

KE 0019071

Tank Wagon Ethyl 1927 - 1929

Lead in Urine mgs./Liter

Mgs. Pb per liter urine	1927 (exclusive of case No. 104)				Mgs. Pb per liter urine	1929			
	f	x	fx	fx ²		f	x	fx	fx ²
.0 - .039					.0 - .039	6	0	0	0
.04 - .079	10	0	0	0	.04 - .079	11	1	11	11
.08 - .119	5	1	5	5	.08 - .119	2	2	4	8
.12 - .159	3	2	6	12	.12 - .159	1	3	3	9
.16 - .199	1	3	3	9	.16 - .199	1	4	4	16
.20 - .239	0	4	0	0	.20 - .239	0	5	0	0
.24 - .279	0	5	0	0	.24 - .279	1	6	6	36
.28 - .319	0	6	0	0	.28 - .319	0	7	0	0
.32 - .359	1	7	7	49	.32 - .359	1	8	8	64
.36 - .399	1	8	8	64	.36 - .399	0	9	0	0
.40 - .439	1	9	9	81	.40 - .439	0	10	0	0
.44 - .479	0	10	0	0	.44 - .479	0	11	0	0
.48 - .519	0	11	0	0	.48 - .519	0	12	0	0
.52 -	1	12	12	144	.52 -	1	13	13	169
	23		50	364		24		49	313

$$Nu_1 = \frac{50}{23} = 2.173913$$

$$Nu_1 = \frac{49}{24} = 2.041666$$

$$Nu_2 = \frac{364}{23} = 15.826087$$

$$Nu_2 = \frac{313}{24} = 13.041666$$

$$(Nu_1)^2 = 4.725898$$

$$(Nu_1)^2 = 4.168400$$

$$Pi_2 = 11.100189$$

$$Pi_2 = 8.873266$$

$$\text{Sigma} = 3.331694 \times .04 = .133268 \text{ mgs.}$$

$$\text{Sigma} = 2.978803 \times .04 = .119152 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .133268}{6.782329} = \frac{.089888}{6.782329}$$

$$\text{P.E. sig.} = \frac{.67449 \times .119152}{6.928203} = \frac{.080367}{6.928203}$$

$$= \pm .013253$$

$$= \pm .011599$$

$$\text{mean} = 2.173913 \times .04 + .06$$

$$\text{mean} = 2.041616 \times .04 + .02$$

$$= .146957 \text{ mgs.}$$

$$= .101667 \text{ mgs.}$$

$$\text{P.E.}_m = \frac{.089888}{4.795831} = \pm .018743$$

$$\text{P.E.}_m = \frac{.080367}{4.898980} = \pm .016405$$

$$\text{mean} = .147 \pm .019 \text{ mgs./liter}$$

$$\text{mean} = .102 \pm .016 \text{ mgs./liter}$$

$$\text{S.D.} = .133 \pm .013$$

$$\text{S.D.} = .119 \pm .012 \text{ mgs.}$$

Test of Difference

$$\text{mean 1927} = .147$$

$$\text{mean 1929} = .102$$

$$\text{Diff.} = .045$$

$$\frac{\text{Diff.}}{\text{P.E. dif.}} = \frac{.045}{.025} = 1 +$$

$$\begin{aligned} \text{P.E. dif.} &= \sqrt{(.019)^2 + (.016)^2} \\ &= \sqrt{.000361 + .000256} \\ &= \sqrt{.000617} \end{aligned}$$

The difference is in favor of 1929 but is not significant. Note exclusion of case No. 104.

Tank Wagon Ethyl 1927 - 1929

Lead in Urine (Total)

Pb in urine mgs.	1927 (exclusive of No. 104)				Pb in urine mgs.	1929			
	f	x	fx	fx ²		f	x	fx	fx ²
.0 - .039	1	0	0	0	.0 - .039	3	0	0	0
.04 - .079	3	1	3	3	.04 - .079	6	1	6	6
.08 - .119	6	2	12	24	.08 - .119	9	2	18	36
.12 - .159	4	3	12	36	.12 - .159	4	3	12	36
.16 - .199	4	4	16	64	.16 - .199	1	4	4	16
.20 - .239	1	5	5	25	.20 - .239	0	5	0	0
.24 - .279	1	6	6	36	.24 - .279	0	6	0	0
.28 - .319	1	7	7	49	.28 -	1	7	7	49
.32 - .359	0	8	0	0		24		47	143
.36 - .399	0	9	0	0					
.40 - .439	0	10	0	0					
.44 - .479	0	11	0	0					
.48 - .519	0	12	0	0					
.52 -	2	13	26	338					
	23		87	575					

