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The attached material written in 1947 may provide some background on the Medical department.

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Ethyl's Medical Department

The Medical Department of Ethyl Corporation came into existence in June of 1924, under conditions which, antedating the origin of the Corporation itself, were to exert their influence upon the form and functions of medical activities of the Corporation throughout the years up to the present time. At that time, the operations of General Motors Chemical Company in Dayton, Ohio, were just emerging from their early developmental state into the commercial blending and distribution of an antiknock compound. Coincident with the increasing scale of these operations, the toxic properties of the constituents of the antiknock compound gave first evidence of their true significance, when, without apparent warning, a group of workmen fell ill and two of them died with what is now recognizable as tetraethyl lead poisoning. This situation called for some combination of medical care for the sick men, and a thoroughgoing investigation of the disease from which they were suffering and the environmental and physiological conditions which gave rise to it. The present head of the Medical Department, Robert A. Kehoe, a physician and a physiologist in the University of Cincinnati Medical School, was near at hand and known to Thomas Midgley, manager of General Motors Chemical Company, and was approached for advice and assistance. The time (May, being at the end of the academic year, it was possible, without delay, to undertake the proposed task. The work of the first summer, carried out in the Dayton plant, resulted in a clinical characterization of tetraethyl lead poisoning, a preliminary and rough interpretation of the nature and the approximate order of magnitude of the hazards of handling tetraethyl lead and certain halogen carriers, and the development of certain principles for the control of the hazards. The care-

of the sick employees, together with the medical selection and supervision of the personnel of the plant, represented a first responsibility, which on many days, especially at first, left little time for anything else. However, as the conditions in the plant responded to the application of good engineering practices based upon the accumulating medical and physiological information, the uncertainties of the medical approach tended to disappear, the anxiety of the employees was replaced by confidence in their security, and the time required for such work decreased in favor of greater experimental efforts. By the end of September of 1924 the situation appeared to be well in hand. One could then view the future of this phase of the industry with reasonable assurance, and could begin to take thought for the actual or potential hazards of its other aspects.

From late in 1923 on, experimental work on the most significant problem of public health, - that of the contamination of the air of streets, highways, and repair and storage establishments with particulate lead compounds in the exhaust gas of motor vehicles -, had been under investigation at the Pittsburgh Experimental Station of the U. S. Bureau of Mines, at the instigation of Midgley. Participation in regular (monthly) conferences on this problem inducted the new medical consultant of General Motors Chemical Company into the consideration and practical appreciation of these problems, and prompted his to advise an extension of the experimental program of the Bureau of Mines to include the potential hazards of the slight but prolonged exposure to tetraethyl lead through contact with leaded gasoline and exposure to its vapors. This was initiated by means of animal experimentation and carried out in rough parallel with experiments conducted in the laboratories of General Motors Chemical Company by Kehoe, with the assistance of Graham Edgar and the technical research

staff of General Motors Chemical Company of which he was the head. A little later, Kehoe and Edgar expanded these experimental observations into the field of commercial distribution and use of leaded gasoline by undertaking a study of the comparative lead exposure of unexposed and exposed garage mechanics, drivers of cars, and filling station attendants.

The foregoing account of the early medical and experimental work is of more than casual importance in the history of the Medical Department of the Corporation in that they lead up to an event of major importance associated with the date, May 20, 1925. This date, referred to elsewhere in the annals of Ethyl Corporation, is that of a conference of prominent medical men, public health authorities, representatives of industry and labor and other interested persons, called by Surgeon General Hugh Cummings to consider the problem of public health presented by this industrial enterprise. The proceedings of this conference are recorded in detail in U. S. Public Health Bulletin No. 158, and its conclusions need not be restated here. It is pertinent to note, however, that the conservative recommendations of this Conference were arrived at after a lengthy discussion in which highly emotional, sometimes lurid, and wholly unsubstantiated statements were tempered by the observations and facts made available by the experimental work authorized and sponsored by the predecessors of Ethyl Corporation. The effect of this crucial test of the practical merits of medical and toxicologic research, upon the executives and medical advisors of the Corporation, was of the greatest moment in establishing the character of future relationships of the Medical Department and its future medical and hygienic policies. As a part of his report of experimental work to the Conference, Kehoe presented the incomplete results of clinical observations on garage mechanics, drivers of cars and filling station attendants, and the analytical results on

their excretions. A full report of these results was prepared shortly thereafter by Kehoe and Edgar and presented to the Board of Directors of Ethyl Corporation. Since, by that time, the investigation of the Public Health Service was under way, these results were not published until a considerably later date (J.A.M.A. 87: 2081, 1926). The subsequent confirmation of these results, in part and officially, in the investigation of the Public Health Service, and more validly and significantly by the later extensive investigations sponsored by Ethyl Corporation in the Kettering Laboratory of Applied Physiology in the University of Cincinati, served to establish the prestige of the Medical Department in the industry and among technical and medical people in related fields, thereby implementing its subsequent efforts to promote the broad hygienic program adopted by the Corporation. From the general medical and scientific viewpoint, moreover, this Conference and date have still greater significance, in that the data of Kehoe and Edgar, presented then, gave statement, for the first time, to certain facts as to the lead exposure, absorption and excretion of normal healthy individuals in the American population. These facts, following their confirmation and further elucidation, were destined to have a profound effect upon hygienic concepts and practices in the lead trades and in the community as a whole, with respect to the physiological significance of lead exposure.

