THE WAY AHEAD FOR OCCUPATIONAL HEALTH

FIVE DOCUMENTS

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Occupational Health

FOREWORD

In this, the year of the 50th Anniversary of the first beginnings of the Division of Occupational Health, there has been much discussion of where occupational health is headed, what role the Division should play in the future, and how the necessity for continuing though modified activities can be brought home to national leaders.

It was felt that some of the difficulty experienced by staff members and others might be reduced if they had readily available in one binding the more specific documents setting out plans, directions, and suggestions for action.

Five documents have been selected for inclusion:

1. Document A -- "Report of the Committee on Environmental Health Problems" by Committee on Environmental Health Problems.

2. Document B -- "Occupational Health in the Public Health Service" by Luther L. Terry, M.D.

3. Document C -- "What Lies Ahead in Occupational Health -- A Look at the Next Fifty Years" by Honorable John E. Fogarty

4. Document D -- "Occupational Health -- The Complementary Approach to Environmental Health" by Douglas H. K. Lee, M.D.

5. Document E -- "Divisional Staff Review of Prospects in Occupational Health" by Douglas H. K. Lee, M.D.

It is hoped that the essential unity in these items of varied authorship will be apparent, and that the call to action will be more easily answered as a result.

Document A

REPORT OF THE SUBCOMMITTEE ON OCCUPATIONAL HEALTH

(Report of the Committee on Environmental Health Problems, Public Health Publication #908, 1962)

RECOMMENDATIONS

1. Major strengthening of the PHS program in occupational health is recommended to secure and maintain the health and well-being of the gainfully employed of the Nation at the highest possible level, so that they may realize their full potential as members of society and the Nation may enjoy, in fullest degree, the benefits from our industrial effort. The PHS must assume primary leadership in the advancement of the total national effort in occupational health.

2. To meet the foregoing, we recommend acceptance of the objectives, specific goals, and plan of action outlined in the accompanying proposal as a "charter" for the U. S. Public Health Service to follow.

3. Administrative organization and operation of the occupational health program within the Environmental Health Center is recommended as a means of insuring a strong position for occupational health within the Public Health Service structure and in order to gain strength from close association with other activities having certain common interest in the field of environmental health. The Subcommittee wishes, however, to sound a note of caution. Care should be taken to avoid compartmentalizing environmental health activities by scientific disciplines and/or professions with consequent loss of identity of the separate problem areas. The potential strength of the Center should develop by interdivisional collaboration and mutual attack upon problems of common interest, with encouragement of interdisciplinary development, rather than by administrative predetermination of specific research areas.

4. As an essential part of the national effort in occupational health, university research must be encouraged and expanded. To meet these needs, financial support through the PHS has to be increased. In addition to the present scheme of support for specific research projects, we particularly recommend that the PHS be authorized to support long-term university research programs in broader problem areas in occupational health, so that effective research groups can be built up within the universities with better chances of drawing well-trained research scientists into this field. We also recommended that such research undertakings be employed as a means of training scientists for work in important areas of occupational health.

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5. Support of specific training programs in occupational health in appropriate universities, and provision of fellowships for student support, are recommended.

6. A program of inservice training is recommended, to be operated within and by the staff of the Division of Occupational Health, to meet two major needs in technical training: (a) for certain Division personnel; and (b) for personnel in State and local health services. In addition to the short-term training provided under (a) above, the Bureau should intensify the program of formal academic postgraduate out-of-service training for suitable personnel in the Division of Occupational Health.

7. To meet the manpower requirements for the proposed program, an increase in personnel, as set out in Table 1 of this report, is recommended over the next 5 years. It is anticipated that the staff needs for 1971 will exceed those shown for 1966 by approximately 50 percent.

TABLE 1. Estimated Technical Manpower Requirements

Professional Discipline	1961	1966
Engineering	12	40
Physics	7	20
Chemistry	37	130
Biology	8	40
Medical and paramedical	36	80
Allied Sciences	8	40
Total	108	350

8. The sums of money set forth in Table 2 of this report are recommended for the support of the proposed program over the next 5 years. It is anticipated and recommended that the budget for 1971 exceed that of 1966 by a factor of approximately 2.