$$Nu_1 = \frac{87}{23} = 3.782609$$

$$Nu_1 = \frac{47}{24} = 1.958334$$

$$Nu_2 = \frac{575}{23} = 25.000000$$

$$Nu_2 = \frac{143}{24} = 5.958333$$

$$(Nu_1)^2 = 14.308131$$

$$(Nu_1)^2 = 3.835072$$

$$Pi_2 = 10.691869$$

$$Pi_2 = 2.123261$$

$$\text{Sigma} = 3.269842 \times .04 = .130794 \text{ mgs.}$$

$$\text{Sigma} = 1.457141 \times .04 = .058286 \text{ mgs. Pb}$$

$$\text{P.E. sig.} = \frac{.67449 \times .130794}{6.782329}$$

$$\text{P.E. sig.} = \frac{.67449 \times .058286}{\sqrt{48}} = \frac{.039313}{6.928203}$$

$$= \pm .013007$$

$$= \pm .005674$$

$$\text{mean} = 3.782609 \times .04 + .02$$

$$\text{mean} = 1.958334 \times .04 + .02$$

$$= .171304 \text{ mgs. Pb}$$

$$= .098333 \text{ mgs. Pb}$$

$$\text{P.E.}_m = \frac{.088219}{4.795831} = \pm .018395$$

$$\text{P.E.}_m = \frac{.039313}{\sqrt{24}} = \frac{.039313}{4.898980} = \pm .008025$$

$$\text{mean} = .171 \pm .018 \text{ mgs. Pb}$$

$$\text{mean} = .098 \pm .008 \text{ mgs. Pb}$$

$$\text{S.D.} = .131 \pm .013 \text{ mgs.}$$

$$\text{S.D.} = .058 \pm .006 \text{ mgs.}$$

Test of Difference

$$\text{mean 1927} = .171$$

$$\text{mean 1929} = .098$$

$$\text{Diff.} = .073$$

$$\frac{\text{Diff.}}{\text{P.E. dif.}} = \frac{.073}{.020} = 3.65 +$$

$$\begin{aligned} \text{P.E. dif.} &= \sqrt{(.018)^2 + (.008)^2} \\ &= \sqrt{.000324 + .000064} \\ &= \sqrt{.000388} \\ &= \pm .020 \end{aligned}$$

The difference is in favor of 1929 but is not significant. Note exclusion of case No. 104 - 5.00 mgs. in sample.

Tank Wagon Ethyl 1927 - 1929

Lead in Faeces mgs./gm. Ash

Mgs. Pb per gm. ash	f	<u>1927</u> x	fx	fx ²
.0 - .039	1	0	0	0
.04 - .079	4	1	4	4
.08 - .119	5	2	10	20
.12 - .159	4	3	12	36
.16 -	<u>3</u>	4	<u>12</u>	<u>48</u>
	17		38	108

No information 7, in 1927 and 1929

Mgs. Pb per gm. ash	f	x	fx	fx ²
.0 - .039				
.04 - .079	7	0	0	0
.08 - .119	2	1	2	2
.12 - .159	3	2	6	12
.16 - .199	2	3	6	18
.20 - .239	1	4	4	16
.24 - .279	1	5	5	25
.28 - .319	0	6	0	0
.32 - .359	0	7	0	0
.36 - .399	0	8	0	0
.40 - .439	0	9	0	0
.44 - .479	0	10	0	0
.48 - .519	0	11	0	0
.52 -	<u>1</u>	12	<u>12</u>	<u>144</u>
	17		35	217

$$Nu_1 = \frac{38}{17} = 2.235294$$

$$Nu_1 = \frac{35}{17} = 2.058824$$

$$Nu_2 = \frac{108}{17} = 6.352941$$

$$Nu_2 = \frac{217}{17} = 12.764705$$

$$(Nu_1)^2 = 4.996539$$

$$(Nu_1)^2 = 4.238756$$

$$Pi_2 = 1.356402$$

$$Pi_2 = 8.525949$$

$$\text{Sigma} = 1.164647 \times .04 = .046586 \text{ mgs.}$$

$$\text{Sigma} = 2.919923 \times .04 = .116797 \text{ mgs.}$$

$$\text{P.E.sig.} = \frac{.67449 \times .046586}{\sqrt{34}} = \frac{.031422}{5.830951}$$

$$\text{P.E.sig.} = \frac{.67449 \times .116797}{5.830951} = \frac{.078778}{5.830951}$$