January of 1926, following upon the report of the investigation of the Public Health Service, saw the resumption of the commercial operations of Ethyl Corporation and the organization of the Medical Department. At that time the medical and hygienic program of the industry as a whole came actually to be centered in one group, namely, the Medical Department and the medical research organization of Ethyl Corporation. This functional coördination of these activities at one

place, essentially under one head and general program, has such significance in relation to the past history as well as the probable future of Ethyl Corporation that it deserves emphasis. Only by the force of unusual circumstances, among which the initial deadly threat to the survival of the industry looms large, could have brought the three industrial groups engaged separately in, (1) the manufacture of the antiknock compound (Du Pont), (2) the sale and distribution of the compound (Ethyl Corporation), and (3) the manufacturers and distributors of leaded gasoline (a number of the oil companies), under one professional influence. This came about largely by reason of a verbal agreement, on the part of Ethyl Corporation, with the United States Public Health Service, to implement a series of recommendations made by the Surgeon General of the United States Public Health Service, for the control of the hazards of the business. The fulfillment of this agreement made it necessary for Ethyl Corporation to establish medical policies and procedures which under ordinary conditions would have been regarded as intrusions into the affairs of the manufacturers of the product as well as the customers of the Corporation. Before long, however, there was general acceptance of the fact that the medical advisors of Ethyl Corporation alone, among those who might otherwise exercise influence in these matters, had access to the information that was required to provide intelligent hygienic guidance. In short, the facilities for medical and hygienic research made available by Ethyl Corporation then and expanded since from time to time as required, have always constituted the cornerstone on which the wisdom and adequacy of medical policy and procedure for the control of the hazards of this industry have been based. One aspect of the coordination referred to was accomplished through the multiple role of Kehoe, who, as a member of the Medical Faculty of the University of

unbiased research in this and other phases of industrial health, while acting as chief medical consultant (Medical Director) to Ethyl Corporation, and medical consultant, in relation to the manufacture of tetraethyl lead, to Du Pont. The other factor in the application of one hygienic policy in the industry arose from the urgent need of controlling the manifest hazards of the operations involved in the mixing of the antiknock compound with gasoline. The most careful consideration of this serious hygienic problem, on the part of executives and medical advisors of Ethyl Corporation, resulted in the development of a program whereby the Corporation undertook to provide the medical and hygienic supervision of mixing plants and mixing personnel, and to set up, in detail, the regulations under which this work was to be done. This program involved the unique feature of formal acceptance (by contract), on the part of the refiners and distributors of gasoline, of medical regulations and instructions issued by Ethyl Corporation.

The foregoing items of policy and procedure may appear to be given undue importance in this recital. Moreover, they may be suspected of attributing undue prominence to medical work and personnel. On the other hand the purpose of this history is to recount and explain the past as a guide to the future. The emphasis, therefore, is upon ideas and principles arrived at largely through an interpretation of the acts and developments which grew out of the problems of the time and the compulsions of circumstances.

In the matter of developments, it may be remarked that the natural outgrowth of the principle of research as the basis of medical and hygienic practice in industry was the relationship between Ethyl Corporation and the Kettering Laboratory of Applied Physiology in the Medical College of the University of Cincinnati. The acceptance and

the creation of this Laboratory and in its development as a responsible public source of medical and hygienic information. At the time of the creation of the Laboratory, and since, other industrial organizations joined Ethyl Corporation in providing these facilities for the University of Cincinnati and in supporting the investigative program. However, Ethyl Corporation was the prime mover in founding the Laboratory, as well as its principal source of financial and moral support in its developmental period. The staff of this Laboratory began its work in the Physiology Department of the Medical College of the University of Cincinnati, late in 1925. Dr. Kehoe found it impossible to continue to absent himself from his duties in the University, and, at the same time, it had come to be apparent that the investigative program engaged in on behalf of Ethyl Corporation, fitted into the public pattern of university activities. Accordingly equipment and such personnel as were willing to do so, were transferred from the Dayton laboratories of Ethyl Corporation (in the General Motors Research Laboratory) to Cincinnati. The group so installed remained nominally in the employ of Ethyl Corporation for a time as a matter of convenience, and additions were made to the staff on that basis. Eventually, however, the policies of the University required that the research activities of this group be absorbed into the academic structure of the University of Cincinnati, and all the individuals were given formal appointments in the Department of Physiology of the Medical College. A separate laboratory building soon came to be a necessity for carrying on the increasing volume of work on the problems of Ethyl Corporation and those of certain other industrial organizations. Several of such organizations joined Ethyl Corporation in making a gift of funds to the University of Cincinnati,

by means of which a new laboratory was built. This laboratory received its name, in honor of Mr. C. F. Kettering, on its completion and dedication in December of 1938. Its activities have continued to expand until, in 1941, a small addition to the building was made, through a further contribution by Ethyl Corporation, and in 1947-48 this addition was extended so as to double the size of the original building. The latter was made possible by the contributions of about a score of large industrial organizations, which, with Ethyl Corporation, had supported the investigative program of the Laboratory. Through its encouragement and financial support of this enterprise, Ethyl Corporation has acquired access to experimental facilities for the systematic investigation of its own medical and hygienic problems, and at the same time has been actively instrumental in the development of a much needed center for industrial medical investigation and training.

The peculiar responsibilities and activities of the Medical Department of Ethyl Corporation also resulted in the creation and development of an allied organization devoted to the maintenance of the safety of all field operations in the Sales Department of the Corporation. The origin, growth and development of this organization and of its functions represents a chapter, in itself, of great interest and importance in the history of the activities of Ethyl Corporation. Its somewhat unique character, guided, as it is in all matters of hygienic policy, by the Medical Department, and yet administered and directed by sales executives, constitutes an example of the capacity of a rather large number of individuals to cooperate in single-minded devotion to an high purpose. The safety organization, managed with great zeal and meticulous attention to detail for many years by C. E. Lewis and now under the capable direction of E. O. Jones, had its

origin and its most important initial function in the work of designing and maintaining field equipment for mixing "Ethyl" antiknock compound with gasoline. The pioneer in this work, when the present type of commercial operations began in 1923, was E. M. Walters. Near the end of the first year of these operations he introduced the idea and designed the first equipment by which pumps could be eliminated in the actual movement of the compound, and an "eductor", activated by a stream of gasoline, was employed to draw the product from its container into the gasoline with which it was to be mixed. The adoption of this principle, whereby contact of the concentrated material with the moving parts of mechanical equipment could be avoided, and the product could be handled at reduced rather than elevated pressures, has contributed incalculably to the simplicity and safety of the mixing operations, and has represented a fundamental contribution to the control of the hazards of this occupation. Walters, as Assistant Sales Manager of the Corporation, in which capacity he had many other responsibilities, continued to direct all the work related to mixing installations, maintaining a continued contact with the Medical Department for advice and approval of specific plans and specifications for such equipment, until his untimely death in December of 1935. During his regime and largely through his initiation and design, the bulk type of mixing equipment (tankcar-to-weightank), now in use most widely, was developed and introduced. This constituted a second fundamental step in securing the safety of these operations by the application of sound engineering. In later years the further design of mixing equipment, the engineering features of the operations, and the technical supervision of mixing plants passed through various stages of development, with authority residing in various hands, and with significant contributions made by various persons, all of whom

