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APPENDIX A
TO MINUTES OF 11ST MAC MEETING

NOT FOR PUBLICATION

MEMORANDUM OF MEETING
OPERATING SUBCOMMITTEE

April 22, 1956
The Warwick
Philadelphia, Pennsylvania

THOSE PRESENT:

L. E. Curtis, M. D., Chairman
V. C. Baird, M. D., Vice Chairman
F. D. Gassaway, M. D., Secretary
Robert E. Eckardt, M. D.
C. H. Hine, M. D.
B. B. Reeve, M. D.
George M. Saunders, M. D.
D. V. Stroop

I

SUBCOMMITTEE MEMBERSHIPS

Those present discussed and agreed upon changes as follows:

a) Existing Subcommittees

- 1) Subcommittee on Atmospheric Pollutants
Add T. B. Rendel as new member
- 2) Subcommittee on Economic Poisons
Add M. N. Newquist, M. D. as new member
- 3) Subcommittee on Toxicological Reviews
Substitute H. W. Gerarde, M. D. for Marshall Clinton, M. D.
as chairman
Substitute Kieffer Davis, M. D. for L. C. Beard, Jr.

b) New Subcommittee

Appoint a Subcommittee on Industrial Hygiene with membership as follows:

P. D. Halley, Chairman
E. K. Daniels
A. E. Dooley
J. W. Hammond
A. C. Pabst
L. E. Renes
Jack Spence
N. Van Hendricks

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II

M. A. C. BROCHURE

The preparation of the M. A. C. brochure was assigned to George M. Saunders, J. P. and D. V. Stroob.

III

BUDGET ESTIMATES FOR 1957-1958

After consideration of all proposals for expenditures during the fiscal year of July 1, 1957 - June 30, 1958, it was agreed that a solicitation of \$75,000 in January 1957 would be adequate for the continuation of the M. A. C. activities.

F. D. Gassaway, M. D.
Secretary

APPROVED:
J. E. Curtis, M. D.
Chairman
12/56

APPENDIX B
To Minutes of 21st MAC Meeting

PROGRAM SUBCOMMITTEE
B. B. Reeve, Chairman.

The Program Subcommittee met on April 21, 1956. Present were members Osborn, Linder, Blaney, Saunders, the Chairman and guests.

The first matter discussed was that of a medical round table session at the Fall API meeting. It was moved by Dr. Saunders, seconded by Dr. Linder that the subcommittee recommend that such meeting be held. The motion carried. In discussing a program for such meeting it was agreed that if the Medical Advisory Committee decides in favor of such meeting, that the members of the Program Subcommittee are, following this meeting in Philadelphia, to forward to the subcommittee chairman suggested topics for the meeting and Chairman Reeve is to then select from these submitted topics, the program for the Fall Round Table Session.

Dr. Crookshank called attention to the fact that the Medical Advisory Committee is not given recognition in the API booklet of organization and administration. This was referred to Dr. Curtis.

The next matter discussed was that of an open medical session at the annual API meeting in the Fall. It was moved by Dr. Osborn, seconded by Dr. Blaney that the Program Subcommittee recommend that the Medical Advisory Committee hold an open session at the Annual Meeting of the API in November, 1956. The motion carried.

In discussing a program for the proposed open session it was pointed out that the purpose of such meeting should be primarily to inform and explain to the non-medical representatives, various aspects of health problems pertinent to the petroleum industry. It was agreed that the program should be so designed as to fulfill this purpose.

The following topics were discussed and are proposed for presentation at the open meeting:

1. Absenteeism: Dr. Saunders was appointed to obtain a speaker and to decide upon the title and general content of the talk.
2. Ionizing Radiation: Dr. Osborn was appointed to obtain a speaker and to decide upon the title and general content of the talk.
3. The Medical Program in a Petroleum Industry: One suggested title was "Why a Health Program in the Petroleum Industry?" The members of the Subcommittee are to contact Dr. Richard Walmer, Industrial Hygiene Foundation, to talk on this subject and if he is not available, to obtain another speaker.

The final matter discussed was that of promoting attendance at this open session. Dr. Curtis suggested that each MAC member contact his own management to promote the meeting and that Mr. Staples be urged to inform other members of the Medical and Health Committee of our objectives.

APPENDIX C
To Minutes of 21st MAC Meeting

REPORT OF AIR POLLUTION SUBCOMMITTEE OF MEDICAL ADVISORY COMMITTEE
OF AMERICAN PETROLEUM INSTITUTE
J. C. Ruddock, M. D., Chairman

Since the last meeting of the MAC, there has been two meetings of your committee, March 26, 1956 and April 22, 1956.

Your committee has collected much literature concerning research developments as concerns Air Pollution. This literature has been mostly technical in character and those that affected human health have been distributed to the members of the subcommittee and some to the membership of the MAC.

Close liaison has been carried on with such agencies as the Los Angeles Smog Control District and Los Angeles Smog Foundation. Your committee has been continually advised of progress and conclusions as they develop in researches sponsored by the Western Oil and Gas Association.

The conclusions adopted by your subcommittee are as follows:

1. The policies of the MAC, as stated in Appendix C of the Minutes of 16th Meeting of the MAC, September 10, 1952, are re-adopted. (Copy attached.)
2. It was unanimously adopted that the MAC request \$20,000 be allocated for the purpose of paying salaries and expenses involved in collecting and critically evaluating all research programs in progress and contemplated in the future which might concern air pollutants and their effect on human health, individual and community.
3. It is recommended that the MAC, through its regular officers, approach the Automobile Manufacturers' Association to determine whether or not they are interested in furthering critical reviews of current and contemplated researches, particularly concerning those elements in smog that are caused or precipitated by automobile exhausts and how these may affect human health, both individual and community.

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APPENDIX C

To the Minutes of 16th Meeting of Medical Advisory Committee

REPORT TO THE API MEDICAL ADVISORY COMMITTEE

BY THE SUBCOMMITTEE ON ATMOSPHERIC POLLUTANTS

September 10, 1952

Atmospheric pollution has today become a major challenge to scientists; to administrative officials and to the public. Important meetings have been held and more are scheduled. These include scientific meetings, industrial conferences, public gatherings, and official agency sessions offering information about air pollution, its sources, effect and control.

Universities, foundations and industrial centers of research are devoting more time to fundamental investigations - meteorological studies and comparable research in adding knowledge of the characteristics of atmosphere. Scientific investigations overlap and points of difference occur when professional and technical viewpoints are multiple. Investigations involve engineers, chemists, toxicologists, biologists, meteorologists, bacteriologists, physicists, botanists, physiologists, economists and physicians.