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TABLE 2

Estimated Fiscal Requirements
(Millions of dollars)

Use	1961	1962	1963	1964	1965	1966
Grants						
Research grants	1.4	4	5	7	8	11
Project training grants				1	4	7
Other grants and fellowships		.5	1	1	2	3
Total, grants	1.4	4.5	6	9	14	21
Direct operations						
Research	1.0	1.2	2.5	3	4	5
Training	.2	.2	.4	1	1	1.5
Technical assistance	.7	.7	1.1	2	3	3.5
Total, direct operations	1.9	2.1	4	6	8	10
Total, occupational health	3.3	6.6	10	15	22	31

INTRODUCTION

The Subcommittee met with representative of the Division of Occupational Health on September 10 and the Chairman had a further conference on September 19. In the course of these meetings, the mission of the Subcommittee was reviewed and the overall objectives, present operation of the Division, and needs for continuation and expansion of the national program of occupational health were examined in a preliminary way. The Division staff were asked to prepare a working paper, setting forth in more specific detail a statement of the present and future problems in occupational health; the objectives and specific goals as developed in the Subcommittee-staff discussion; and an outline of the programs, organization, and facilities needed to meet these goals. In the preparation of this paper, the staff was particularly requested to examine the subject in relation to the central questions confronting the committee on environmental health, having to do with meeting the scientific and

professional manpower requirements, provision of the necessary organization and physical facilities for the conduct of essential research, both in the laboratory and in the industries, proper coordination and balance between the PHS and non-Federal agencies in respect to research and training of scientific and professional personnel, and between PHS and other Federal agencies having personnel and research facilities and responsibilities in the areas of occupational health. These questions, in turn, center around the main question respecting the need for an organic Environmental Health Center designed to bring together for mutual strengthening and to give a central purpose to the several major problem areas of public health arising out of environmental challenges to man's health.

The staff working paper was reviewed by the Subcommittee and consultants on September 27 and is attached as a supplement to the Subcommittee report. It reflects the Subcommittee views and provides essential foundation material in support of the conclusions and recommendations of this report.

NEEDS FOR A STRONG PROGRAM IN OCCUPATIONAL HEALTH

The need for a strong national effort to secure and maintain maximum health among the gainfully employed men and women of America requires no particular justification. The need is obvious. They must be given the same protection against ill health as is enjoyed by other members of our society but, in addition, they require special protection against the peculiar health hazards that arise out of and in the course of their work. As individuals, too, and from the standpoint of total national welfare, both economic and in terms of deeper human values, every opportunity must be taken to raise their level of health in a positive sense, over and above the mere elimination of negative health factors. Great benefits have come from advances in science and technology and from their application by our industries. These have not been gained, however, without certain costs in terms of human values. If we are to enjoy to the fullest extent the benefits from our modern industrial society, these costs have to be better recognized, evaluated, and reduced. The national effort in occupational health must be directed to this end. All of the costs, of course, are not to be measured in terms of ill health, but it is in this area that we can especially expect clear-cut returns. The remarkable successes from organized, scientific public health effort of the past assure this, and success will be limited only by the extent of

our effort to define the problems, identify significant cause-and-effect relationships and devise and apply corrective measures. These broad principles and methods of operation--the basic, time-tested procedures of public health--are spelled out for particular application to occupational health in the accompanying program.

The specific problems of occupational health are many and varied and, owing to the dynamic nature of American industry, it is impossible to anticipate the exact nature of future problems. Hence, an occupational health program must be flexible, anticipating new problems in broad categories and not making rigid commitments to particular areas of research, development, and operation. The Subcommittee accepts and recommends this program as a broadly conceived, sound, and essential "charter" to meet the particular responsibilities of the Federal Public Health Service within the total national effort to secure and maintain the health of the gainfully employed.

It is significant to note that the total cost of the current program in occupational health amounts to 5 cents per worker, per year, and that the estimated cost of the fully expanded program for 1970 would amount to not more than 70 cents per worker, per year. On the basis of past accomplishments, the returns to the Nation would more than offset these expenditures.