The responsibility of the latter for final decision with reference to the compatibility of proposed engineering procedures with the ultimate safety of personnel concerned with the transport of the product and with mixing operations, has never been a matter of question or controversy. From the organizational viewpoint, certain changes occurred from time to time, engineering and technical field supervision of mixing plants being first a function of the Sales Department in collaboration with the Medical Department, then being transferred, as to its responsible direction, to the Medical Department, and later returning to the Sales Department, where it operates at present as an integrated part of a service organization to the customers of the Corporation. The present stage of the organization became mandatory, partly because of the variety of the operations and the necessity of their integration with other field activities, but largely because of the emergence of an hazard which for a time required heroic efforts on the part of the entire field staff of the Corporation for its control. This hazard - that associated with the cleaning of gasoline storage tanks - now recognized as the most serious of the occupational hazards of the industry, because of the virtual universality of its geographic occurrence, and because of the difficulty of keeping it under observation, was not anticipated originally by the Medical Department or by the technical personnel of the Corporation. It was recognized for the first time and somewhat incompletely in 1923, and regulations were issued by the Medical Department for its control. These regulations required modification, shortly after their initial issuance, in order to cover the various features of the hazard as they came to light, but even after they reached their present satisfactory state (1932 with only slight changes in detail, since), they were ineffectual because they were not always applied at a point

where a tank used for the storage of leaded gasoline was being cleaned. The problem has been a difficult one, since it is many sided, involving, in some measure, all transporting equipment for gasoline and all containers used in storing and handling leaded gasoline, in all parts of the world. After a series of cases of poisoning, numbering more than one hundred among employees of American manufacturers and distributors of gasoline, of whom more than a score died, it became apparent that steps had to be taken to bring this hazard under control, despite the reluctance, on the part of representatives of Ethyl Corporation, to extend their activities further into the operations of customer companies. In 1936, following a series of meetings of executives of the Sales Department and representatives of the Medical Department with various groups of the field staff, a program of observation and investigation was worked out, whereby, until further notice, the large proportion of the gasoline storage tanks in the United States and Canada, that were to be entered for cleaning, were to be observed by representatives of the Corporation during their cleaning. Samples of their water bottoms and of scale and sludge were to be obtained for examination, and detailed information concerning the previous use of the tanks was to be assembled for study. The plan of an integrated experimental study was worked out in advance through the collaboration of the Sales and Medical Departments, with the understanding that the information was to be gathered in the field and furnished to the Medical Department. All of the samples were to be analysed and all of the results were to be correlated and interpreted in the Kettering Laboratory of Applied Physiology under the direction of the Assistant Medical Director of the Corporation, Dr. W. F. Machle, who was also the Associate Director of the Laboratory.

After many months of faithful and intelligent work on the part of the field staff, and after further months of careful statistical study of the results, a report was issued in 1940, which pointed clearly to the necessity of maintaining the intensive organized collaboration of field personnel of Ethyl Corporation in the tank-cleaning operations of customer companies. The history of this collaboration, and the developments that have followed further investigation of various aspects of this problem would take us far afield into a voluminous account of organizational and technical details. The basic facts, recounted as briefly as possible, will serve to demonstrate the functional and historical association of field and service staff with the activities of the Medical Department, thereby illustrating the point that industrial safety and hygiene in the hazardous chemical trades is largely, of necessity, and by its very nature, a medical matter which requires medical research and medical direction for its implementation.

While the various activities of the Corporation were developing and expanding, the Medical Department grew in size and in the scope of its activities. The first year of business after the investigation of the Public Health Service, (1925), can be said to be the actual beginning of planned commercial operations, and the first stage in the organization of a Medical Department. During that year, and subsequently, additions were made to the traveling medical staff with headquarters in Cincinnati, as the systematic examination and re-examination of an increasing number of mixing personnel in the refineries of customer companies required. Men of high calibre and of sound medical training were needed for this work, and despite the personal and professional difficulties associated with this unusual

longed periods of time. This was made possible because the executives of the corporation were willing to follow the policy required to mitigate certain unattractive qualities of much of the medical work. Members of the staff of the Medical Department were given opportunities and were encouraged to engage in other investigative and professional activities that were not incompatible with their responsibilities to Ethyl Corporation. By such means they were spared the rigors of continuous traveling and were enabled to avoid a degree of isolation from other professional colleagues and activities, which would have made such a position unacceptable at any price to a well trained and generally competent physician. Through the operation of this policy the physicians of the Medical Department, as a rule, have conducted their work as virtually full-time (in the sense of continuous responsibility) members of the staff and with the benefits and privileges associated therewith, while engaged in restricted private medical practice or in organized investigative work. Several of them have had formal membership in the medical faculty of the University of Cincinnati, by virtue of their appointment to the staff of the Kettering Laboratory.

The first physician to be added to the medical staff was Dr. Karl V. Kitzmiller (1926). The next, within a few months, was Dr. W. P. Machle (1926), to be followed in succession by Dr. R. L. Crudgington and Dr. Lester W. Sanders (1927), Dr. L. J. Schradin (1929), and Dr. Francis F. Heyroth (1942). Dr. Crudgington relinquished his duties in 1934, in order to devote himself to the practice of obstetrics and to take up more extensive duties on the obstetrical staff of the Cincinnati General Hospital (the teaching hospital of the College of Medicine of the University of Cincinnati). Dr. Machle, who became

was on military leave from October of 1942 until October 1945, during which he directed the U. S. Army Medical Research Laboratory at Fort Knox, Kentucky. He returned as head of the New York office of the Medical Department, taking this part of a new function of the Medical Department which will be referred to later. The other members of the medical staff as named above have continued their professional services on behalf of the Corporation. Dr. Kitzmiller has been Assistant Medical Director since 1946.