One of the finest engineering investigations has been made under the auspices of The Western Oil and Gas Association, and quoting from the 3rd Interim Report by the Stanford Research Institute a pertinent paragraph as follows:

"Little is known about the exact effect of smog on human health. Reported experience of medical men in the area indicates that smog is detrimental to well-being. How serious a threat this may be has not been established. If it could be demonstrated by medical research that some ingredients of smog are harmful, a great impetus would be given to research leading to their specific elimination and, possibly, to further basic discoveries."

We are primarily interested in air pollution in its relation to the petroleum industry. The petroleum industry has been responsible for certain of the elements that have to do with air pollution. These substances have their origin in the refining processes or in the use and combustion of the finished product. The petroleum industry has not been responsible for the air pollution nuisance in its entirety. This is a local problem and occurs only locally in relation to the amount of waste material from industrial and manufacturing plants as well as the waste material that is released into the air in communities where there is a concentration of population, -- (garbage, refuse, incinerators, etc.).

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MAC Minutes

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As physicians and members of the Medical Advisory Committee and further, as members of the sub-committee on air pollution of the Medical Advisory Committee, it is apropos and pertinent at this time that an evaluation be made with regard to what approach should be made by the medical group concerning this problem of air pollution as it effects the oil industry. I have listed these as follows:

1. Medical science deals with physiological and toxicological effects on living human beings, or agricultural effects that might relate directly or indirectly to human health. This is in opposition to the exact science of chemistry, physics, and other types of technical groups. The effect of a substance on an inanimate object can be definitely measured. Whereas the same effect of that substance upon a human being is modified by many physiological laws and actions. One must not forget that in the living human being nature repairs damages that might occur. We, therefore, have two types of approaches from the medical standpoint.

(a) Accute effect. When the physician knows the amount of the substance that a human being has been exposed to, then he can tell you what immediate effect it would have upon that human being and whether or not there would be any persisting residuals of the effect.

(b) Chronic effect. It is only by exposure of an animal over a long period of time to minute quantities of substance "X" that the medical man may state what that effect may be. Is it harmful or is it not? Does it produce disease? Is it carcinogenic? What physiological changes occur in the animal to offset the continued exposure to such an element?

2. To determine physiological effect on an animal of any substance "X" there are basic factors which must be known.

(a) The medium of exposure, - air, liquid or solid.

(b) Is exposure made by inhalation, ingestion or contact?

(c) The nature of the substance, namely, chemical formula and physical properties. I refer you again to the 3rd Interim Report of the Stanford Research Institute wherein the conclusion and recommendations are made with regard to improvement of methods of identifying constituents of air pollutants. The Smoke and Fumes Committee has already proposed certain projects toward the development of analytical and identification methods, and any basic medical research might have to await the outcome of further investigation along the lines recommended in such projects.

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IN SUMMARY, the sub-committee on air pollutants of the Medical Advisory Committee feels that they should be kept continuously advised of all research work which have to do with the human physiological effects of air pollutants in relation to the community problem. The pharmacology of these substances, along with the physiological properties if requested may then be worked out by medical investigation.

At the present time the sub-committee feels that no medical research under the auspices of the petroleum industry should be instigated by them at this time. The sub-committee feels they should await the final outcome of such projects and investigations that have been proposed or are already in the process of investigation before undertaking any projects of their own.

As stated in the minutes of the 15th meeting of the A.P.I. Medical Advisory Committee, "The subcommittee stands ready, if necessary, to render whatever service and assistance it can in those matters related to the physiologic effects of atmospheric pollution which it may be specifically requested to consider."

- (1) Nuisance values as concerns eye smarting, coughing and odors would be considered physiological effects.
- (2) Research has been underway for sometime concerning the effects of air pollutants on plant life. It is conceivable that the effects of plants and animals, - especially that are used for human consumption, - may be direct or indirect upon the human health. When such a problem arises the Medical Advisory Committee stands ready to advise, counsel, or continue any research investigations along these lines.

To investigate the harmful effects of air pollutants can be very definitely summarized in the following:

- (1) How much quantitatively of substance "X" is in the atmosphere?
- (2) What are the physiological effects immediate and after long time exposure?
- (3) What can be done medically to counteract immediate exposures or long time exposures by the medical profession?

APPENDIX D
To Minutes of 21st MAC Meeting

REPORT OF THE C₉ - C₁₂ SUBCOMMITTEE

C. H. Fine, M. D., Chairman

Although funding of this project was instituted on 1 July, 1955, active investigation by the research group headed by Dr. Nau did not commence until November.

The initial phases of the investigation involved assembling of equipment needed for generating and monitoring atmospheres containing the toxicants and of chambers for exposure.

Exposure of animals commenced in January 1956. At present, three groups of animals are being exposed to 1000 and 2000 ppm of benzene and to 1000 ppm of C₉ - C₁₀ aromatics.

Three additional groups of animals have been assembled for exposure to 1000 ppm of C₉ - C₁₀, n-decane, C₁₁ - C₁₂.

The experiment has not been underway for a sufficient time to permit the collection of significant data.

It is our opinion that no pertinent data can be obtained for at least six months. This will necessitate continuation of the project during the next fiscal year. It appears that greater quantities of the C₁₁ - C₁₂ fraction will be needed than was originally planned. Rather than attempt an additional fractionation of pooled stocks, it is recommended that this material be obtained by pooling the original C₁₁ - C₁₂ fractions with material of similar boiling range and aromatic content obtained from one of the participating companies.

While there are a number of reports describing a possible relationship between leukemia and benzene exposure, a survey of the pertinent literature, carried out under the direction of Dr. Potts, failed to establish this.

It was suggested by one of the members of the MAC that additional studies be carried out to evaluate the extent of liver damage produced by the C₉ - C₁₂ fractions. The suggestion was discussed but not adopted.

RECOMMENDATIONS OF THE SUBCOMMITTEE

The Subcommittee recommends that the present study be extended through the fiscal year 1956-1957 and that additional monies in the amount of \$10,000 be solicited for support if needed during the year 1957-1958.

Reports submitted by Dr. Nau and Dr. Potts are attached.

REPORT TO MEMBERS OF THE SUBCOMMITTEE ONC₉ - C₁₂ AROMATICSDescription of Exposure Chambers

The exposure chamber shown in photograph No. 4 consists of three essential parts: (1) the Venturi mixing tube (2) surge chamber with diffuser plate (3) inner chamber for holding rat cages. These parts are constructed of galvanized sheet metal and galvanized hardware screen.