RESPONSIBILITY OF THE PUBLIC HEALTH SERVICE IN OCCUPATIONAL HEALTH

The direct operation of services to protect the health of employed people has to be done by the industries themselves, and direct governmental assistance in such efforts is carried out by State and local public health agencies. The essential role of the U.S. Public Health Service is one of leadership and advisory assistance, supported by a dynamic research program designed to provide the necessary scientific and technical knowledge on which to base effective control measures. Because the health problems of industry are so varied and involve so many different man-environment relationships--physical, chemical, biological, and social--and because the health problems of the gainfully employed cannot be divorced from nor dealt with altogether separately from those of the general public, it is evident that the research programs, scientific and professional staff, research facilities and means for undertaking field studies and operation must be broadly based. It must draw upon scientific skills in all branches of the physical, biological, behavioral, and social

sciences, and their counterparts in applied science and professional practice, medicine, engineering, etc. Individuals from these many areas must be brought together to work jointly upon problems of common concern. Thus, organized effort in occupational health has to be problem oriented rather than by disciplines or professions. It cannot be compartmentalized by disease categories nor by classes of stress agents, nor can it be viewed solely as an area of environmental health in the sense that common denominators of the environment dominate the different problems. Primary importance is given to man-environment relationships that may disturb health, but from one situation to another the environmental stress factors range over the whole gamut of physical, chemical, biological, and social relationships to man, and the relative importance of man and of environment in the equation shifts from one problem to another. Problems are solved in one case mainly by correcting the environment and in others by working with people.

OCCUPATIONAL HEALTH WITHIN A BUREAU OF ENVIRONMENTAL HEALTH

In order best to serve the national needs in occupational health, the Federal program must be organized within the Public Health Service in such a way as to draw maximum strength from the other activities, staff, and facilities of the Service. It was with this point in mind that the Subcommittee examined the question of the place of the Division of Occupational Health within the Bureau of Environmental Health, and, physically, within the Environmental Health Center. The following points are made:

1. The nature, magnitude, and national importance of a Federal program in occupational health are such that the program must occupy a strong position and at a high level within the Service to insure its essential support.

2. The structure of the Occupational Health Division, its staff and facilities, must be sufficient, up to a point, to insure its independent capacity to perform its mission. Since this is not an isolated area of concern, it should be organized, both conceptually and administratively, with those other PHS activities from which it will particularly gain strength.

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3. Occupational health has many important and obvious interrelations with other areas within the proposed grouping of environmental health activities. Problems of radiologic health, air pollution, and water pollution are inevitably associated with industry. General sanitary controls, food protection, and other such environmental problems are encountered in the industries as well as in the surrounding communities. Basic approaches and the kinds of scientific and professional skills needed in the several areas have much in common, and close association will give mutual strength to the several divisional programs.

4. Administrative compactness, efficiency, and economy of operations, avoidance of unnecessary duplication of scientific staff and research facilities, and the convenience of certain common services are further important advantages to be gained from operation within the Center.

5. There are some important common areas of interest in basic research which can be properly shared, as well as common scientific and technical services. In both basic research and high-level services the cost of separate provision would be prohibitive. There is greater chance, too, of recruiting first-quality scientists into the larger and broader Center.

In view of the foregoing points, the Subcommittee believes that the Division of Occupational Health will gain material strength by administrative organization within the Environmental Health Center. In doing so, however, it must have its own integral organization, including a staff drawn from all the necessary areas of science and the professions to insure its effective operation. Thus, for example, it must have its own research program in industrial toxicology, its own competence in epidemiological research, etc. The Subcommittee believes, as matter of administrative policy, that the common scientific effort of the Center should be developed and maintained by bringing together appropriate individuals from the several divisions for common study of problems, rather than by setting up in advance permanent groups to carry out basic research in separate underlying disciplines.

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MANPOWER NEEDS, TRAINING AND NON-FEDERAL RESEARCH

With respect to special charges to the Committee on Environmental Health concerning manpower needs, Federal and non-Federal research and inter-Federal coordination of activities in environmental health, the accompanying working paper sets forth the needs within the Occupational Health Division, we believe, in a reasonable manner. Manpower requirements--for the Division itself--as presented in the tables are not of great magnitude; they represent about a fourfold increase over present staff within 10 years. New personnel are to be drawn from many areas of science and the professions, and the numbers from each are not large. For the country as a whole, the estimates of needs are much bigger, but it must be pointed out that these are ideal figures for a fully developed program. Actual demands will be much more dependent upon the success with which real needs are met. We believe that the well-defined needs can be met without unreasonable expansion of existing university-training programs, in either the underlying disciplines and professions or in schools of public health or other university departments devoted to training of occupational health specialists.

