

MISCELLANEOUS REPORTS OF EXPOSURE
TO TEL - INDEXED AND SUMMARIZED

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The first very full report of the Committee was presented August 20, 1924 -

Since that time, minor reports have been presented dealing with the activities of the Committee which has given unremitting study to the problems involved.

The following report presents a summary of Bayway and Bayton cases of poisoning to date, with other matters to date of importance and interest, with the exception that no formal statistical reports thus far have been obtainable from the du Pont plant.

Convalescence

Dayton Cases

Deepwater Cases

Dismantling

Experiments

Exhaust Gas Experiments

Hazards of Exposure at the Dayway Plant

Hazards of Exposure at the Dayton Plant

Hazards of Exposure at the new building of the du Pont

Number of cases of Poisoning

Number of Deaths

Number of cases of each symptom observed in 63 Patients

Research

Researches being Prosecuted at Dayton

Symptoms as produced by different types of exposures

Treatment employed

Dayton as physician.

There were no cases from
All told, the cases in D
are no cases at present

18 cases since October 1st -

138 Total reported cases.

NUMBER OF DEATHS

At Bayway 5

At Deepwater 6

At Dayton 2

13 Total.

RAYWAY CASES

Number of recoveries

Number of men returned to normal or part time work

Number who have left the service of the Company

Number sent to hospitals

Number treated at home

DEEPWATER CASES

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Number sent to hospitals

none

Number treated at home

all

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Prostration
Vertigo
Dreams
Nausea
Vomiting
Anorexia
Constipation
Diarrhoea
Thirst
Dry Mouth
Nocturia
Pains in groins
Abdominal pain
Other pains
Metallic taste
Loss of weight
Marked pallor
Low blood pressure
Slow pulse
Delirium
Stippling
Lead in stools
Lead in urine
Lowered temperature
Hyperacidity
Acetone
Albumen
Skin test
Tremors
Scotoma
Increased muscular reactions
Enlarged pupils
Itching
Mucous membrane irritation

NOTE: Not all these patients had the urine, sweat and st

Among 29 patients whose stools were examined, lead was pr
was examined in 3 cases and lead was present in only one
instances in which lead was absent from the urine it was

this symptom. About one-half the patients examined at the Hospital also showed it. When the ethyl chloride process was used by the chemists at Bayway, they felt quite confident that it was less hazardous than the ethyl bromide process, but animals poisoned in experiments made for the Committee at Bayway, showed that it was to be the case. Moreover, at the du Pont plant the original work was conducted simultaneously while the newer ethyl chloride process was being used. It was in the latter work that the recent sudden out-break occurred.

The well-known stimulating effect of inhalation of ether is evident in some of the workmen; that is, men who were particularly exhausted, a little out of sorts, would feel temporarily better while working if they gained some slight exhilaration from traces of the ether. On going home they would collapse again. Men working on the night shift to suffer more than those employed during the day, in many cases.

At Dayton, with the reduction of exposure to lead, there has been the greatly decreased rate of absorption of lead, there has been a change in the clinical picture of the poisoning. The subjective symptoms in the pronounced form, in fact, in some cases they do not appear. In cases where lead absorption have put in their appearance. In several cases where complaint has been made, it has been possible to find slight

it seems likely that the danger of any protracted illness of poisoning before the subject is conscious of any illness at the Dayton plant may be overcome completely. A practice of all exposure any employee who shows any of the signs of signs which appear are as follows: Slight drop in blood temperature, slow pulse, an occasional stippled erythrocyte (blood corpuscle) in the blood. Symptoms may or may not a slight drop in the blood pressure and temperature is not subject has a cold or any other infectious or other illness. However, in the absence of these things, and if the subject it is considered sufficient cause for cessation of exposure stippling almost invariably appears. Its appearance, with other signs is considered an indication of lead absorption. The appearance of definite symptoms of sleeplessness or if they occur in more than the most fleeting manner, is always

CONVALESCENCE

Convalescence usually has been protracted and patients were able to be up and walking about, they nevertheless failed in regaining appetite and weight. Insomnia also was a usual low blood pressure.

