

ETHYL CORPORATION

INTER-OFFICE CORRESPONDENCE

TO	C. B. Hunt	ADDRESS	Houston Plant
FROM	J. P. Gibbs, M. D.	ADDRESS	Houston Plant
SUBJECT	Surveillance for liver disease in Houston Plant Employees	DATE	August 14, 1984

As part of our physical examination program we routinely check several factors (on blood test) that indirectly provide information regarding the status of the liver.

These tests include:

- Total Protein
- Albumin
- Globulin
- Total Bilirubin
- Direct Bilirubin
- Alkaline Phosphatase
- G-Glutamyl Transpeptidase
- SGOT
- SGPT
- LGH

Each of these tests is done annually and the results compared against normal ranges established for healthy populations. In addition, the average values for our employees are computed and compared with averages experienced in a much larger population tested by our commercial laboratory (MetPath). In this way, hopefully, we would be able to detect any minor abnormalities that might affect a large number of employees.

The two most sensitive of these tests, which frequently become abnormal when the other tests remain normal are the SGPT and SGOT (enzyme tests). These enzymes are easily measured and when elevated imply some damage to liver cells, however, other testing is required to determine the cause of the damage. The attached figures 1 and 3 show a month by month comparison of our mean values for SGPT and SGOT respectively over a 12 month period. Figures 2 and 4 show a frequency distribution plot for all of our values in the first quarter of 1984 for SGPT and SGOT respectively. The several values above 2 standard deviations represent multiple rechecks on 3 or 4 employees with high enzyme levels.

By far the most common cause of high SGOT and SGPT levels is excessive alcohol consumption. The employee is counselled regarding the effects of alcohol and the risks of cirrhosis and if it is evident that alcohol could be a factor the employee is asked to stop drinking and the tests repeated at 2 or 3 week intervals until they return to normal.

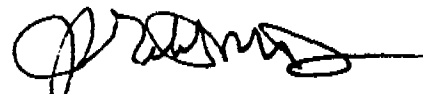
August 14, 1984

One employee was recently found to have persistently elevated liver enzyme levels that could not be attributed directly to alcohol or to any medications. Since he worked as an outside machinist it was assumed that he could potentially have been exposed to any of the chemicals that we have here on the Plant, although no particular exposure incidents could be recalled. He was referred to a gastroenterologist for further evaluation which included nuclear scans of the liver, special blood tests and a liver biopsy. The scans and blood tests were normal and the biopsy revealed mild to moderate fatty infiltrate (steatosis). Figure 5 taken from Zimmerman's textbook of Hepatotoxicity lists several possible findings on a liver biopsy and agents associated with each finding. Figure 6 also taken from Zimmerman's text lists agents known to produce Steatosis. Unfortunately, there is no way to determine if this employee's steatosis (fatty liver) is due to a toxic exposure or to some other condition (such as obesity). If it is presumed to be due to a toxic exposure, there is no laboratory test available to determine what the responsible agent is nor is there any way to test for the presence of any suspected agents in the blood or liver cells.

In order to determine if other employees with similar possible chemical exposure histories had an increased incidence of abnormal liver enzyme tests, I reviewed the medical records of all other employees who have been working as shift Machinists for at least a year at the Houston Plant.

In figure 7, I have compared their SGPT and SGOT enzyme levels with those of the remainder of the employees at the Houston Plant and with MetPath's average values. I do not think that there is any statistically significant difference between the group of outside machinists and the total Houston Plant population or between the Houston Plant population and the much larger population that MetPath serves. I would therefore conclude that there is not any significant exposure to liver toxins occurring routinely at the Houston Plant.

It is well known that a number of agents can produce an hepatic injury that appears to be an expression of special individual susceptibility instead of intrinsic toxicity of the offending agent. This could possibly be the case with the employee with steatosis. In such cases, I recommend that the employee be restricted from any likely exposure to any suspected liver toxins unless a definite cause of his liver disease (such as alcohol) is found.



J. P. Gibbs, M. D.

JPG:iz

cc: G. B. Meyers, M. D.