The Venturi mixing tube receives the vapor or aerosol from the generators and mixes it with the inlet air. From the Venturi the air-vapor mixture is sucked into the surge chamber and diffused through the diffuser plate into the animal chamber. The outlet mixture of vapor and moisture from the exposed rats is exhausted to the outside atmosphere. A sampling port is provided in the approximate center of the chamber for sampling the air-vapor mixture to which the animals are actually exposed. The animals are housed in six cages constructed of $\frac{1}{4}$ inch mesh hardware screen. There are six rats per cage or a total of thirty-six per chamber.

A two (2) foot square glass door is provided in the top of the chamber for placing or removing the caged rats. There are six chambers for the project - three for the C₉ - C₁₀ mixture and three for the C₁₁ - C₁₂ mixture. Concentrations of 500, 1000 and 2000 PPM of each mixture probably will be investigated at the same time.

Three chambers are now (and have been) in operation

- Chamber: #1 - 1000 PPM Benzene
- #2 - 2000 PPM Benzene
- #3 - 2000 PPM C₉ - C₁₀

Thirty-six male white rats (6 rats per cage) are exposed in each chamber, seven hours per day, five days per week. The other three chambers are now ready to be started with

- Chamber: #4 - 1000 PPM C₉ - C₁₀
- #5 - 1000 PPM Normal Decane
- #6 - 1000 PPM C₁₁ - C₁₂

Thirty-six rats will be exposed in each chamber. The animals receive no feed or water while in the exposure chambers. They are fed and watered when the exposures end and the rats are put in other cages outside the exposure chambers.

Operation of Chambers

The operation of the chambers is as follows:

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1. Air flow into chambers is measured by use of a thermo-anemometer and a dry test gas meter. Hourly checks are made by reading the inclined manometer shown in photograph No. II, no. 4.

2. A constant and known quantity of benzene or $C_9 - C_{10}$ is fed into the vaporizers by means of the infusion pump and 100 ml syringes, photograph I, no. 1.

3. Daily or hourly sampling is done with the sampling set-up shown in photograph No. I, no. 5.

4. At hourly intervals checks are made on the rats being exposed by viewing them through the glass door shown in photograph No. 4.

Atomizing of the material was found impractical.

Calibration and Analyses of the Concentration of Vapor in the Chambers

1. 1000 PPM (3.19 mg per liter of air) of benzene

The sample of vapor taken from the chamber is measured with a wet test meter and is then absorbed in two pyrex 125 ml fritted glass absorbers connected in series using redistilled methanol as the sampling medium.

The concentration of the sample is determined by measuring the absorption of the benzene at 254 millimicrons with the Beckman DU spectrophotometer. The specific gravity of benzene is taken as 0.880 and all calculation of PPM are corrected to 760 mm atmospheric pressure and 25°C temperature.

2. 2000 PPM (6.38 mg per liter of air) benzene

The sample of vapor taken from the chamber is measured with a wet test meter and is then absorbed in two pyrex 125 ml fritted glass absorbers connected in series using redistilled methanol as the sampling medium.

The concentration of the sample is determined by measuring the absorption of the benzene at 254 millimicrons with the Beckman DU spectrophotometer. The specific gravity of benzene is taken as 0.880 and all calculation of PPM are corrected to 760 mm atmospheric pressure and 25°C temperature.

3. 2000 PPM (10.38 mg per liter) of $C_9 - C_{10}$

The sample of vapor is absorbed in absolute ethanol and the concentration determined at 266 millimicrons with the Beckman spectrophotometer. The specific gravity is taken as 0.845 75°F/60°F and the parts per million are calculated at 760 mm. and 25°C, using a molecular weight of 127.

Physiological effects observed grossly on rats exposed to $C_9 - C_{10}$

The rats exposed to 2000 PPM of $C_9 - C_{10}$ seem to find the exposure extremely disagreeable. They exert every effort to es-

cape. There is inflammation and irritation of the conjunctiva with swelling of the tissues. Narcotic effects appear early in most animals but tolerance to a given dosage seems to develop. A few animals become anesthetized and lose consciousness. Recovery, when removed to fresh air, is rapid. After eighteen hours of exposure there was some weight loss followed by normal weight gains.

As soon as they are removed from the exposure chambers they begin to "wash" their face and eyes. These animals appear to consume more water than controls or than rats exposed to benzene (after removal from the chambers). Their furs are moist with the condensate offering excellent opportunity for ingestion (by licking) and for skin absorption.

Physiological Effects Observed Grossly on Rats Exposed to Benzene

There is no visible effect of benzene on the rats in the chamber (at 1000 PPM). The only visible effect in the chamber at 2000 PPM is irritation to their eyes and nose. They tend to bury their heads and cover their faces as much as possible and occasionally show signs of trying to get away from the vapor. The fur does not appear to get moist.

Blood Studies and Weight Changes

No significant changes have been observed thus far. It appears that the rats exposed to $C_9 - C_{10}$ material bleed more freely than those exposed to benzene or than the control rats. This has not been confirmed.

Attached Photographs

Photograph #1 - Front view of exposure chamber showing

1. infusion pump and 100 ml. syringes
2. fritted disc vaporizers
3. 3-way stopcocks and liquid reservoirs
4. compressed air regulator
5. vapor sampling set-up
6. extra rat exposure cages

Photograph #2 - Front view of exposure chamber showing

1. sampling set-up
2. compressed air regulator
3. constant temperature bath
4. inclined manometers

Photograph #2 (continued)

5. thermcanemometer port

Photograph #3 - Vaporizer designed by Rieders and Hodes

Photograph #4 - Sketch of exposure chamber

NOTE: Due to unforeseen events our work has not progressed as rapidly as we expected and hoped it would. We believe most obstacles have now been overcome.