$$= \pm .005389$$

$$= \pm .013510$$

$$\text{mean} = 2.235294 \times .04 + .02$$

$$\text{mean} = 2.058824 \times .04 + .06$$

$$= .109412 \text{ mgs. Pb}$$

$$= .142355 \text{ mgs. Pb}$$

$$\text{P.E.m} = \frac{.031422}{4.123105} = \pm .007621$$

$$\text{P.E.m} = \frac{.078778}{4.123105} = \pm .019106$$

$$\text{mean} = .109 \pm .008 \text{ mgs. Pb}$$

$$\text{mean} = .142 \pm .019 \text{ mgs. Pb}$$

$$\text{S.D.} = .047 \pm .005 \text{ mgs.}$$

$$\text{S.D.} = .117 \pm .014 \text{ mgs.}$$

Test of Difference

$$\text{mean 1929} = .142$$

$$\text{mean 1927} = .109$$

$$\text{Diff.} = .033$$

$$\frac{\text{Diff.}}{\text{P.E.dif.}} = \frac{.033}{.021} = 1 +$$

$$\begin{aligned} \text{P.E.dif.} &= \sqrt{(.008)^2 + (.019)^2} \\ &= \sqrt{.000064 + .000361} \\ &= \sqrt{.000425} \\ &= \pm .021 \end{aligned}$$

The difference is again in favor of 1927 but is not significant.

Tank Wagon Ethyl 1927 - 1929

Pb in Faeces (Total)

1927					1929				
Pb in faeces mgs.	f	x	fx	fx ²	Pb in faeces mgs.	f	x	fx	fx ²
.0 - .079					.0 - .079				
.08 - .159	3	0	0	0	.08 - .159	2	0	0	0
.16 - .239	4	1	4	4	.16 - .239	2	1	2	2
.24 - .319	3	2	6	12	.24 - .319	3	2	6	12
.32 - .399	2	3	6	18	.32 - .399	3	3	9	27
.40 - .479	3	4	12	48	.40 - .479	1	4	4	16
.48 - .559	0	5	0	0	.48 - .559	3	5	15	75
.56 -	2	6	12	72	.56 - .639	1	6	6	36
	17		40	154	.64 - .719	1	7	7	49
					.72 - .799	0	8	0	0
					.80 - .879	0	9	0	0
					.88 - .959	0	10	0	0
					.96 - 1.039	0	11	0	0
					1.04 -	1	12	12	144
						17		61	361

$$Nu_1 = \frac{40}{17} = 2.352941$$

$$Nu_1 = \frac{61}{17} = 3.589235$$

$$Nu_2 = \frac{154}{17} = 9.058824$$

$$Nu_2 = \frac{361}{17} = 21.235294$$

$$(Nu_1)^2 = 5.536331$$

$$(Nu_1)^2 = 12.882608$$

$$Pi_2 = 3.522493$$

$$Pi_2 = 8.352686$$

$$\text{Sigma} = 1.876831 \times .08 = .150146 \text{ mgs.}$$

$$\text{Sigma} = 2.890101 \times .08 = .231208 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .150146}{5.830951} = \frac{.101272}{5.830951}$$

$$\text{P.E. sig.} = \frac{.67449 \times .231208}{5.830951} = \frac{.155947}{5.830951}$$

$$= \pm .017368$$

$$= \pm .026745$$

$$\text{mean} = 2.352941 \times .08 + .12$$

$$\text{mean} = 3.589235 \times .08 + .12$$

$$= .308235 \text{ mgs. Pb}$$

$$= .407139 \text{ mgs. Pb}$$

$$\text{P.E.}_m = \frac{.101272}{4.123105} = \pm .024562$$

$$\text{P.E.}_m = \frac{.155947}{4.123105} = \pm .037829$$

$$\text{mean} = .308 \pm .025 \text{ mgs. Pb}$$

$$\text{mean} = .407 \pm .038 \text{ mgs. Pb}$$

$$\text{S.D.} = .150 \pm .017 \text{ mgs.}$$

$$\text{S.D.} = .231 \pm .027 \text{ mgs.}$$

Test of Difference

$$\text{mean 1929} = .407$$

$$\text{mean 1927} = .308$$

$$\text{Diff.} = .099$$

$$\frac{\text{Diff.}}{\text{P.E. dif.}} = \frac{.099}{.045} = 2 +$$

$$\begin{aligned} \text{P.E. dif.} &= \sqrt{(.025)^2 + (.038)^2} \\ &= \sqrt{.000625 + .001444} \\ &= \sqrt{.002069} \\ &= \pm .045 \end{aligned}$$

In this case the difference is in favor of 1927, caused by one high finding in 1929. This finding seems reasonable and cannot be excluded. The difference is not at all significant.