An important point to be noted is that much of the staff training for the Division can be done through inservice programs and, with respect to training of personnel for State health services, major dependence has to be on such intensive training within the Division. This has worked very well in the past and will in the future. This means a continuing training program must be made a part of the operation of the Division. For convenience and efficiency, such inservice training activities may share a common administrative setup within the Center with the other divisions, but we believe that the actual planning and conduct of training courses should be carried on within and by the staff of the Division to insure close integration within its own problem area. Training has to be oriented around the health problems of the industries and not by disciplines or professions or in terms of general environmental health.

The Subcommittee agreed that the universities must be encouraged and supported in a greater research effort in problems of occupational health, for three reasons: first, proper training of occupational health specialists (especially research workers) can be done most effectively by a faculty who are, themselves, deeply involved in solving occupational health problems; second, there are certain areas of research that can best be done in the university, free of the government-private industry relationship; third, such university programs multiply in a major way the number of research workers throughout the country who are involved in and committed to this important area of research. The Subcommittee was

not able to draw any sharp lines between Federal and non-Federal research activities, in respect to either the nature or magnitude of effort. Given strong leadership within the Public Health Service, we believe these questions are best left to be answered as the program develops.

In respect to questions of inter-Federal relationships and coordination of efforts in occupational health, the Subcommittee found no problems of immediate concern and does not feel that this matter has particular application to the present question of how best to organize occupational health activities within PHS.

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Supplement

PHS PROGRAM IN OCCUPATIONAL HEALTH

DEFINITIONS

The general objective of health programs may be defined, not merely as maximizing the length of life of the individual but also as permitting him to realize his full potential as a member of society. Mere length of life is not enough; the effectiveness of the individual throughout that life is just as important.

The pattern of bodily functions which determines maximum expression, or health, is the result of interactions between the characteristics of the individual, on the one hand (such as bodily conformation, physiological reactions, psychomotor functions, psychological patterns, and immunities); and the environmental conditions surrounding him (such as physical factors, chemical contacts, electrical conditions, radiation, infective and allergenic agents, psychological stresses, socioeconomic conditions, etc.), on the other. From whence it follows that health can be understood and preserved only by adequate and simultaneous attention to both the man and the environment.

The term "Occupational Health" signifies that part of the total health picture which is closely associated with the individual's occupation. While it needs to be viewed in relation to the individual's total life, this segment calls for special consideration because: (a) it presents certain special environmental influences or risks; (b) the worker's life centers around his work; (c) it brings persons together into defined groups which can be studied not only as regards specific occupational diseases but also in respect to disturbances affecting the population at large; (d) health enters in an important way into the relationships between employer and employee; and (e) the products of industry in turn affect the life of people in general. The term "occupational" should be taken in the wide sense of including all types of occupation, and the term "industry" should be taken in a similarly wide sense of any department or branch of art, occupation, or business; especially one which employs much labor and capital and is a distinct branch of trade. Agricultural, educational, and service work and workers, for example, would be included as well as those of the mechanical and chemical industries.

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The basic objectives of any occupational health program can be very simply stated: (a) recognition of the influences and risks; (b) evaluation of their effect upon human health and efficiency; (c) development of preventive measures, and (d) effective application of the knowledge so gained to industrial practice.

HISTORICAL

The traditional emphasis in the study of occupational disease has been on specific, dramatic, and killing diseases apparently caused by single or small groups of environmental factors. Medical history from Agricola (mid-16th century) to McCord (early 20th century) affords eloquent testimony to the success of this approach, but occupational medicine today suffers to a certain extent by that very success. The recognition and conquest of such killing and disabling diseases as lead poisoning, mercury poisoning, tar cancer, phosphorus poisoning, radium poisoning, and silico-tuberculosis, is a classical story. Such cases as still develop are nearly always traceable to failure in the application of knowledge rather than to lack of knowledge. New industrial materials will produce new hazards requiring careful detective work before the exact agent or mode of action is incriminated, and to which the classical approach can be applied, but the principles are known and the work can proceed along what are now fairly conventional lines.