The psychological effects of the disaster at the Dayton plant were studied in an extensive and valuable study at the Reconstruction Hospital. In general, patients who showed very few genuine symptoms while at hospital

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their use, and the general atmosphere of cheer in the inst
factor in shortening the duration of illness.

AFTER EFFECTS

Deducting the five deaths from the seventy-one
at Bayway, there remain sixty-six. Of this entire number
20th, 1925 - nearly five months after the original poisoni
way incapacitated and his symptoms were practically gone,
have shown no permanent mental or physical symptoms beyond
or lead any still probably be found in the stools of a few
two have occasional gastric disturbances. A great majori
men have been returned to either full or part time work.
various reasons, left the service of the Company.

RESEARCH

In patients having mild symptoms, it was decid
lead stored in the body could be caused to be excreted by
To this end, calcium chloride was given, followed by bicar
some cases this seemed to increase the lead output.

In all the patients studied, the chief source
found to be through the bowels. Although lead was found
in the urine, it often was absent from that secretion whil

Although thirteen deaths were recorded, only
oughly made. In two or three instances in connection with
autopsies were made by outside authorities, which proved
of very little scientific value. In other cases, permission
refused. The four accurate autopsies were made by Dr. C.
Medical Examiner of New York City, upon patients who died at
Hospital. The gross appearances in these cases only have been
for the chemical and microscopic examinations require speedy
completion. The Medical Examiner is exceedingly busy and
efforts have been made to hasten this work, it has not yet
Examiner stated that one of the four patients presented at
the autopsy from which lead poisoning could have been diagnosed
knowledge of the man's occupation. In three other patients
characteristic findings were as follows: "Extreme congestion of
mucous membrane" and the lungs showed "extreme congestion".
The bloodvessels on the surface of the brain showed "interstitial
outer layer of brain substance showed "small hemorrhages".
congestion of the abdominal viscera. In one case there was
appearance of the muscles. In one case, blood was present in
In three patients the cause of death was given as "Hemorrhage".
In the fourth case, it was given as "General Visceral Congestion".
case in which the partial chemical analysis has been completed,
quantity of lead was found in the brain substance, said to be
half grains.

ceedingly obstinate, although a great variety of hypnotics then proving without effect and morphine particularly made Paraldehyd and similar drugs also were well-nigh useless. up to the excessive individual dosage of 90 grains with pa cases. In one case of violent delirium treated at the was given hypodermatically with marked relief causing sleep hours. When the symptoms subsequently recurred in this ment was again effective. The abdominal pains were relieved and such remedies as codein, with evacuation of the bowels.

To promote elimination, the patients were encouraged to take large quantities of fluids, plain water, lemonade, milk and vichy. They were strongly evacuated with saline cathartics. Respiration was aided by packs and electric light baths. To the patients at the Reconstruction Hospital, sodium thiosulphate was given by injection into the veins, and was extensively used also in mercury poisoning to promote elimination. In the patients treated at the Reconstruction Hospital, it seemed to have little value.

Alkalies such as soda and magnesium sulphate were given in the supposed acidosis.

In the mildest cases the only treatment followed was to remove the patient from further exposure to the poison and placing him in a room with abundant fresh air and sunlight with moderate exercise. It is of course a lie that patients with mild symptoms who were kept in bed

This plant occupied/comparatively small room, about 30 x 40 feet square. The apparatus was all of experimental size; the chemists were constantly present with the workmen and only a score or so of men were exposed in all. As they were all under constant careful supervision, no symptoms of any seriousness were observed in this plant.

(b) The Experimental Manufacturing Plant. (closed by the Medical Department on October 25, 1924.)

This was a much larger room where all the machinery was grouped, with the exception of that for the small part of the work which was conducted outdoors. In this plant there was the obvious fault of non-segregation and of over-crowding, so that any workman might be called during his shift to work in any part of the room, at any part of the process, and the space between the various pieces of apparatus was considerably crowded. Simultaneously construction was going on with production. It therefore happened that a number of patients were among the employees who were not process men at all, but pipe fitters or other mechanics. One man

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poison is known.