Respectfully submitted,

CARL A. NAU

EXPERIMENTAL ANIMAL INDUCED LEUKEMIA

In the review of the literature for the past thirty years, various hydrocarbons have been incriminated in the induction of leukemia in experimental animals. The following group have been incriminated as factors of etiology in leukemia:

Carcinogenic tar
Methylcholanthrene
1-2 Benzpyrene ⁵⁷
9,10 Dimethyl - 1,2 Benzantracene ¹

1:2:5:6-DiBenzanthracene ⁶³

3:4 - Benzpyrene ⁵

These compounds have been tested primarily on mice of various strains, some of which have spontaneous leukemic incidence, while others are of low incidence. In some of the more substantiated series, the hydrocarbons will induce leukemia in resistant strains and shorten the latent period in high Leukemic strains.¹ There are, however, strains that are entirely resistant to hydrocarbons, but are more susceptible to other leukogenic agents, of which the most frequently mentioned are estrogens and ionizing radiation (x-alpha-beta rays). There are many related as well as unrelated complicating factors, most of which depend on the genetic stock of the mice involved. Various factors seem to act in a synergistic mode of action. Estrogens and x-ray are the more frequently mentioned. ^{1,22}

Other workers have reported factors such as dietary supplements of cystine and methionine. ⁹ Along with hydrocarbons these have been reported to cause a greater incidence of spontaneously induced leukemia. Light is another factor that has been mentioned. ²¹ Other compounds have been mentioned which are indol, ⁸ colchicine, ² and bile, ^{44,50} Other workers have reported diets of amino-azo dyes producing leukemic-like state in mice. The modes of induction of most of these carcinogenic hydrocarbons have been varied; topical applications, subcutaneous, intrasplenic, and gastric installations. ^{25,27}

Few, if any, workers have used inhalations or some other physiological method of introducing suspected carcinogenic agents in experimental animals. Other experimental animals, in addition to rats and mice, that have been used are fowls such as chickens, ^{32,51} guinea pigs, ³³ and a worker using guinea pigs has used beef liver preparations. ³³ Several of the workers using rats have instilled intramedullary carcinogenic tar. ^{45,49,53,54,55,56}

As to the compound Benzene itself, workers disagree as to its carcinogenic effect. Some have reported the induction of leukemia in mice while others have been unable to confirm it. ^{10,16,17,20,48}

As to the extent of the leukogenic effect of various hydrocarbons, one cannot say for sure how applicable data based on animal experiments is to man; however, a few scattered reports of leukemia subsequent to Benzene poisoning in man have been made.

SUSPECTED ETIOLOGIC FACTORS (New England Journal of Medicine, 246:15:575.)

Dameshek, in discussing the possibility of a real increase in leukemia, thought that such factors as radiation, benzol, benzol-ring drugs and arsenicals might be responsible for this increase. He emphasized that radiologists, photographers, dye workers and gardeners are susceptible groups. (Dameshek, W. Is leukemia increasing? BLOOD 2:101, 1947) Hueper regarded benzol, radioactive substances and roentgen rays as established carcinogens of blood-forming organs.

Mallory, Gall and Brickley reviewed 12 cases of leukemia with chronic benzol exposure up to 1939. (Mallory, T. B. Gall, E. A., and Brickley, W. J. Chronic exposure to benzene (benzol): pathologic results. J. INDUST. HYG. & TOXICOL. 21:355-93, (1939) According to a recent survey by Moeschlin, about 20 such cases are recorded in the literature. (Moeschlin, S. KLINIK UND THERAPIE der VERGIFTUNGEN. Stuttgart: G. Thieme (inpress) Skimkin and his associates suggested that the increasing use of women in industries employing radiation and benzol might account for the higher proportion of females with leukemia found in their series today as compared to that of former years.

From an article entitled "Some Practical Aspects of Cancer Prevention (Concluded)", by Ernest L. Wynder, M. D.

EXPOSURE TO RADIATION

(Public Health Reports, 71:2:107)

Wynder (Wynder, E. L.: Some practical aspects of cancer prevention. New England J. Med. 246: 492-503, 538-546, and 573-582, March 27, April 3 and 10, 1953.), in a discussion of the practical aspects of cancer prevention, reviewed the evidence for the relationship between the development of leukemia and prior exposure to radiation or to chemicals suspected of having leukemogenic properties. His evaluation of present knowledge of these factors was that "no good evidence was at hand" except with respect to radiation and possibly with respect to benzol. Wynder's conclusion with regard to radiation was based, in part, on analyses by March and Ulrich of the mortality among radiologists from leukemia.

For a 20-year period ending in 1948, March (March, H. C.: Leukemia in radiologists in a 20 year period. Am. J. Med. Sc. 220: 282-286, Sept. 1950) computed ratios of deaths from leukemia to all deaths for radiologists (4.68 percent) and for nonradiologist physicians (0.51 percent). He concluded that the risk of death from leukemia among radiologists was 9 or 10 times that of nonradiologist physicians. Dublin and Spiegelman (Dublin, L. I., and Spiegelman, M.: The longevity and mortality of American physicians, 1938-1942. J.A.M.A. 134: 1211-1215, Aug. 9, 1947) compared age-adjusted death rates from leukemia for male physicians (11.4 per 100,000) to the rate for the white male population (6.5) and found a ratio of 1.75. Later they found the number of deaths from leukemia among radiologists during 1938-42 was "several times the number expected on the basis of the mortality experience of all male physicians". (Dublin, L. I., and Spiegelman, M.: Mortality of medical specialists, 1938-1942. J.A.M.A. 137: 1519-1524, Aug. 21, 1948)

Peller (Peller, S.: Cancer in man. New York, International Universities Press, Inc., 1952, 556 pp.) cited age-standardized rates for mortality from cancer exclusive of leukemia and from leukemia for radiologists, all other physicians, and for all white American males of the same age. He concluded that the mortality from leukemia was 3.5 times greater for radiologists aged 35-74 than for other physicians, and 8.5 times that of all white males of similar age. These ratios are somewhat less than the estimates of March. It was his impression that part or all of the increase in the leukemia mortality took place at the expense of the total mortality from all cancer, including leukemia, though he was unable to confirm this from the data available.

The fact that all persons, with even more prolonged exposure to radiation or to chemicals, do not develop leukemia (for example, not all radiologists die of leukemia) suggests that for those who do not succumb, some condition or conditions "necessary" to leukemogenesis are not operative. It has been frequently suggested that presence or absence of a hereditary predisposition might explain some of the vagaries of the behavior of the disease in a human population, that is, that a "cancer diathesis" might be a necessary condition for leukemogenesis.

From an article entitled "Epidemiology of Leukemia", by Gilcin F. Meadors, M. D.

DISCUSSION

On the basis of the clinical, laboratory, and pathological findings there can be no doubt that this case must be classified as an erythro-leukaemic type of anaemia.

