.0	ns	ns	NS	NS
Officer -						
Other Sites vs. None	--	--	--	--	NS	ns
Enlisted Flyer -						
Ear, Face, Head, and Neck vs. None	--	NS	--	--	ns	--
Enlisted Flyer -						
Other Sites vs. None	+0.011	NS	+0.037	+0.017	NS	+0.037
Enlisted Groundcrew -						
Ear, Face, Head, and Neck vs. None	NS	ns*	-0.047	NS	ns*	ns
Enlisted Groundcrew -						
Other Sites vs. None	ns	ns	ns	NS	ns	ns

TABLE 7-21. (Continued)

**Summary of Current Dioxin and Time Analyses for Malignancy  
Variables Based on Minimal and Maximal Assumptions  
(Ranch Hands Only)**

Variable	C*T	Unadjusted				C*T	≤18.6	>18.6			
		Minimal		Maximal							
		≤18.6	>18.6	≤18.6	>18.6						
<b><u>Sun Exposure-Related Malignant Skin Neoplasm by Occupation</u></b>											
Officer -											
Ear, Face, Head, and Neck vs. None	NS	ns	ns	ns	ns	NS	NS	NS			
Officer -	--	--	ns	NS	--	ns	ns	ns			
Enlisted Flyer -											
Ear, Face, Head, and Neck vs. None	--	ns	--	--	--	ns	--				
Enlisted Flyer -											
Other Sites vs. None	+0.010	NS	+0.037	+0.017	NS	+0.038					
Enlisted Groundcrew -											
Ear, Face, Head, and Neck vs. None	NS	ns*	ns	NS	ns*	ns					
Enlisted Groundcrew -											
Other Sites vs. None	NS	ns	ns	NS	ns	ns					
<b><u>Basal Cell Carcinoma (Number)</u></b>											
One vs. None	NS	ns	ns	ns	ns	ns	ns	ns			
Multiple vs. None	ns	ns	ns	NS	ns	ns	ns	ns			
<b><u>Systemic Neoplasms</u></b>											
All	NS	ns	NS	ns	NS	NS	NS*				
Malignant	ns	ns	ns	ns	ns	NS	ns				
Benign	NS	NS	+0.035	NS	NS	NS*	+0.013				
Uncertain Behavior or Unspecified Nature	--	--	ns	--	--	--	NS				
<b><u>Malignant Systemic Neoplasms by Location/Site</u></b>											
Ear, Face, Head, and Neck	--	--	--	--	--	--	--	--			
Oral Cavity, Pharynx, and Larynx	--	--	--	--	--	--	--	--			

TABLE 7-21. (Continued)

**Summary of Current Dioxin and Time Analyses for Malignancy Variables Based on Minimal and Maximal Assumptions (Ranch Hands Only)**

Variable	C*T	Unadjusted		C*T	Maximal			
		Minimal	Unadjusted		Minimal	Unadjusted		
<b>Malignant Systemic Neoplasms by Location/Site (continued)</b>								
All Sites Combined								
Brain	--	--	--	--	--	--		
Thymus and Mediastinum	--	--	--	--	--	--		
Thyroid Gland	--	--	--	--	--	--		
Bronchus and Lung	--	--	--	--	--	--		
Colon and Rectum	--	--	--	--	--	--		
Kidney and Bladder	--	--	ns	--	--	ns		
Prostate	--	--	--	--	--	--		
Testicles	--	ns	--	--	--	NS		
Ill-Defined Sites	--	--	--	--	--	--		
Carcinoma In Situ of Penis	--	--	--	--	--	--		
Carcinoma In Situ of Other and Unspecified Sites	--	--	--	--	--	--		
Hodgkin's Disease	--	--	--	--	--	--		
Leukemia	--	--	--	--	--	--		
Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue	--	--	--	--	--	ns		
<b>Skin and Systemic Neoplasms</b>								
All	NS	ns	ns	NS	ns	NS		

+: C\*T: Relative risk for  $\leq 18.6$  category less than relative risk for  $> 18.6$  category.

--:  $\leq 18.6$  and  $> 18.6$ : Relative risk 1.00 or greater.

-:  $\leq 18.6$  and  $> 18.6$ : Relative risk less than 1.00.

NS/ns: Not significant ( $p > 0.10$ ).

NS\*/ns\*: Marginally significant ( $0.05 < p \leq 0.10$ ).

--: Analysis not performed due to sparse data.

Note: P-value given if  $p \leq 0.05$ .

A capital "NS" denotes relative risk for  $\leq 18.6$  category less than relative risk for  $> 18.6$  category or relative risk 1.00 or greater. A lowercase "ns" denotes relative risk for  $\leq 18.6$  category greater than relative risk for  $> 18.6$  category or relative risk less than 1.00.