The original program of the Medical Department was concerned with the medical supervision of (1) members of the field staff of Ethyl Corporation whose occupations involved actual or potential exposure to lead hazards, (2) members of the technical staff of Ethyl Corporation in research and testing laboratories, and (3) employees of customer companies in the United States and Canada engaged in mixing operations or in other occupations which gave rise to hazardous exposure to tetraethyl lead. The physicians were also required to investigate reported cases of illness among garage mechanics, refinery personnel engaged in handling leaded gasoline, filling station attendants and all other persons, including the drivers of automobiles, when any of such cases were thought or alleged to be due to exposure to leaded gasoline or to the exhaust gases of automobiles using leaded gasoline as a fuel. Medical representatives were also to consult with and advise refinery superintendents and other executives and technical personnel of customer companies on problems arising from their use of the antiknock compound, and to maintain such regular contact with regional and local representatives of customer companies as to be acquainted with their problems. This was facilitated greatly by the eventual development by Ethyl Corporation of a trained staff of

of customer companies, whether in the promotion of sales or in the technical control of hazards, were of great help to the physicians. The technical supervision of mixing plants and the medical supervision of the personnel were coördinated effectively by an arrangement whereby the doctor visited the plants in the company of the appropriate member of the field organization.

With the advent of a program of health and sickness benefits, provided by Ethyl Corporation for all of its employees, in 1938, the work of the Medical Department was expanded to include medical examinations for all new and prospective employees. So far as possible, these examinations were carried out by traveling members of the medical staff. However, the geographic distribution of division offices, and the fact that the headquarters of the Medical Department was in Cincinnati and not New York or Detroit, made for inconvenience and delay in the performance of these examinations. For this reason, a group of local medical consultants was engaged to carry out pre-employment examinations of applicants for positions in Ethyl Corporation when and as requested, and to report these to the Medical Department. These consultants were located in New York, in relation to the New York office and the Yonkers Laboratory, in Detroit, and in other cities in which there were division offices. Members of the Medical Staff have maintained close professional contact with these consultants, familiarizing them with the relevant medical policies of the Corporation, and integrating their work with that of the Medical Department.

The foregoing development led to the advisability of further extension of the medical services of the Corporation to its employees, and paved the way for the present program of medical service and, so to speak, medical maintenance. Plans were laid during the war, and

consummated as soon as possible after its close, for providing not only pre-employment examinations for all employees, but also annual examinations, with somewhat limited opportunities for certain types of medical advice in the interim. This required the development of a medical office in New York, and an extension of the medical facilities of the Detroit Laboratory. Dr. Machle took over the responsibility for this development in New York, and soon associated with himself an office and laboratory staff of two persons and an assistant physician, [illegible] Bayer. At the same time, this group took over the responsibility for all personnel of Ethyl Corporation in the New England and Philadelphia areas, and for mixing personnel of customer companies in that area.

The Detroit Laboratory, under the medical supervision of Dr. Sanders as the visiting physician, had first acquired the services of a nurse for first aid and minor medical service to its staff in 1942. With the adoption of the more comprehensive program of medical work, it became advisable to engage the services of a physician to visit the Laboratory daily and to set up and maintain a schedule of periodic examinations. Dr. Carl J. Sprunk of Detroit assumed these duties, in which capacity he now acts as assistant to Dr. Sanders.

At the end of the war it was possible to augment the staff of traveling physicians so as to lighten the load of medical work which had increased steadily during the war and of necessity had been assumed by the existing staff. Dr. Earl Doty was appointed in this role in 1945, first as assistant to Dr. Schradin, then as a staff member assigned to an area in which he assumed full responsibility for the medical supervision of personnel of both Ethyl Corporation and oil companies.

implemented, a new phase of medical work came into being, in that Ethyl Corporation took over the operation of its manufacturing plant in Baton Rouge in September of 1945. It became necessary to organize a plant medical service, without delay. Fortunately this was not as difficult as might have been expected, since the Medical Director of Ethyl Corporation, acting as a special medical consultant to E. I. Du Pont de Nemours and Company, had had intimate and continual familiarity with the Baton Rouge plant and its personnel throughout the entire period of the existence of the plant. After a period during which the physicians of the Du Pont medical staff remained at the plant to carry on the medical services as they had before, Dr. Roy C. A. Bock was appointed to head the Medical Staff at Baton Rouge. Dr. William W. Corbett, formerly of the Du Pont organization, elected to remain, and other physicians were found to assist Dr. Bock in the work at Baton Rouge. The present medical service at Baton Rouge, which will require some expansion when a new medical building has been completed, consists of four physicians, Dr. H. C. Harris having joined Dr. Bock and Dr. Corbett in November of 1946, and Dr. George D. Dicks having come in October of 1947. The full staff of the plant dispensary, in conformance with the requirements of the varied services, (formally approved by the American College of Surgeons) is made up of nurses, technicians in the clinical and X-Ray laboratories, and secretarial assistants.

The beginning of commercial operations in Mexico in 1939 required the appointment of a physician residing in and licensed in that country to supervise the mixing personnel of the gasoline distributing companies. This was accomplished when Dr. W. J. Lynn agreed to undertake this work. Dr. Lynn died in November of 1937, and was succeeded by Dr. Salvador Bermudez, who is associated with

the School of Public Health in Mexico City. Dr. Bermudez maintains a close consulting relationship with Mr. L. M. Phillips, who represents Ethyl Corporation commercially in Mexico, and sends reports frequently to the Medical Director.

The activities of the Medical Department, over the years, and its present functions have been indicated in the preceding account. In order to summarize them and to demonstrate the functional pattern of the Department as a whole, a chart has been prepared and is attached. Two additional features of the medical activities mentioned in the chart as duties of the Medical Director appear to require elaboration as history and as present policy.

The occupational hazards involved in the conduct of this business enterprise, and the justified concern manifested by health authorities and by the public in relation to the effects of exposure to lead compounds, have necessitated the maintenance of close and mutually frank relationships between the Medical Department of Ethyl Corporation and responsible public health officials. Such a liaison has been maintained with the U. S. Public Health Service, and when Ethyl Corporation has extended its activities into other countries, the public health authorities have been consulted beforehand and put in possession of all the available information relating to occupational or public health. By such a policy, and by virtue of the systematic publication of the results of investigations carried out in a responsible institution of learning, the good faith of the Corporation has been shown and its medical representatives have been accorded a respectful hearing. Indeed, on several occasions, their professional assistance has been sought in dealing with problems of public and governmental

policy and procedure, in relation to this industry.