Here the initial blood picture was that of a leukaemia of haemocyto-blastic character later to assume the morphological characters of a mixed-type anaemia in which primitive cellular types were accompanied, on the one hand, by a moderate number of immature elements of the myeloid series, and on the other, by a considerable proportion of immature elements of the red series, until a leucoerythro-genic ratio of 0.33 was reached. Regarded then as a mixed type, it would seem from its particular characteristics of special importance from the aetiological and patho-genetic points of view. Thus, it does not appear easy to escape an aetiological relation between the work in which the patient was engaged and the blood disease which led to his death. Such a view is supported by the finding that a short exposure to benzene vapour, for example, in the case reported by Loeper, Fabre, and Boreau, 1946, which was in contact with benzene for only six months, a period approximately the same as that in our case, can be the determining factor in such a type of anaemia. Moreover, the time of action of the agent, regarded as the toxic cause of the disease, must be assessed with great care (unless the period was extremely short), bearing in mind the fundamental fact, admitted by all writers on the subject, that the lighting up of such types of blood disorder requires a particular constitutional predisposition.

Since, in addition to the inhalation of benzene vapour, the process renders possible that of chlorine and of the finely divided, powdered hexachlorocyclohexane, these also might be suspected in the aetiology of the disease. But hexachloro-cyclohexane has up till now not been found to be toxic to man and the syndrome of chronic poisoning is manifestly of an entirely different kind from that described. Only benzene can be seriously considered as the possible aetiological factor, and its marked toxic effects are well demonstrated not only in the fatal case described but also in the symptoms experienced by the other workers on the process and their haematological pictures.

As benzene is recognized as a toxic cause of leukaemia the proposed attribution to benzene of the form of blood disorder manifested in the present case appears to be reasonable in view of its erythro-leukaemic character. Examination of cases reported in the literature after that observed by Delore and Borgomano (1928) leads to the view that benzene leukaemia shows diverse clinical aspects and the reactive manifestations of the haemopoietic tissues are very variable. Careful evaluation, however, of the lesions of the haemopoietic organs produced by benzene suggests that, starting from the typical picture of aplastic anaemia, a whole series of intermediate blood abnormalities leading ultimately to leukaemia is found. Thus from the varied blood pictures emanating from the toxic action of benzene, the erythro-leukaemic myelosis of our case may be held to result from it and to have developed a particular aspect as a consequence. What may be the cause of the diversity of toxic effects produced by benzene, possibly provocative of aplasia or a proliferative process in the bone marrow, and what constitutes its mode of action are entirely matters of opinion and may give rise to many hypotheses but facts are not yet available.

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From an article entitled "Erythro-Leukaemic Myelosis in Benzene Poisoning,
by B. Galavotti and F. M. Troisi.

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APPENDIX E
To Minutes of 21st MAC Meeting

REPORT OF THE SUBCOMMITTEE ON CARCINOGENICITY

to the

MEDICAL ADVISORY COMMITTEE OF THE AMERICAN PETROLEUM INSTITUTE
R. E. Eckardt, M. D., Chairman

The original objectives of the carcinogenic work at the University of Cincinnati were to survey various refinery streams for their carcinogenic activity and to study the chemistry of these refinery streams, in an attempt to develop a physical-chemical method which might permit the prediction of their carcinogenic actions. In addition, epidemiological work was to be conducted in order to attempt to determine whether or not there had been introduced into the petroleum industry in recent years any new carcinogenic hazards. In the course of the experimental work which has been conducted to date on the various carcinogenic streams in the refinery and the analysis of the composition of these streams, it appears that the original objectives of this work have been somewhat modified. It now appears that these objectives, other than the epidemiological work, are divided approximately as follows:

1. 60% of the effort is devoted to attempts to isolate and identify the various carcinogens and to determine their contribution to carcinogenicity of the various refinery products.
2. The remaining 40% of the effort, other than the epidemiological work, is devoted to an attempt to isolate and identify the accelerators and non-accelerators and to determine their contribution to carcinogenicity in the various refinery streams.

In this respect, the work at The Kettering Laboratory appears today to be of a more fundamental nature than it was several years ago, and possibly more in line with some of the fundamental research being conducted by other committees of the American Petroleum Institute. Thus, for instance, certain work being sponsored by the American Petroleum Institute is in an attempt to analyze the chemical composition of the various constituents of petroleum which contribute to the lubricating properties of petroleum, and also to determine the nature and characteristics of various nitrogen-containing compounds and sulfur-containing compounds found in petroleum. The work The Kettering Laboratory does is devoted to isolating and determining the contribution to carcinogenicity of various pure compounds found in petroleum. The Subcommittee believes that this change in emphasis is, nonetheless, justified as sufficient reason for the support of the work at The Kettering Laboratory.

As evidence of the progress being made by The Kettering Laboratory on the isolation and identification of the various constituents of petroleum which contribute to its carcinogenicity, a manuscript, which is attached, has been submitted by The Kettering Laboratory which they propose to publish in a cancer research publication. The Subcommittee has reviewed this manuscript and, with minor changes, recommends that it be published in the journal of choice of The Kettering Laboratory.

The epidemiological work is continuing, but has met certain difficulties in attempting to develop the occupations which are involved in the petroleum industry.

It appears to the Subcommittee from the attached report from Dr. Phair that the present epidemiological studies are not and offer little hope of offering in the future any significant results. The Subcommittee re-endorses the importance of adequate epidemiological studies but believes the time has come to reorganize the epidemiological studies either at Kettering Laboratory or elsewhere.

Due to an artificiality in the budget situation which occurred in the 1954-1955 budget, The Kettering Laboratory is experiencing some difficulty in remaining within the budget this year. They have requested that a special appropriation of \$5,300 be made to its budget this year, in order to correct this artificiality which has occurred in the past. The proposed budget for the interval July 1, 1957 - June 30, 1958 from The Kettering Laboratory is attached.

The Subcommittee on Carcinogenicity recommends to the Medical Advisory Committee:

1. That the manuscript entitled, "Carcinogenesis of the Skin. II. The Accelerating, Promoting, and Preconditioning Effects of Aliphatic and Related Hydrocarbons", by A. Wesley Horton, Dorothy T. Denman and Ruth Pierle Trossett, be cleared by the Medical Advisory Committee and the Medical and Health Committee of the Board for publication in the periodical of choice of The Kettering Laboratory.

2. That an ad hoc contribution of \$5,300 be made to The Kettering Laboratory this year in order to meet an artificiality in its budget created in 1954-1955.