Occupational health today, however, must not only continue the application of conventional methods to the detection of new agents, but also extend its traditional concept in new dimensions. The problem confronting us today contains many elements that are new, but our methods of attack have been slow to adapt to the new challenges. In spite of the attention given to the single dramatically killing and disabling factors, the health of the worker is far from optimal, and frank occupational disease also persists. Some of this is due to newer and as yet imperfectly defined agents, but much of it cannot be explained upon this basis. Much of this residual disease and disablement may not be apparent to the casual observer, especially if he relies upon the classical approach using the conventional examination procedures of clinical medicine, and conventional records of death and reported disease. This residual disease and disablement may not be dramatic, it may not kill (or not obviously), and much of the disablement that it produces is apt to be subtle, of slow development, and easily confounded with "normal" causes of progressive deterioration such as aging. The involvement of the individual may be

less, but more persons are involved. Of the 70 million members of the civilian labor force, probably more than half have some degree of physiological impairment which could be greatly reduced if adequate knowledge were available. Furthermore, the impairment is not produced by single, isolable, easily incriminated factors; rather it is the result of multiple factors working together, each adding its own insult and helping others to add theirs.

By way of example, we may point to the paradox that has developed in the South African mines--dust, as it was known, has been largely suppressed, and with it has disappeared the gross silicosis of old; but pneumoconiosis remains, and resultant deterioration of pulmonary and cardiac function continues. This pneumoconiosis may at times even show a negative correlation with the environmental dust count, at least as conventionally estimated. Again, with the decrease in emphasis upon heavy physical labor, and the introduction of automation, the incidence of physical strain in industry can be expected to decrease; but the psychological stresses are obviously increasing at least in proportion, and probably absolutely as well. For example, the problem of handling and interpreting masses of incoming information, under pressure, in split-second fashion, and often with very critical consequences, so dramatically seen in airport control rooms, is developing with increasing frequency in communication centers across the Nation, in plant control rooms, and in emergency installations. Modern man shows remarkable ingenuity in the acquisition of information, but much poorer ability in digesting it when he has it. In less intensive fashion the psychological and social concomitants of the job affect every worker, his relations with others, his productivity, his anxieties, and his health--that is, the lifetime sum of his realization as a member of society.

The traditional concept of occupational health as dealing with the man-environment relationship, as it applies to the job, still holds and can be as successful in the future as in the past in revealing the true nature of the relationship, its significance for health, and the measures that are necessary to optimize that health; but it must be exploited in the new terms. The interrelated operation of multiple factors, the existence of new factors, the importance of hitherto neglected classes of factors, the aging of the population exposed, and the variability of the human material must be taken into proper account; the less marked, more slowly developing, less easily defined responses of man to these factors must become the prime object of examination; and the significance of total stress as well as individual stresses must be assessed. The relationship of disability to physiological status illustrated in the accompanying diagram remains the same; but whereas we have hitherto concerned ourselves with the upper portion of the curve, applicable to only a small

proportion of persons, we must now give proper attention as well to the middle portion of the curve which applies to the majority of employees over an extended potentially rewarding lifespan. This is largely terra incognita, over which the deteriorative and reparative processes fight out a fluctuating battle for man's health; we must discover the rules of this warfare, and devise means for influencing the result in favor of man.

For completeness, this historical conspectus should draw attention to changes which can be seen in the legal setting in which practical occupational health programs must operate. Whereas in the early years of this century corrective action tended to be taken only after a direct causal relationship had been established between an environmental factor and major disease industry today is more and more adopting the policy of instituting preventive measures, if not before the event, at least as soon as the risk is recognized. The role of Federal and State health agencies is correspondingly becoming one of advising and helping industry to help itself; there is a growing demand being placed upon public health authorities for information, research, and leadership as a supplement to and eventually, it is hoped, a replacement for purely regulatory control. On the other hand, there appears to be a growing tendency for the party at risk to resort to litigation and claims for compensation, and a tendency on the part of some jurists to liberalize the basis for granting compensation. Occupational health programs will necessarily need to temper their practices to the varying legal winds that blow about them.

THE ROLE OF THE PUBLIC HEALTH SERVICE

The health of the worker is a national asset calling for protection and conservation at all levels, Federal and State, academy and agency, management and labor, economic and humanitarian. While it would be unwise to define too exactly the role of any one group in the total effort to maximize human health, for fear of restricting individual freedom in the striving for betterment, the general role of the Public Health Service can be delineated.