The conduct of the admittedly hazardous business of Ethyl Corporation has been fraught with more than an ordinary need for the means of defense against litigation based upon false or mistaken claims of injury to the health and well-being of persons engaged in specific occupations or merely represented in the general population. This need had been one of the factors which has justified the expense of the program of hygienic research sponsored by the Corporation. In addition, it has been a duty of the Medical Department to maintain intimate and detailed acquaintance with all of the activities of the Corporation which might, conceivably, result in medico-legal complications. It is true unfortunately, that very few of the business operations of the Corporation fall outside this category. Consequently the Medical Department has been required to enter into the discussion of all manner of policies and procedures which, ordinarily, would be regarded as strictly related to commercial matters. It has had a degree of authority deliberately delegated to it by executives of the Corporation, the exercise of which, under other circumstances, might have had an arbitrary and dogmatic character. The point which has been recognized and implemented, is that if the Medical Department must accept professional responsibility for the guidance of the Corporation in matters of public policy related to health, - as it must under legal attack - it must have minute and detailed knowledge of what is done by representatives of the Corporation and, in many instances, by customers of the Corporation. It must also have an authority commensurate with its responsibility. This has translated itself into an organizational relationship which is not common in American industry, in that the Medical Director has derived his authority directly from the President

MEMORANDUM ON THE OBJECTIVES AND OPERATIONS OF THE MEDICAL DEPARTMENT OF ETHYL CORPORATION - 1953

Objectives

The primary objectives of the Medical Department of Ethyl Corporation are:

1. Continuous appraisal of the occupational and public hazards to health associated with the operations of the Corporation, as these derive from the manufacture and distribution of all of its products (clinical, epidemiologic and physiologic research).

2. Protection of persons who may be subjected to hazards from Ethyl's products or operations;

   a. The employees of the Corporation;

   b. The employees of carriers of the products;

   c. The employees of customer companies whose handling of these products (principally ETHYL fluids) exposes them to significant danger;

   d. The public.

3. Maintaining employees of the Corporation in a state of health, so far as may be possible within the limits of the medical policies and capacities of the Corporation, and giving advice and assistance toward appropriate medical care when preventive measures fail.

Secondary but essential objectives are those of:

1. Coordinating the activities of the Medical Department with those of other departments, notably manufacturing, sales and

research, to the end that hygienic considerations are maintained in a prominent position in the conduct of the day's work;

2. Cultivation of familiarity with current policies and plans for the further development of the Corporation, at various points of contact, including that with major executives, for the purpose of providing such guidance on hygienic matters as might be indicated.

Robert A. Kehoe, M. D.
Medical Director

November 24, 1952

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APPENDIX

Operations

The operations which are concerned with the foregoing objectives are the following:

Direction and Administration

The Medical Director limits his activities mainly to the general administration of the activities of the Medical Department, but pays particular attention to those operations that seem to him most crucial:

1. Control of the hazards of the manufacture of tetraethyl lead;

2. Various current and long term investigations on the medical and hygienic problems of the Corporation, initiated by the Medical Director and then followed in his capacity of Director of The Kettering Laboratory.

The Associate Medical Director is responsible for the day-to-day conduct of the medical and hygienic operations of the Corporation, with particular reference to the clinical and safety programs. He also coördinates the clinical work of the manufacturing plants with that carried out in theCorporation, generally, and does a considerable portion of the clinical work himself.

Medical Care of Ethyl Personnel

The regular clinical and first-aid operations involving personnel of the Corporation, exclusive of the two manufacturing plants (Baton Rouge and Houston) which are operated and budgeted separately, are carried out by regular medical consultants in New York, Detroit, Los Angeles, and Cincinnati, and by Medical Supervisors whose headquarters are in Cincinnati and whose principal

activities relate to the medical care of employees of customer companies. In this work are involved nine physicians and two nurses (one each in New York and Detroit).

Medical Care of Customer Personnel

The regular clinical supervision of blending plant personnel (and that required occasionally for other customer personnel) involves approximately four thousand persons in some four hundred locations, scattered over the United States, Canada, Mexico, Cuba and certain South American Countries (Venezuela and Chili at present). These employees of customers are examined periodically and maintained under instruction and supervision by a substantially uniform and personalized procedure, which, thus far since 1926 when this work was organized and inaugurated, has succeeded in preventing the occurrence of lead poisoning among this group despite the potentially great severity of their occupational hazards. The Associate Medical Director, the three Medical Supervisors, one part-time plant physician, six regularly retained Medical Consultant, and three local medical consultants (in Venezuela and Chili), i.e. fourteen physicians in all, are concerned with the conduct of these medical operations.

Clerical and Financial Operations

The maintenance of the medical records of Corporation and customer personnel is the responsibility of one confidential secretary in Cincinnati.

The maintenance of the records and correspondence of the Medical Supervisors and regular Medical Consultants, as those relate to the plants and the management of plants of customers is carried out by one secretarial assistant, who is also the secretary

of the Associate Director.

The financial matters involved in the operations of the Medical Department and in the activities of the Kettering Laboratory as these relate to Ethyl Corporation, are handled by a financial secretary, who also is the accountant for the Kettering Laboratory.

One additional secretary is confidential secretary to the Medical Director of the Corporation. Her work includes secretarial responsibilities to the Director of the Kettering Laboratory.

Robert A. Kehoe, M. D.
Medical Director

November 24, 1952

related to the occupational hazards of employees of the Corporation and those of employees of customer companies, in so far as the latter were believed to require uniform medical supervision at our hands. In the case of employees of Ethyl Corporation, all persons whose work has involved potential or actual exposure to tetraethyl lead and "Ethyl" fluid, from the earliest period of the medical work have been scheduled for pre-employment, annual (more frequent if indicated) and terminal examinations, whether such persons were engaged in the technical laboratories, the manufacturing activities (Deepwater originally), or in field activities. This program requires that the medical work be done in all parts of the country, including the New York area, by physicians whose headquarters were in Cincinnati. The personnel included in those examinations consisted of practically the entire sales organization, except strictly clerical and steno-

MEMORANDUM ON THE PROGRAM OF MEDICAL DEPARTMENT OF ETHYL CORPORATION WITH PARTICULAR REFERENCE TO NEW YORK ACTIVITIES

Function

In examining the functions of the New York unit of the Medical Department, it is necessary to give consideration to the general medical program of the Corporation and to see, thereby, the background into which these local functions fit. This is especially true, since the activities in New York, for a number of purely local reasons, are destined to be more costly than corresponding activities elsewhere, and therefore they attract undue attention to themselves if they are not recognized as part of an over-all plan out of which certain average costs arise.