3. That the Medical Advisory Committee solicit the participating companies for contributions to the work of the Subcommittee in the amount of \$53,000 to be divided as follows:

- a. \$15,000 for the epidemiological work

- b. \$38,000 for the chemical and biological work at The Kettering Laboratory

4. That the abstract submitted by Dr. Horton be cleared by the Medical Advisory Committee and forwarded to the Medical and Health Committee of the Board for their clearance for publication.

4/23/56

APPENDIX F
To Minutes of 21st MAC Meeting

SUBCOMMITTEE ON ECONOMIC POISONS REPORT TO A.P.I. M.A.C.
J. W. Osborn, M. D., Chairman

The above committee met in the Rittenhouse Room, Warwick Hotel, on Sunday, April 22, 1956 at 9:00 A. M. with the following subcommittee members present:

Dr. J. W. Osborn, Chairman
Dr. C. H. Hine
Mr. J. W. Hammond, Appointed Secretary by the Chairman

Sixteen others, including medical and technical advisor members of the MAC and guests, were present.

The Chairman submits to the MAC, for its approval, the following report of that meeting:

I. Poison Control Centers

The subcommittee voted to continue to circulate to Medical and Technical Advisors of the Medical Advisory Committee the latest list of poison control centers on a continuing basis as new centers are activated.

II. Kerosine Poisoning Problem

During a thorough discussion of this subject it was brought out that Dr. M. N. Newquist, one of the three Representing M.A.C. Members on the A.P.I. Interdivisional Committee on Labeling, had a specific recommendation to make to the M.A.C. regarding a Labeling and Educational Program for Kerosine Poisoning. The subcommittee voted to defer action until the subcommittee could meet with Dr. Newquist and his group. Dr. Curtis, Chairman of the M.A.C. advised the subcommittee that the Operating Subcommittee meeting later in the day would consider appointing Dr. Newquist to the Subcommittee on Economic Poisons which would result in consolidating responsibilities for furthering the kerosine poisoning problem under the Subcommittee on Economic Poisons.

Dr. Osborn and Dr. Hine, following the appointment of Dr. Newquist to the subcommittee, met with him. These three, representing a quorum of those present, approve the following recommendations to the M.A.C.:

- 1) The submission of the PROPOSED RECOMMENDATION FOR CONSIDERATION BY THE MEDICAL ADVISORY COMMITTEE API as contained in letter of April 23, 1956 (copy attached) to Mr. M. D. Gjerde, Chairman, Interdivisional Committee on Labeling, from Dr. L. E. Curtis, Chairman, M.A.C.

- 2) The submission of the PROPOSED LETTER FOR CONSIDERATION BY THE MAC dated April 23, 1956, Subject: Kerosine Poisoning Among Children - Educational Program (copy attached) to Mr. D. T. Staples, Chairman of the Medical and Health Committee, from Dr. L. E. Curtis, Chairman, M.A.C.

The subcommittee approves any revisions in the above two proposed letters which Dr. Curtis and/or Mr. Stroop believe necessary for the sake of clarity and brevity.

The Chairman moves that the M.A.C. approve this report.

April 23, 1956

PROPOSED RECOMMENDATION FOR CONSIDERATION BY THE
MEDICAL ADVISORY COMMITTEE API

Mr. M. D. Gjerde, Chairman
Interdivisional Committee on Labeling API
Standard Oil Company (Indiana)
910 South Michigan Avenue
Chicago 80, Illinois

Dear Sir:

It is the recommendation of the Medical Advisory Committee of the API that the Interdivisional Committee on Labeling should prepare an appropriate precautionary label for kerosine.

For your information, a copy of my letter of _____ to Mr. Staples, Chairman of the Medical and Health Committee of the Board, is attached. You will note that the MAC is in favor of an educational program including labeling as an aid in minimizing kerosine poisoning among children.

Very truly yours,

L. E. CURTIS, M.D., Chairman
Medical Advisory Committee API

April 23, 1956

PROPOSED RECOMMENDATION FOR CONSIDERATION BY THE
MEDICAL ADVISORY COMMITTEE API

Mr. M. D. Gjerde, Chairman
Interdivisional Committee on Labeling API
Standard Oil Company (Indiana)
910 South Michigan Avenue
Chicago 80, Illinois

Dear Sir:

It is the recommendation of the Medical Advisory Committee of the API that the Interdivisional Committee on Labeling should prepare an appropriate precautionary label for kerosine.

For your information, a copy of my letter of _____ to Mr. Staples, Chairman of the Medical and Health Committee of the Board, is attached. You will note that the MAC is in favor of an educational program including labeling as an aid in minimizing kerosine poisoning among children.

Very truly yours,

L. E. CURTIS, M.D., Chairman
Medical Advisory Committee API

PROPOSED LETTER FOR CONSIDERATION BY THE MAC - APRIL 23, 1956

KEROSENE POISONING AMONG CHILDREN
EDUCATIONAL PROGRAM

Copies to
Members

Mr. D. T. Staples
Chairman of the Medical & Health Committee
Board of Directors, API
Tide Water Associated Oil Co.
79 New Montgomery Street
San Francisco 20, Calif.

Dear Sir:

The Medical Advisory Committee of the API is seriously concerned over the increasing number of reports in medical journals, newspapers and magazines, of deaths among children from drinking kerosine. These reports show that kerosine is responsible for approximately 25 per cent of the accidental deaths from poisoning among children under 5 years of age in the U.S. (See Exhibit I). There is growing criticism, from various quarters, of the petroleum industry for not taking cooperative action towards solving the aforementioned problem.

The Council on Pharmacy and Chemistry of the American Medical Association in its report in the Journal of the American Medical Association for December 17, 1955, makes the following statement:

"In the absence of federal legislation to safeguard distribution of household articles, such as kerosene and other petroleum distillates that are serious offenders, consideration could be given to enactment of such legislation so as to protect the public. In addition, physicians and lay groups should work for appropriate state laws to strengthen the federal laws and to bring about correction of their special problems as found within a state. In this connection consideration could be given to a law restricting the sale of kerosene other than in a special container, which would prohibit the use of any other type of container. In addition, such containers should bear informative warnings as to the poisonous and combustible properties of kerosene and like substances. A suggested caution label is as follows:

WARNING

Kerosene is flammable and may produce dangerous explosions.

If it is swallowed, it may cause fatal damage to the lungs. It should be kept out of the reach of children and should never be put in beverage bottles, glasses, or cups or left in unlabeled containers."