HAZARDS OF EXPOSURE AT THE BAYVIEW PLANT

(a) Chemical experiment plant

(b) Experimental manufacturing plant

(1) Non-segregation of machinery and workmen

(2) Crowding

(3) Construction simultaneously conducted with production

(4) Dust

(5) Pipes - blowouts

(6) Spills

(7) Failure of use of protective equipment

(c) Chemical experiment plant.

walked through the rest of the plant to get to their work, the escaping fumes on several occasions, which filled the plant also, the autoclaves were filled with lead alloy from ten feet above the floor. The process was very dusty and readily was disseminated. Several so-called "blowouts" making it necessary for all the men to rush out of the building sometimes for two or three hours, before all traces of odor be removed. There were various occasions when spills occurred opportunity for skin contact with tetraethyl lead. Owing character of the work it was impossible to determine from been exposed, just what had been at fault for each particular for various reasons, failure of constant use of the protection been recommended by the Medical Department.

DISMANTLING OF RAYWAY PLANT

On the occasion of the dismantling of the Rayway department ordered the strictest protective measures for the clad in rubber from head to foot and the entire plant was with water to allay dust. A large gang of men were assigned it was conducted intensively while strict supervision was result that no trouble of any sort followed.

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valves and that in the process of emptying the lead alloy
chloride vapor was released in considerable quantity through
end of the autoclaves. Too much reliance had been placed
on ventilation and the men therefore had not worn masks.
Sixteen autoclaves filled, twice each day, and at varying
Therefor, there was the possibility of escape of ethyl
containing traces of tetraethyl lead derivable from six
openings. The workmen in this process wore no masks.
of the building are separated only by an interrupted floor.
escaping vapors might be common to both floors. Inasmuch
more difficult to confine than steam, unusual tightness
etc. must be secured.

HAZARDS OF EXPOSURE AT THE DAYTON PLANT

1. Filling drums with "Ethyl" fluid.
2. Washing drums
3. Cleaning and decapping small cans in which
shipped. (Hazard here from inhalation)
4. Analytical and experimental work on tetraethyl

Note: The filling of small cans of "Ethyl" fluid and t
been completely discontinued, thus eliminating most of t
will now be no appreciable exposure to the dust of tri-ethyl

During the past seven weeks (i.e., prior to A
at Dayton have been very materially reduced. This is a

these operations required the employment of a considerable number of men. This operation discontinued the actual danger of exposure has been reduced and the number of employees also has been reduced.

The hazards which now remain to be considered are:

1. The filling of drums of "Ethyl" fluid. This is done in a well ventilated room. The constituents are piped into this room in any way by the employee. Their delivery into the drum is by automatic filling devices which reduce the possibility of spillage to a minimum.

2. The unloading of tetraethyl lead into storage tanks is accomplished with a minimal amount of danger from exposure. The vapor, which might be had, is prevented by the use of masks.

3. The washing of drums. This is being done in a special room by means of automatic machinery, and appears to be a safe process.

4. Analysis of tetraethyl lead. The process, which is done by a single chemist, involves a slight amount of exposure.

Some months ago a great number of small pumps which were used in Dayton for dispensing the concentrated fluid, were returned to the manufacturer. An attempt to clean these quickly and get them out of the way, and a number of men were poisoned by the inhalation of the dust of tri-ethyl lead salt. The operation carried out for a little more than a week brought about a marked reduction of the cases of poisoning which have occurred in Dayton since

ed herein as cases of "poisoning" never became ill, but were employed because of the discovery of objective signs of lead did not lose time, but were either released or transferred of the eighteen were seriously ill, though a few of them had ed for several weeks at a time.