The initial steps taken by the Medical Department in fulfillment of its professional responsibilities to the Corporation

graphic staff and the New York executive group, and all the personnel of research and testing laboratories. Originally this constituted more than two-thirds of the employees of the Corporation. Also as time went on, members of the staff of the Medical Department were called upon for medical advice by executives in New York and by personnel in all areas of activity of the Corporation. This occurred primarily because of the capabilities of the medical staff and because of the frequent and urgent need for medical advice which arose among the personnel. There is no question as to the desirability and the utility to the Corporation of having such service available within reasonable limits. Many situations over the years have arisen in which medical aid has been rendered which has resulted in salvaging individuals and in building morale among the personnel of the Corporation.

With the inauguration of various health and sickness benefits for all employees of the Corporation it became necessary for the Medical Department to assume the responsibility of pre-employment examinations for all employees of the Corporation, and to deal with medical problems arising out of this situation. The nature of disabilities, their compensability, their implications with respect to duration and probable outcome, the subsequent employability of individuals, and similar matters, had to be dealt with. Because of the wide distribution of the employees of the Corporation, the direct handling of individual cases became troublesome and expensive, and therefore a series of local consultants were engaged to care for such matters at the call of the Medical Director or members of the Medical Staff. Without going into detail as to professional matters, the work of such consultants has always been a problem to deal with. Initial interviews and frequent correspondence on matters of

company and professional policy, are required, and because of the fact that these matters are rarely of first importance to men engaged in private practice, it is difficult to achieve that quality of medical service which members of the Medical Staff of the Corporation have desired to provide, themselves, and obtain from others.

The setting up of the New York Medical Office was the outgrowth of this general situation. It was a logical and, in the opinion of the Medical Director, an highly desirable move, (1) because of the growth in numbers of the New York group, (2) because of the importance to the Corporation of the health maintenance of its top management, and (3) because of the increasing difficulty of handling the medical problems by remote control.

The establishment of the New York Medical Office came about later than the need which it was designed to meet, for a number of reasons, (the urgent need for medical personnel in essential services during the war, the unavailability of the right person for the job, etc.,. It was not created, therefore, without relation to the considered medical policies of the Corporation, but was, in fact, a part of such policy as it had been applied over the years. The actual time of its establishment was conditioned by the fact that the right person, in the opinion of the Medical Director, became available, through a combination of circumstances, in that Doctor Willard Machle, on leave from the Medical Department during the war, decided to go into clinical medical practice rather than to return to his post as Assistant Medical Director (and Associate Director of the Kettering Laboratory). The Corporation had a large stake in Doctor Machle, in that his fifteen years or more of experience with the Medical Department and with the experimental program relating to

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the hygienic problems of Ethyl Corporation, had built up in him a knowledge possessed by no one else in the organization except the Medical Director. Such knowledge is not easily come by, and this represented an asset and an investment which the Corporation could ill afford to lose. In addition, his clinical abilities and his acquaintance with the New York personnel of the Corporation made him the ideal choice for the task of setting up the New York Medical Unit. Under these circumstances the Medical Director recommended this course, and, with the approval of executives of the Corporation, it was undertaken.

1. On this background the present and future status of New York medical activities may be examined critically. From the purely medical viewpoint, careful examination of the accomplishments of the New York Medical Staff leaves little room for doubt that in the space of less than two years it has achieved in large measure what was intended and that the remainder will come with time. Some little difficulty arose at first in the matter of the nature and scope of services which were to be rendered without cost to employees of the Corporation. This matter has been dealt with by the adoption of a policy that members of the Medical Department are not to engage in personal medical services for employees for which charges would be made directly to such employees. Other minor problems, which stemmed from lack of understanding of the general purposes and scope of the medical services on the part of personnel of the Corporation, and which can be solved only by the cultivation of proper personal and professional relationships, are well on the way to disappearance. The service is good, it has gained extensive acceptance and good will among the employees, and its loss would be felt considerably, even after so short a time as it has been in existence. If evidence of

been dealt with properly if at all, by any other means than that now available in this form at the expense of the Corporation.

2. In short, the New York medical service was set up on the basis of the experience of the Medical Director, to achieve certain ends believed to be in the best interest of the Corporation. These ends, in his judgment, are being achieved to a satisfactory degree, and bid fair to be achieved fully within a short period by the continuation of the service. Such functions as are believed to be of the greatest value to the Corporation cannot be maintained by any other general means than that now available. It has been sugge that nothing or little would be lost to the Corporation by a return to the arrangement whereby certain medical services were provided previously to New York employees of the Corporation. If there is any wisdom in the considered judgment of the Medical Director of th Corporation, this is simply untrue.

this fact is required, beyond the candid judgment of the Medical Director, a few data will furnish it. In the year 1948, the first full year of the present operations, 157 members of the New York organization, (approximately half of the group) presented themselves for periodic diagnostic or check-up examinations. During this perio employees of the Corporation made 705 visits to the Medical Departme for first aid, personal counsel and follow-up services. From the aspect of value to the Corporation, the most important services rendered were those represented in personal counsel. A number of personal problems, dealt with by the Medical Staff and discussed by them with the Medical Director at the time or subsequently, have be of such importance as, in themselves, to justify a large portion of the effort and expense of the service. There is excellent reason, in past experience, not have

Economy

The question now posed is not that of the advantage or lack of advantage of the present medical services to the Corporation and its employees, but whether the Corporation can afford the good medical service now provided. Obviously, only the management of the Corporation can answer this question. However, in order to put the matter on a basis of economic reality, as well as to avoid any invidious implications, the question might well be restated in other terms. Are the benefits of the service worth the cost? Could equally beneficial services of comparable type be provided at reduced cost?