The State Health Department of Arkansas has initiated an educational campaign to reach all persons concerned and particularly families using kerosine, petroleum distributors, physicians and other interested groups. (See Exhibit II). Dr. H.A. Carithers reports in the September 10, 1955, issue of the Journal of the American Medical Association concerning investigations that have been made on the kerosine hazard among children in the State of Florida. (See Exhibit III). Another report from Dr. A. Bradley Soule, Jr., of Burlington, Vermont, reveals that the same problem exists in their part of the country. Obviously, this is a nation-wide problem.

The American Academy of Pediatrics is urgently recommending that positive steps be taken in connection with this problem. Some organizations which are actively concerned with the poisoning problem in general and which would welcome cooperation and support from the API to the extent of its interest in the matter are as follows:

American Academy of Pediatrics
American Medical Association
American Public Health Association
Health Departments (State and Local)
National Safety Council
State Medical Societies
U.S. Public Health Service

Since materials other than kerosine and petroleum distillates are also involved in the poisoning problem and since the principles of prevention apply generally to all toxic or poisonous materials, it would seem appropriate that some suitable organization other than the API should undertake to spearhead or coordinate an educational program for the prevention of accidental poisoning.

CONCLUSIONS

While the Medical Advisory Committee is recommending to the API Interdivisional Committee on Labeling that it prepare a

suitable precautionary label for kerosine, it is the opinion of the Medical Advisory Committee that labeling alone is not the answer to the problem because the victims of kerosine poisoning are too young to read. It is primarily a matter of educating the parents in the safe handling of kerosine so they do not leave it in cups, bottles or other containers readily accessible to small children. Labeling is a part of the educational program for prevention of accidental poisoning.

It is recognized that the problem is a continuing one and that an educational program will be most effective if it is directed towards all groups concerned and with their active participation.

The petroleum industry has an opportunity and a responsibility to participate in a constructive program towards eliminating the misuse of kerosine and other petroleum distillates and thereby save lives.

RECOMMENDATIONS OF THE MEDICAL ADVISORY COMMITTEE

1. That the API agree in principle to participate in a broad educational program of which labeling shall be a part for the prevention of accidental poisoning to the extent of its interest in the subject.
2. That the role of the API in such an educational program be developed jointly by the MAC and other API committees interested in this subject in close collaboration with the API staff.
3. That no API funds be allocated at this time for such educational program. (A full report with findings and recommendations will be submitted by the MAC to the Medical and Health Committee of the Board for their review and approval before any commitments are made or funds requested for support of an educational program).

I would appreciate a reply at your early convenience as to the action of the Medical & Health Committee of the Board with respect to the above recommendations.

Very truly yours,

API 07261

L. E. CURTIS, M.D., Chairman
Medical Advisory Committee API

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APPENDIX G
To Minutes of 21st MAC Meeting

REPORT OF MEETING MAC SUBCOMMITTEE ON PHYSICAL AGENTS
Lamson Blaney, M. D., Chairman

The significance of noise and hearing loss in the petroleum industry was discussed. F. D. Halley gave a special report of noise exposure in a refinery. Of 8,000 employees, 6,000 operating, approximately 3,000 of this latter group were probably exposed to significant noise, at one time or another. In the course of general discussion, it was indicated that obviously many persons in the petroleum industry (especially the crafts) are exposed to levels of noise which may be harmful, although relatively fewer than in certain other industries. Instances were cited where suits had been brought for hearing losses. One plant initiated a hearing program after an expensive case, realizing that they were vulnerable without studies of exposure or pre-employment baseline audiograms. The possibility that suits might arise which could not be evaluated adequately at the present stage of knowledge in regards to the relationship between exposure and hearing loss and the difficulty in advising on definite cut off levels of allowable noise for new equipment or instituting a program of worker protection points up the need for basic research in noise and its effects. The Subcommittee on Noise in Industry (Dr. Howard P. House, Chairman) through its research staff (Dr. Aram Glorig, Director) in Los Angeles is and has been the foremost organization in America engaged in this work. It is generally looked to for further development in the field.

Your committee had been asked to evaluate two requests from the Committee on Noise in Industry for API support. The first was for \$5,000 to pay the entire cost of a project to evaluate the relationship between head injury and hearing loss. The second was for \$30,000 to support part of a \$100,000 annual budget for basic research in noise problems:

1. Evaluate relationships between long exposure to noise and hearing loss.
2. Establish relationship between speech intelligability and pure tone audiograms in determining disability due to impaired hearing.
3. Study effectiveness of ear protection.
4. Provide data upon which to establish safe levels of noise exposure.
5. Evaluate auditory recovery following noise exposure.
6. Provide controlled methods of procedure for obtaining reliable data from industry.
7. Maintain a center for compiling and analyzing data.
8. Study of individual variations in susceptibility to noise.

On the basis of the fact that the former proposal was of a highly specialized nature for the most part unrelated to the petroleum industry, it was voted not to recommend appropriation. In the case of the request for \$30,000, it was noted that this was 1/3 of an annual budget to study a nationwide problem. Since petroleum employees constitute only 3% of the non-agricultural total, it was felt that the amount requested was not in proportion to the number of our people potentially effected. Therefore, this request, too, was voted down. However, your subcommittee felt that noise levels and hearing loss were problems involving many persons in the industry for which there were not fully satisfactory answers. Therefore, on the basis of the previous discussion and the recognized importance of the work being performed by the Committee on Noise in Industry, it was voted to recommend that the API should make available the sum of \$5,000 in unrestricted funds

for basic research by the foresaid committee, this amount to be renewed on an annual basis while the need was apparent to us and the results of research significant.

In order to further determine more specifically the extent of significant noise exposure in the petroleum industry, it was proposed that a relatively simple method of making an area noise survey and enumerating those exposed be worked out by the committee. This data sheet would be made available to MAC members who could then check their own organizations. This would be enlightening to those individuals making the survey and the total information would serve further to elucidate the industry-wide situation.

The Significance of Radiation Exposure in the Petroleum Industry - Including X-Ray and Varying Radiation

The petroleum industry is one of the largest users of isotopes. While the use of the latter is controlled by AEC requirements, radium and x-ray are generally not supervised by the government. California and New York, however have passed regulatory laws, New Jersey and Pennsylvania have them under consideration and the Federal government (AEC) and National Bureau of Standards have proposed "model" laws to safeguard those working with these agents. Insofar as possible, they would leave detailed control to industry. A general discussion brought up the facts that hundreds of people in petroleum are potentially exposed. Control of x-ray and radium sources has been found to be lax in several instances. It was felt that the subcommittee could contribute to the understanding of its members and to the safety of employees by making available information on the use of radioactive materials in the oil industry and adequate methods for their control. Nathan Van Hendricks presented an excellent review paper entitled "Some Potential Sources of Radiation Exposures in the Petroleum Industry and Precautionary Programs", copies of which will be made available to members.