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In essence, the function of the Public Health Service is to provide those opportunities for combined or coordinated action which are unlikely to develop from the independent action and responsibilities of the multitudinous individual activities across the Nation. It provides the technical means for discharging those functions which are adjudged at the governmental level to be a Federal responsibility or opportunity; it provides a set of facilities for such research and investigation as is not easily developed by individual organizations; it may sometimes permit review of a problem in a detached fashion not always possible to those engaged in the daily flux of events; it provides a link between the more basic sciences and the severely practical demands of immediate industrial operations; it furnishes a mechanism for supporting those segments of the national effort which have not developed sufficiently to meet national needs; and in all that it does it has the opportunity of setting an example of devotion to the national needs and aspirations. It does not and should not seek to substitute its efforts for those that are the province of or are being adequately discharged by individual groups; it does not and should not undertake routine activities unrelated to its primary mission, or which can be adequately carried out by others; and however much it may assist others in the development of their own roles, it cannot and should not take away from them their rightful initiative in the discharge of those roles.

As was indicated earlier, the basic objectives of an occupational health program can be simply stated as: (1) recognition of the influences and risks associated with occupations; (2) evaluation of their effect upon human health and efficiency; (3) development of preventive measures; and (4) effective application of the knowledge so gained to industrial practice. The program operated by the Public Health Service should provide for all of these, not only by its internal operations but also by proper support of State, industrial, and academic organizations engaged in relevant activities.

It is desirable that these objectives be examined in more detail before proceeding to a specific program. Here, as elsewhere, knowledge cannot be divided into mutually exclusive compartments, so that there will be a certain overlap between the categories described; but in general the description will proceed from the acquisition of information to its application, and from the more fundamental aspects to their practical significance.

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RECOGNITION AND DEFINITION OF OCCUPATIONAL INFLUENCES AND RISKS

An outstanding characteristic of modern industry is change. It would be unrealistic to rely upon past knowledge and experience to predict or prepare for the future to say nothing of information concerning those influences which were not previously recognized as significant. The acquisition of detailed knowledge concerning the existence, nature, and mode of operation of all significant factors is essential to the design and prosecution of any worthwhile effort in occupational health. Practice cannot be adequate unless this information is extensive, representative, accurate, and projective.

Nature and trends of industrial processes

Except with the most toxic materials or most damaging conditions, there is necessarily a timelag between the introduction of a new material or process and the recognition of deleterious effects in operating personnel. The timelag is large enough where one is content with preventing frank disease or disability; but it is apt to be much greater still where the effects are subtle nonspecific deteriorations of general health and efficiency. It is very important, therefore, that information on industrial processes and materials not only be kept current over a wide section of industry, but that it include projections of the materials and processes that are scheduled or even proposed for introduction over the following several years. Had those concerned with public health been fully aware beforehand, for example, of the proposed development of epoxy resins, agents for foaming plastics, or plastic materials for machining, and in a position to study them, the effects of these substances and the derivatives formed in processing could have been predicted, precautionary measures devised, and a considerable amount of disability saved. The rather fortuitous fact that health experts were consulted early in the newly introduced plasma torch operation, with the consequent recommendation of protective measures, could become the rule rather than the exception. The institution of an adequate information-collecting scheme is not easy, but it is as important to the rational practice of occupational health as a sampling network is to an air pollution program. The difficulties, though considerable, are not insurmountable if attacked with quiet and tactful determination.