In considering the first question, the scope of the present activities should be set against the cost of its several parts, none of which cannot be dispensed with unless medical policies, generally agreed upon within the Corporation, are to be abandoned. It was recognized at the outset that the cost of medical services to the New York personnel alone would be high if carried out in the manner desired by the Medical Department, and for this reason certain activities, formerly carried out by the physicians located in Cincinnati, were allocated to New York. This reduced the traveling expense for medical services to employees of customer companies in the New England area, lightened the burden of the medical work of the Cincinnati group and lowered the cost of the latter to the extent of the reduction in the personnel required to do the medical work. At the same time, competent medical advice could be provided for customer companies having headquarters in the East, in relation to their problems of policy and of medico-legal significance in connection with their use of "Ethyl" fluid, with considerable increase in effectiveness and with some saving in cost. That this provided the means of saving the

time of the Medical Director, who up to that time had handled all medico-legal matters for the Corporation, is another point of some importance in view of the increasing administrative load of the Medical Director in matters of direct as well as indirect concern to the Corporation.

Tabulated below are the various major items of the New York medical activities, together with the approximate cost of each item and the summation of the entire cost of the operations in 1948. In arriving at these figures the time spent by the members of the New York Medical Staff in medical service for Ethyl Corporation alone, has been determined, by analysis of the daily activities of the individual physicians (as tabulated), to be approximately 55 per cent of their time. Since the clerical and technical work and all other activities go along with the work of the physician, the proportion of time expended by the physicians on each of the several items has been combined into the proportion of time spent by the group on the respective items, and the entire cost of the medical service for the year has been subdivided accordingly. The book figure of $46,000.00 in round numbers for 1948 covers all of the expense of the work of the New York group with the exception of a few items of general expense, such as those of traveling, contributions to retirement plan, and various types of insurance. These may be estimated for present purposes at about $2,000.00, giving a total expense of $48,000.00.

Percentage of Time of Physicians Spent on Affairs of Ethyl Corporation and Distribution of this Percentage in Relation to Ethyl Major Problems and Personnel

Physician	Ethyl	Customer Companies		All
	Office Cases and Interviews	Problems and Personnel of Mixing Plants	General Hygiene and Medico-legal	
Machle	27	10	23	60

Distribution of Cost of Services Rendered to Ethyl Corporation Weighted according to salaries of physicians and their proportional expenditure of time

Items	Cost (Round Numbers)	Error + Calculation made Reasonable Allowance ↓
Medical Problems of Customers (Medico-legal, etc.)	$14,250.00	14900.00
Medical Supervision of Customer's Employees (Mixing Plant)	12,250.00	13,200.00
All Medical Service to Customers	26,500.00	28,100.00
Pre-employment Physical examinations	1,210.00	1710.00
Periodic Diagnostic Examinations	8,500.00	9,400.00
First Aid, Personal Counsel, Follow-up) (705 @ $4.00)	10,230.00	9,630.00
Workman's Compensation and Insurance	160.00	160.00
All Medical Service to Ethyl	$1,100.00	$2,900.00
All New York Medical Service	$3,000.00	$4,000.00

Examination of the expense associated with certain items of the year's work, on a cost-per-unit basis, will serve to provide a means for comparison of the cost of the corresponding activity if it were carried out by a consultant using his own facilities and naming his own fee. Thus the average cost of 35 pre-employment examinations at the rate indicated in the table was about $55.00 (52.00), as compared to the average of about $37.50 for which similarly comprehensive examinations have been carried out for us by internists in several parts of the country. The average cost of 157 comprehensive periodic diagnostic surveys was a little less than $50.00 (54.00), which while high for an organized group, is not remarkably excessive in view of the time, equipment and experience called upon. Our figures for comparable examinations elsewhere have ranged from $40.00 to more than $1,000.00, and while the latter sum, admittedly, is grossly excessive, some idea of the problem presented by special situations may be conveyed thereby. We have no satisfactory basis for comparison of other unit costs, as

recognized, in terms of the foregoing paragraph, as excessive, and either this should be recognized and accepted, if this is unavoidable and productive expense, or it should be reduced. For a number of reasons, some of which will be developed later, the Medical Director does not believe that it should or can be eliminated. He recommends that it be accepted in large part as the inevitably high cost of services of the type desired, and that an effort be made to bring about a decrease in cost to the extent compatible with good professional service.

The excess of the cost over that which was estimated originally, and above that which would seem usual, is due in large part to the high overhead cost of doing the medical work in the Chrysler Building, and to the individual and aggregate of the salaries of those who provide the medical services. As to the former experience in r

would

for example, the cost of dealing with a situation involving potentia
litigation, and moreover, in view of the potentialities of these
situations, financially and in terms of the reputation of an industr
it is quite impossible to give them a valuation. It may be point ed
out, however, that one troublesome case of litigation which was
handled by Dr. Machle in New York, at virtually no expense to Ethyl
Corporation, would have taken several days of the time of the Medica
Director on several occasions, and would have involved traveling
expense on his part approximating $1,000.00. By virtue of the
concentration of oil company headquarters in New York City, issues
of this type arise frequently there, and when dealt with convenient
and with dispatch in their early stages, much subsequent difficulty
as well as expense, is avoided.

The unit cost of certain items of the medical work can be

that is little more than half of his time, is the largest factor in the excessive cost of the conduct of the New York Medical Office. For the value represented in Dr. Machle's broad acquaintance with the medical and hygienic backgrounds of Ethyl Corporation, his services could be dispensed with, and the work of supervising mixing plants and providing medical service to the personnel of Ethyl Corporation could be done by two men such as his present associates, engaged on a part-time basis. Or, if the work of supervising mixing plants and of rendering other advice and assistance to customer companies were reallocated to Cincinnati, one of these men could do the New York job. The situation hinges, therefore, on Dr. Machle and on the extent to which he is an asset to be cherished, since his qualities of mind and character and his broad interests in clinical and industrial medicine cannot be confined within the limits of a conventional job and the problems of one industry. The Medical Director believes that the elimination of Dr. Machle is inadvisable for two