APPENDIX E
To Minutes of 21st WAC Meeting

REPORT OF SUBCOMMITTEE ON TOXICOLOGICAL REVIEWS
Marshall Clinton, M. D., Chairman

The Subcommittee on Toxicological Reviews believes that the published toxicological reviews are losing some of their usefulness because of the fact that most of the reviews are eight to ten years old and have not been brought up to date. It is unfortunately a fact that all of the reviews will lose much of their usefulness if even a few are discredited by reason of omission of newer data or inclusion of data which have subsequently been shown to be in error.

It is therefore recommended that all of the reviews which have been published be critically reviewed by an authority outside of the petroleum industry, or revised or rewritten where indicated. Reviews on subjects which are now covered by the Manufacturing Chemists' Association, American Standards Association, or American Industrial Hygiene Association could be eliminated.

It is recommended that the necessary review and revision be undertaken by or under the direction of a suitable authority, the necessary financial arrangements to be worked out between that authority and the Operating Committee.

APPENDIX I
To Minutes of 21st MAC Meeting

REPORT OF THE SUBCOMMITTEE ON DERMATOLOGY
Leo J. Wade, M. D., Chairman

Re: Dermatitis Survey

April 23, 1956

The following members of the Joint Committee met at the Mellon Institute on March 28: Messrs. R. M. Landon, K. G. Mackenzie, D. G. Proudfoot, M. D. Gjerde, and Dr. L. Wade. Members of the Institute staff present included Doctors C. R. Walmer and D. Braun, and Mr. Schrenk.

Attached is a copy of the report submitted by the staff. This was discussed at length by the members of the Joint Committee present, and no exception was taken to the general progress of the study. Dr. Braun felt that a final report could be made by September 1. He indicated further that data now present had stimulated him to ask a number of questions which might be clarified only by an extension of the present study.

The question of soliciting funds for a continuation of these studies was discussed. It was agreed that it was too early to decide whether or not it was desirable to continue these, or other studies. It was agreed, however, that a request for funds should be made in due course so that they could be collected if authorized by the Board of Directors if a continued study was approved by the Medical Advisory Committee and the Lubrications Committee.

INDUSTRIAL HYGIENE FOUNDATION OF AMERICA, INC.

Mellon Institute, 4400 Fifth Avenue

Pittsburg 13, Pa.

March 28, 1956

Interim Report to

American Petroleum Institute

Re Dermatitis Survey

In earlier progress reports, dated October 6, 1955 and January 16, 1956, were set forth the methods developed for planning, preparing and executing the study. The construction of the sample of industrial plants was described and the technique of collecting data was outlined. Some of the difficulties encountered in making contact with the cooperating plants were mentioned. In addition, the most recent of these reports included the numerical and geographical distribution of plants and employees constituting the sample, and noted the delay of approximately one month in the original schedule, due to circumstances explained therein.

Since the date of the last report, a considerable number of individual case data records have been received from the plants in the sample. All those dealing with cases arising prior to January 1, 1956, were considered only as a check on our methods and forms. Such records consisted of scattered reports covering 29 cases arising over a six-month period in eleven plants. In studying these reports, our biostatisticians failed to discover evidence of fallacies or deficiencies, either in the forms which were designed or in the methods used in collecting the data.

Beginning with January 1, 1956, reports of individual cases of dermatitis received from the cooperating plants have been recorded as received and then turned over to the biostatistician for coding of the information contained. A part of this information deals with a description of the lesions present and their location on the body. Although the cause of the dermatitis is also given, each data sheet will be studied to determine whether the type and location of lesions is consistent with the diagnosis given, and with the type of exposure noted. The plant data as collected on our form No. 1 for all plants in the study were turned over to the biostatistician for coding and the preparation of the master information sheet regarding the sample. In this, the type of industry, number of employees, sex distribution, main categories of exposure and other pertinent information will be available.

A record of the receipt of data from the plants indicates that for the first three months returns have been quite inconsistent. Some have reported regularly but many have not. For this reason, a letter was sent to all participating plants thanking them for their cooperation to date and calling the attention of those who were delinquent of our failure to receive reports from them.

As stated in the previous reports, contact was made with the health departments of the states in the geographic areas represented. As anticipated, the data from this source has proved unproductive. Some states failed to reply; at least one has no data available, and the data from one state is obviously very incomplete.

To date, we have not attempted to evaluate records potentially available from insurance companies and from physicians in the private practice of industrial dermatology.

The Bureau of Medicine and Surgery of the Department of the Navy receives monthly from its more than 100 installations, reports of all occupational dermatitis among about 400,000 military and civilian personnel. As nearly as possible, the causative agent in each case is noted. At a conference with Captain Sessions and Commander Siegel, the Bureau granted us permission to analyze this data for purposes of comparison with figures from our selected sample of industrial plants. From a statistical standpoint, these figures cannot be lumped with the others, but they will provide a valid and very useful comparison. It is understood that some of the Navy installations lack ideal reporting, but very good reports can be expected on approximately 200,000 persons. These data will serve as a basis for comparison with those on about 125,000 people in our pilot study, of which perhaps 100,000 will be production workers.

Discussion

The progress of the study to date appears to be satisfactory in that the sample which was selected by random choice satisfies the statistical requirements of geographic and size distribution, covers a sufficient number of employees, and represents a broad category of exposures. Cooperation from these plants was excellent when a personal visit was made. Although early reporting has been somewhat inconsistent, it is believed that the failure to receive reports will in most cases be shown to be due to the fact that no dermatitis was encountered for those periods. In any case, the reminder letter will probably produce results.

We believe it has been confirmed that a study covering six months from the date of the visit was a wiser choice than any attempt to study the incidence of dermatitis in retrospect. Our earlier conviction that sufficient data could not be obtained from state and local health departments seems likewise to have been justified. We expect only confirmatory data from insurance records and dermatologists' records but will include such as can be obtained. A very important and valuable source of comparative data will be obtained from the records of the Bureau of Medicine and Surgery of the Department of the Navy.

At this stage of the study, the conclusion seems justified that meaningful information relative to the incidence of occupational dermatitis due to petroleum products will have been obtained.