ETHYL CORP

EGPT

METPATH DATA

	0.00	10.00	20.00	30.00	40.00	50.00
MAR 84	I	*****	*****	*****	*****	*****
MEAN	I	34.51				
S.D.	I	28.57				
COUNT	I	55				
FEB 84	I	*****	*****	*****	*****	*****
MEAN	I	31.73				
S.D.	I	25.01				
COUNT	I	67				
JAN 84	I	*****	*****	*****	*****	*****
MEAN	I	34.43				
S.D.	I	27.29				
COUNT	I	67				
C 83	I	*****	*****	*****	*****	*****
IN	I	30.81				
D.	I	16.29				
COUNT	I	26				
NOV 83	I	*****	*****	*****	*****	*****
MEAN	I	32.95				
S.D.	I	16.51				
COUNT	I	57				
OCT 83	I	*****	*****	*****	*****	*****
MEAN	I	30.65				
S.D.	I	15.57				
COUNT	I	57				
SEP 83	I	*****	*****	*****	*****	*****
MEAN	I	29.33				
S.D.	I	15.11				
COUNT	I	55				
AUG 83	I	*****	*****	*****	*****	*****
MEAN	I	27.65				
S.D.	I	26.70				
COUNT	I	51				
JUL 83	I	*****	*****	*****	*****	*****
MEAN	I	27.79				
S.D.	I	16.37				
COUNT	I	58				
JUN 83	I	*****	*****	*****	*****	*****
MEAN	I	32.00				
S.D.	I	19.04				
COUNT	I	53				
MAY 83	I	*****	*****	*****	*****	*****
MEAN	I	31.54				
S.D.	I	16.46				
COUNT	I	56				
APR 84	I	*****	*****	*****	*****	*****
MEAN	I	32.82				
S.D.	I	18.54				
COUNT	I	55				

ETHYL MEAN
4/83 → 3/84
N = 657

METPATH MEAN = 30.0
4/83 → 3/84

	0.00	10.00	20.00	30.00	40.00
MAR 84	I	*****	*****	*****	*****
MEAN	I	28.53			
S.D.	I	64.15			
G.T.	I	100000			
FEB 84	I	*****	*****	*****	*****
MEAN	I	27.70			
S.D.	I	68.14			
G.T.	I	100000			
JAN 84	I	*****	*****	*****	*****
MEAN	I	29.16			
S.D.	I	69.16			
G.T.	I	100000			
DEC 83	I	*****	*****	*****	*****
MEAN	I	29.61			
S.D.	I	74.21			
G.T.	I	100000			
NOV 83	I	*****	*****	*****	*****
MEAN	I	28.75			
S.D.	I	80.07			
G.T.	I	100000			
OCT 83	I	*****	*****	*****	*****
MEAN	I	29.77			
S.D.	I	72.86			
G.T.	I	100000			
SEP 83	I	*****	*****	*****	*****
MEAN	I	30.77			
S.D.	I	71.14			
G.T.	I	100000			
AUG 83	I	*****	*****	*****	*****
MEAN	I	29.95			
S.D.	I	74.98			
G.T.	I	100000			
JUL 83	I	*****	*****	*****	*****
MEAN	I	30.01			
S.D.	I	78.45			
G.T.	I	100000			
JUN 83	I	*****	*****	*****	*****
MEAN	I	31.87			
S.D.	I	91.30			
G.T.	I	100000			
MAY 83	I	*****	*****	*****	*****
MEAN	I	32.73			
S.D.	I	86.83			
G.T.	I	100000			
APR 83	I	*****	*****	*****	*****
MEAN	I	31.54			
S.D.	I	71.01			

Figure I

EC 2980

TEST RESULT
GROUPINGS

0.0 - 2.50 2-SD I
2.51- 5.00 I
5.01- 7.50 IXX
7.51- 10.00 IXXX
10.01- 12.50 IXX
12.51- 15.00 IXXXXXXXXXX
15.01- 17.50 IXXXXXXXXXXXXXX
17.51- 20.00 IXXXXXXXXXXXXXXXXXX
20.01- 22.50 IXXXXX
22.51- 25.00 IXXXXXXXXXXXXXXXXXXXXX
25.01- 27.50 IXXXXXXXXXXXXX
27.51- 30.00 IXXXXXXXXXXXXXXXXXXXXX
30.01- 32.50 MEAN IXXXXXXXXXXXXX
32.51- 35.00 IXXXXXXXXXXXXX
35.01- 37.50 IXXXXXXXXXXXXX
37.51- 40.00 IXXXXX
40.01- 42.50 IXXXXXXXXXXXXX
42.51- 45.00 IXXXXX
45.01- 47.50 IXXXX
47.51- 50.00 IXXXX
50.01- 52.50 IX
52.51- 55.00 IXX
55.01- 57.50 IX
57.51- 60.00 IX
60.01- 62.50 2-SD I
62.51- 65.00 I
65.01- 67.50 IX
67.51- 70.00 IX
70.01- 72.50 IX
72.51- 75.00 IX
75.01- 77.50 I
77.51- 80.00 I
80.01- 82.50 I
82.51- 85.00 IX
85.01- 87.50 IXX
87.51- 90.00 I
90.01- 92.50 IXX
92.51- 95.00 I
95.01- 97.50 I
97.51- 100.00 I
100.01- 102.50 I
102.51- 105.00 I
105.01- 107.50 I
107.51- 110.00 I
110.01- 112.50 I
112.51- 115.00 I
115.01- 117.50 I
117.51- 120.00 I
120.01-9999.99 IXXX