indicate that the present location is desirable despite its cost, an
that no other location would be so satisfactory. As to compensation
for personnel, it is fair to say that all of the work could be done
by one physician and one technician-secretary at a cost less than
half of that now incurred, if the necessary qualities required in
physician and technical-clerical assistant were combined in the two
people giving their entire time to the activity, and if the physicia
could be in two places at once, i.e., in his office and in a custom
refinery. Ignoring the last consideration, it would be difficult i
not impossible to find two persons who could meet the specifications
and if such a physician existed, he would not accept what we have to
offer as his exclusive professional activity. Looking at the situa-
tion frankly, the salary of Dr. Machle, and the arrangement whereby
he gives his time to Ethyl Corporation as required, but to an exten

reasons. First, because no other member of the Medical Department has had the experience in all phases of the medical and hygienic work of Ethyl Corporation that would provide a basis for sound advice and service to the Corporation in the event of the early retirement of the Medical Director. This situation exists because the Medical Director has relied upon the availability of Dr. Machle in emergency, in lieu of taking on and giving comparable training to a younger assistant. Each of the other members of the Medical Department is fully competent to do his job within his own area of responsibility, but none of them has had the combination of experience in relation to manufacturing plant, field operations and general hygienic practice and policy, that were built up in Dr. Machle by years of sharing the responsibilities of the Medical Director. This situation can be corrected, but time and opportunity have not been afforded to do so, as yet. Second, the Medical Director is convinced that it is advisable and almost a necessity that the physicians of Ethyl Corporation who deal with the public and with the executives, technical representatives and other employees of customer companies, should have actual and recognized professional competence beyond that generally expected of industrial physicians in the past or at present. Accordingly he has always believed that his associates should be engaged in professional work other than that strictly related to the affairs of Ethyl Corporation. Dr. Machle's reputation and professional eminence in the field of occupational medicine - an eminence which stems only partly from his association with Ethyl Corporation and the Kettering Laboratory, but is derived largely from his work at Fort Knox during the war, and his investigative and consulting activities since that time - are valuable to Ethyl Corporation, quite beyond any present sum represented in his compensation. If Dr. Machle is to be available, the conditions

should be provided for employees of the Corporation in New York and Illinois, one may not ignore recent provisions of the laws of New Jersey and New York State. The details of the new legislation in relation to the medical care of industrial personnel are not clear at this time, but we have been informed that this law will resemble the New Jersey law, and that the trend in legislation is toward the extension of more and more medical service of this type. It is our understanding that certain benefits and medical services must be made available to all industrial employees, the cost to be provided for by a payroll tax. Companies that provide services of suitable scope are said to be exempt from such taxation. Certainly this is a matter that requires examination and clarification before our own plans are discarded or altered radically. We should be glad to consult with the Legal Department on this matter at a suitable time. It is fair to say, in this connection, that governmental authorities are determined, increasingly, to make provision for better medical care of our

of his engagement must be such as to give us the benefit of his services without unreasonable interference with his other professional interests. It was for this reason that he was set up in his present capacity, and if he is to be retained, it will have to be on some comparable but not necessarily identical basis.

The arrangement whereby both Dr. Boyer and Dr. Gregorius spend only part of their time in service to Ethyl Corporation is believed to be sound in principle, because of the nature of the work which requires that one physician be in the New York office at all times, while each is available for services outside the office. The question of Ethyl's proportional cost of the professional services of these men, and the desired mode and extent of their compensation, are matters for further examination.

In considering the nature of the medical services that

...rise, but for large numbers of people who find themselves in a very ...ingly state with reference to their medical problems, one of the ...ost satisfactory means of dealing with many of the ills of a large ...proportion of our total population can be provided through industrial ...edicine. This type of medical practice is largely preventive in ...character, in that it seeks to recognize illnesses in their early ...stages, or attempts to ward them off by appropriate advice and help. ...What seems certain to be attempted is more, rather than less, medical ...care for increasing numbers of industrial employees in all categories ...From this viewpoint, which we believe to be realistic in terms of ...policy and eventual cost, the suggested abandonment of Ethyl Corporation's medical program is a retrogression, which, if acted upon, will ...almost certainly have to be reconsidered later. We believe the pro... ...gram should be continued as effectively and yet as economically as ...possible.

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population. Every effort will be made to bring various groups of the population into some relationship whereby medical services will be paid for out of taxes, compulsory health insurance payments and the like. The pros and cons of this public policy could be argued at length, but it may suffice for present purposes to point out that if industry is to be compelled to pay for such service, it would do well to maintain as much control as may be possible of the type and quality of the service rendered. We have not been unaware of this trend for some years. It is, we think, desirable and inevitable, under the conditions of modern life, and the example of what can be done by private enterprise and by private professional practice may well have an highly important influence on the entire development of the national health program. Speaking, not for the physicians, who will suffer little under any set of conditions that seem likely to

This brings us to suggest certain alternatives to the liquidation of the present medical regimen in New York, subject to critical examination in the hope that an acceptable policy can be agreed upon for the same time to come. This need not exclude consideration of still other possibilities.

1. In view of the foregoing discussion, the decision of the management may be that the present program is satisfactory in concept and principle, but that its cost should be reduced as much as may be possible. It would seem that this could be accomplished only by the reduction in the aggregate or individual salaries of the physicians. It has been recommended recently that part-time members of the medical staff be classified as Medical Consultants. If this recommendation is approved, it will not be amiss to review the retainer fees of all such consultants in line with the extent of the services they are called upon and prepared to give. Dr. Machle, for example, might be asked merely to supervise the medical activities of the association and to act as consultant in matters involving insurance companies and medico-legal considerations.

2. It may be that the management of the Corporation is prepared to set a sum beyond which the cost of the New York medical activities is not to go. This could be a round sum, or a proportion of over-all medical costs exclusive of research, or, perhaps, a schedule of unit costs, thereby, in the latter case, making allowance for the expansion of the total cost in proportion to the use made of the service. This would leave the character of the medical service to the judgment of those who, we believe, are best prepared by training and experience to determine what it should be.

3. Dr. Machle and his associates might separate themselves entirely from the medical organization of Ethyl Corporation, and,

after taking over the present medical facilities by suitable financial arrangement with the Corporation, they might find it possible to provide medical services of the type desired by the Corporation on a fee-for-service basis. Because of the professional relationship between ourselves and Dr. Macnie, this service could be carried out with certain advantages to the Corporation and with fewer handicaps than would obtain if other physicians were to be engaged in this capacity.