DISTRIBUTING TETRAETHYL LEAD

The Committee has formulated definite and comprehensive rules to all employees handling tetraethyl lead in transportation, delivery tank wagons, etc. Printed posters of warning are placed at filling stations and any one purchasing ethyl gasoline is furnished a card of warning against its use for any other purpose than motor fuel. Copies of these rules, regulations and warning are sent to the report. The Medical Department of the Standard Oil Company now employs a special inspector who is borrowed from the State Bureau of Mines and who visits all the filling stations where tetraethyl lead is supplied. He makes weekly reports to the Medical Department on the thoroughness with which the rules are carried out and reports any neglect or failure to observe literally the rules and regulations. The results have been eminently satisfactory and no cases of poisoning have

EXPERIMENTS

The experiments instituted by the Committee in the Chemical Laboratory of Columbia University under Professor Flinn and

Gasoline. This object has been kept strictly in mind all many scientific features of the subject which are of colla one of the laboratories is yet ready to make a final report established thus far that daily skin contact of Ethyl Gasol few weeks is capable of causing such degree of tetraethyl may be determined in the stools of the animals experimented already have shown symptoms of chronic lead poisoning. Committee, once this fact definitely is established, that cute this line of experimentation further. Details of the different animals in relation to the surface exposed, their determine maximum and minimum dosage are interesting science be applied to human beings. The whole question is whether and stored in the human system through prolonged or frequent Gasoline. Once that fact is determined it matters little how much or how little lead is absorbed, or over how large

EXHAUST GAS EXPERIMENTS

With exhaust gas, experiments were instituted by the Chemical Company before the Ethyl Gasoline Committee was organized conducted for about a year. After eight months of experiment was issued by the Bureau of Mines, practically completely clearing any hazard for the public. Nevertheless, there is a group

Harvard and Cornell Universities, who have seen fit to criticize severely these experiments without any personal knowledge of them and without any attempt to repeat them themselves. They have sent a number of communications to the Public

Health Committee of New York Academy of Medicine disparaging these experiments.

It is the opinion of the Tetraethyl Lead Committee that if these men could be induced to visit the laboratories themselves and learn at first hand what they are criticizing, their antagonistic views might in great degree be modified. Surgeon General Cramling of the United States Public Health Service has promised to call a conference upon the whole subject of tetraethyl lead poisoning from the public health point of view. He has, however, been dissuaded from doing this until such time as the laboratory experiments may be completed.

RESEARCHES BEING PROSECUTED AT DAYTON

1. The Absorption of Tetraethyl Lead from Gasoline.

In view of the fact that the application of the gasoline and a subsequent possibility of absorption of concentrated tetraethyl lead, experiments have been performed to determine whether or not tetraethyl lead may be absorbed out of the liquid gasoline. This is obviously the manner in which exposure may take place in man.

The manner of experimentation and the details of the results are not included in the present discussion. However, it has been shown that tetraethyl lead may be absorbed by experimental animals out of gasoline, when the exclusive exposure of the animal is to the solution of tetraethyl lead in gasoline; i. e. when care is taken to prevent the possibility of evaporation of the solvent.

This indicates the probable futility of attempting to protect against skin absorption by the application to the skin of oils and greases which will be solvents for tetraethyl lead.

patients.

I both

from a

up to five milligrams, for a twenty-four hour period.
excreted in the urine exceeded that in the faeces for a c

In all others the quantity secreted in the
that in the urine. Somewhat inadequate, (because incomple
on the influence of various salts on the excretion of lead
cases the administration of sodium bicarbonate in a dosage
increased the quantity excreted in twenty four hours.
of secretion varied from thirty to fifty percent. In o
duced. ^{the} In one case in which it was employed, calcium o
fifteen grams daily, increased the secretion of lead in b
almost double its former quantity. In one case, sodium
each failed to increase secretion.

Experimentation both in man and in animals
this line. If secretion can be obtained and maintained a
accumulative effect will be produced by lead, at least in
direct medical control.

3. The Hazard from "Ethyl Gasoline".

A considerable number and variety of animals
mine the hazard from the above source. Experiments are

Submitted for the Tetraethyl Lead Committee by

Dr. W. Gilman Thompson, Chairman

W. Gilman Thompson

and Dr. Robert A. Kehoe,

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