EC 2981

FIGURE 2

XXXX FREQUENCY DISTRIBUTION XXXX

SPECIMEN *
COUNT *

ETHYL CORP
STATISTICAL SUMMARY
FROM 1/1/84 TO 3/31/84
ACCOUNT 20692

TEST 1758 TRANSAMINASE, SGP

REFERENCE RANGE
UNADJUSTED FOR AGE AND SEX
1-70 UNITS/L

LOW 7.00
HIGH 212.00

RAW STATISTICS

SAMPLE SIZE = 189
MEAN = 33.497
STD. DEV. = 26.782
CO. OF VAR. = 79.954

REFINED STATISTICS
(VALUES BEYOND 3 S.D. OMITTED)

SAMPLE SIZE = 186
MEAN = 30.710
STD. DEV. = 15.376
CO. OF VAR. = 50.870
MEDIAN = 27.51- 30.00
MODE = 22.51- 25.00

PREVIOUS MONTH

MEAN = 34.510
STD. DEV. = 28.57

ACTUAL COUNTS BASED ON
DEPENDENT REFERENCE RA.

	COUNT	PCT.
TOTAL	189	100
INSIDE REF. RANGE	175	93
OUTSIDE REF. RANGE	14	7

SCALE: 1 SYMBOL = 1 OCCURRENCE

SCOT

ETHYL CORP

0.00 10.00 20.00 30.00 40.00 50.00

Month	MEAN	S.D.	COUNT
MAR 84	29.60	13.99	55
FEB 84	23.94	10.32	67
JAN 84	24.46	10.37	67
DEC 83	22.58	7.76	26
NOV 83	24.46	8.41	57
OCT 83	24.95	9.57	56
SEP 83	28.29	8.79	55
AUG 83	27.12	16.69	50
JUL 83	25.77	9.25	57
JUN 83	27.09	9.56	53
MAY 83	26.23	8.54	56
APR 83	27.18	10.55	

ETHYL MEAN = 26.0

N = 654

4/83 → 3/84

METPATH MEAN = 29.2

4/83 → 3/84

EC 2982

FIGURE 3

METPATH DATA

0.00 10.00 20.00 30.00 40.00

Month	MEAN	S.D.	G.T.
MAR 84	29.18	42.84	100000
FEB 84	28.68	47.14	100000
JAN 84	29.34	50.72	100000
DEC 83	29.76	54.11	100000
NOV 83	29.11	54.84	100000
OCT 83	28.90	47.16	100000
SEP 83	29.15	49.11	100000
AUG 83	29.37	52.24	100000
JUL 83	28.84	54.04	100000
JUN 83	29.43	64.59	100000
MAY 83	29.92	59.20	100000
APR 83	28.50		

EST RESULT
GE GROUPINGS

0 0 -	2.00	I
2.01 -	4.00	I
4.01 -	6.00	I
6.01 -	8.00	I
8.01 -	10.00	2-SD I
10.01 -	12.00	I****
12.01 -	14.00	I*****
14.01 -	16.00	I*****
16.01 -	18.00	I*****
18.01 -	20.00	I*****
20.01 -	22.00	I*****
22.01 -	24.00	I*****
24.01 -	26.00	MEAN I*****
26.01 -	28.00	I*****
28.01 -	30.00	I*****
30.01 -	32.00	I*****
32.01 -	34.00	I*****
34.01 -	36.00	I*
36.01 -	38.00	I**
38.01 -	40.00	2-SD I
40.01 -	42.00	I
42.01 -	44.00	I
44.01 -	46.00	I*
46.01 -	48.00	I***
48.01 -	50.00	I
50.01 -	52.00	I
52.01 -	54.00	I
54.01 -	56.00	I
56.01 -	58.00	I
58.01 -	60.00	I*
60.01 -	62.00	I
62.01 -	64.00	I*
64.01 -	66.00	I
66.01 -	68.00	I
68.01 -	70.00	I
70.01 -	72.00	I*
72.01 -	74.00	I
74.01 -	76.00	I
76.01 -	78.00	I
78.01 -	80.00	I
80.01 -	82.00	I
82.01 -	84.00	I*
84.01 -	86.00	I
86.01 -	88.00	I
88.01 -	90.00	I
90.01 -	92.00	I
92.01 -	94.00	I
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722.01 -	724.00	I
724.01 -	726.00	I
726.01 -	728.00	I
728.01 -	730.00	I
730.01 -	732.00	I
732.01 -	734.00	I
734.01 -	736.00	I
736.01 -	738.00	I
738.01 -	740.00	I
740.01 -	742.00	I
742.01 -	744.00	I
744.01 -	746.00	I
746.01 -	748.00	I
748.01 -	750.00	I
750.01 -	752.00	I
752.01 -	754.00	I
754.01 -	756.00	I
756.01 -	758.00	I
758.01 -	760.00	I
760.01 -	762.00	I
762.01 -	764.00	I
764.01 -	766.00	I
766.		