

ACCUMULATION OF LEAD IN GARAGES WHERE ETHYL GAS IS USED

Report of an Investigation Conducted in the Service Garage of the General Motors Research Corporation for the Purpose of Determining the Amount and Proportion of Lead in the Dust Accumulating on the Floors of Garages Used by Cars Running on Ethyl Gas.

September 30, 1923.

Summary of Results

Doctor J. C. Aub of the Harvard Medical College has stated that the absorption of 6 milligrams of lead per day by the human system over a period of time is sufficient to cause lead poisoning. The results of this test indicate that in order for an employee or patron of the garage under consideration to absorb 6 milligrams of lead he would have to extract and retain in his system all of the lead from 4.4 grams of the average floor dirt. If the region immediately surrounding a 4-cylinder engine, which was idled on Ethyl Gas throughout the period of the test, he left out of consideration, it would be necessary to extract the lead from 23.2 grams of floor dirt in order to get 6 milligrams.

Method of Making the Test

The Service Garage of the General Motors Research Corporation, which is used as a base for three Company trucks and one small touring car for service and in which the cars of 24 executives are parked daily, was set aside for the investigation. The floor of the garage was first swept thoroughly and no further sweeping was done in it during the period of the test, which was 30 working days. The time of the test was from August 8, 1923, to September 26, 1923.

All the cars and trucks coming into the garage were run on Ethyl Gas which was supplied to them from the regular supply tank of the Service Garage by means of a No. 4 Ethylizer. The composition of the Ethyl Gas used was as follows:

1 gallon gasoline
3 cubic centimeters tetraethyl lead
1.5 cubic centimeters carbon tetrachloride

During the period of the test a record was kept four times daily of each car parked in the garage. This was done by checking the stalls that were occupied at 7:30 A.M., 10:00 A.M., 12:45 P.M., and 3:00 P.M., and it had for its purpose the estimation of the number of automobile entrances and exits made during the period of the investigation. These notations were made at such times of the day that an approximation of the number of cars coming into and leaving the garage could be made. No record was kept of the Company trucks and service car.

Near one corner of the garage a "490" Chevrolet engine was run idle on Ethyl Gas for a period of 9 hours each working day. This car was not moved during the entire test.

At the close of the test period the garage was again swept in the same thorough manner as at the beginning. The sweepings from under and immediately around the Chevrolet car that had been idled during the test were collected separately from the rest. In the subsequent part of this report the variously collected sweepings will be designated as follows:

Chevrolet sweepings - The floor dirt collected just around the Chevrolet car.

General sweepings - The floor dirt collected from all the garage floor except that just around the Chevrolet.

Total sweepings - The combined "Chevrolet sweepings" and "General sweepings".

The floor sweepings were treated in the following way:

1. Carefully weighed.
2. Screened through an 8-mesh sieve in order to separate such materials as small stones, scraps of paper, cloth, burnt matches, and such things as could contain no lead.

3. Each portion of the screened sweepings weighed separately.
4. Screened sweepings carefully examined for lead by two analysts whose results agreed within the limit of error.

Tabulation of Results

The data obtained are tabulated in the table included herewith.

T A B L E

Weight of total sweepings	-	-	-	-	-	-	-	-	-	9300	grams
Weight of total screened sweepings	-	-	-	-	-	-	-	-	-	8000	grams
Weight of screen "Chevrolet sweepings"	-	-	-	-	-	-	-	-	-	255	grams
Weight of screened "General sweepings"	-	-	-	-	-	-	-	-	-	7745	grams
Weight of lead in screened "General sweepings"	-	-	-	-	-	-	-	-	-	2.40	grams
Percent of lead in screened "General sweepings"	-	-	-	-	-	-	-	-	-	.031	%
Weight of lead in screened "Chevrolet sweepings"	-	-	-	-	-	-	-	-	-	10.3	grams
Percent of lead in screened "Chevrolet sweepings"	-	-	-	-	-	-	-	-	-	4.05	grams
Weight of lead in total sweepings	-	-	-	-	-	-	-	-	-	12.7	grams
Percent of lead in screened total sweepings	-	-	-	-	-	-	-	-	-	.159	%
Percent of lead in total sweepings	-	-	-	-	-	-	-	-	-	.137	%
Gallons of "Ethyl Gas" burned in Chevrolet	-	-	-	-	-	-	-	-	-	103.5	
Weight of lead in "Ethyl Gas" burned in Chevrolet	-	-	-	-	-	-	-	-	-	322	grams
Percent of lead burned in Chevrolet found in total sweepings	-	-	-	-	-	-	-	-	-	3.95	%

As estimated from the daily record there were 442 car entrance and 426 car exits during the period of the test. No doubt some entrances and exits escaped record. Since the three company trucks and one service car were not recorded, the total number of cars entering the leaving the garage must have been at least double the figures given above.

Discussion of Results

During the test period the weather was generally good, with very little rain, and the cars came in from a paved street. So a minimum amount of road dirt was carried into the garage, a thing which made the percentage of lead in the sweepings at a maximum.

Taking 6 milligrams of lead per day as the toxic dose, the following observations may be made. On the assumption that the garage employees absorbed the lead from the general sweepings only, they would have to extract the lead from 697 grams of dirt in the thirty days in order to be in danger of lead poisoning. If there were 13 men in the garage they would have to absorb all the lead from the general sweepings before they would be in danger. That is, if in order to absorb the lead they breathed in the floor dust they would keep the floor clean with sweeping. If the Chevrolet sweepings also be included 70 men would keep the floor clean in the same way.