Mechanisms of human responses to environmental conditions

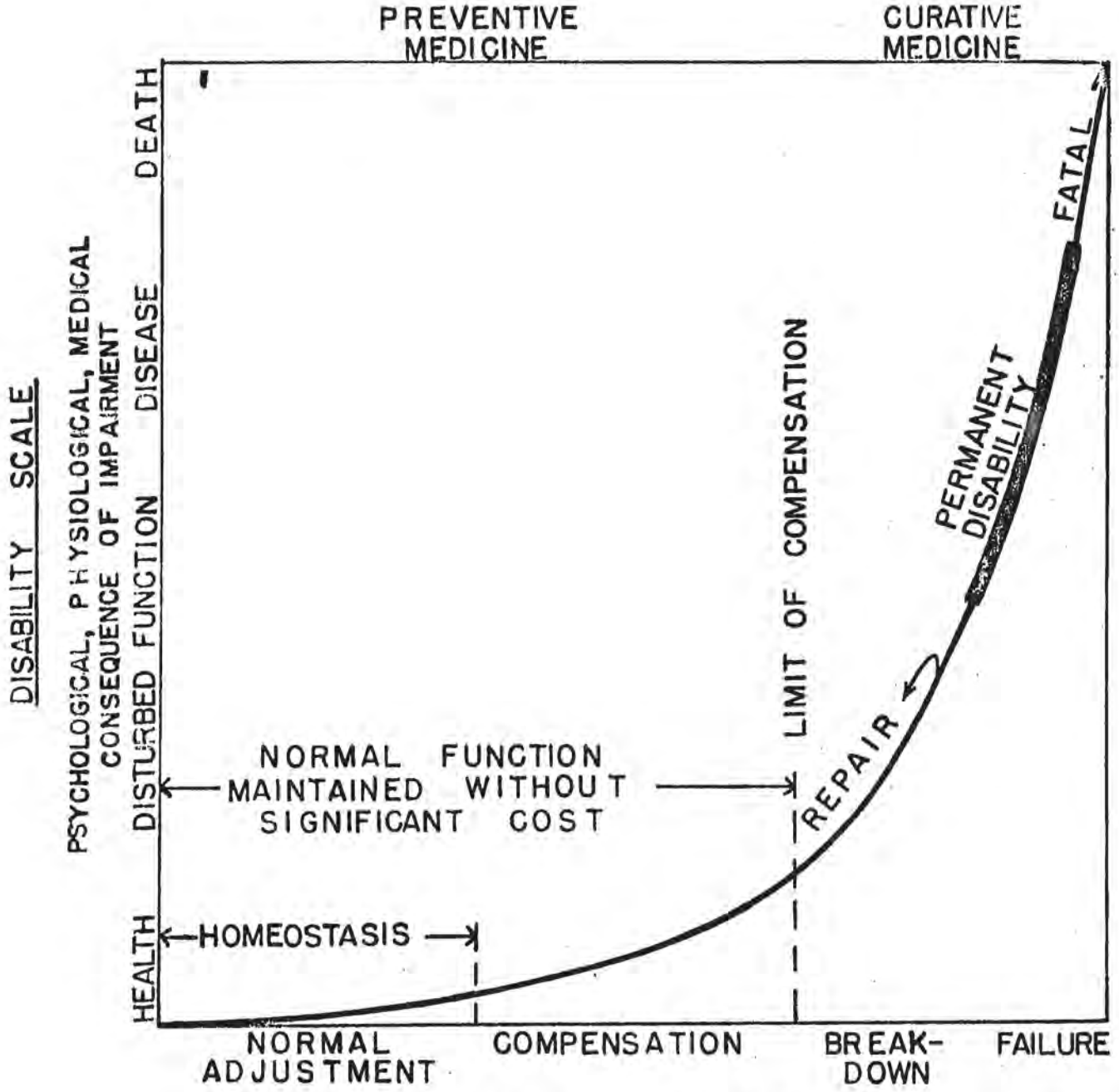
In terms of the new dimensions cited earlier, occupational health has as its goal, not merely the prevention of additional cases of recognized disability but the prevention of any cases at all. It is concerned, not

only with the immediate effects of occupational conditions but also with the interaction between them and the various other vicissitudes of the employee's life. It implies knowing enough about all possible causes and their mode of operation upon the body to recognize and eliminate them before they have opportunity to be effective. To give an example, one would not wait until pulmonary distress focused attention upon a new substance X, or emotional outbreaks raised questions of sensory overloading, before inquiring into the cause and devising preventive measures; one would have established the probable toxicity of X-like substances and the probable consequences of sensory overloading beforehand, drawn attention to their possible occurrence, and devised measures to eliminate the stress before breakdowns occurred. Similarly with the operation of multiple environmental factors in the impairment of health, whether frank or insidious, the significant patterns of combined operation would have been established, the probable consequences worked out, and appropriate preventive measures developed.

As of now, this would be a counsel of perfection indeed; but nevertheless this is the goal toward which the new occupational health must work. It envisages: (a) careful systematic review of all the environmental factors that may affect human functions; (b) establishment of their mode of operation on the body singly and in combination; and (c) the development of methods whereby their effects upon health, used in its widest sense, can be systematically examined. In this section we are concerned with the more fundamental aspects of this picture; the resolution of specific problems will be taken up in the next section.

To meet these needs a comprehensive occupational health program must provide: (a) mechanisms of keeping thoroughly abreast of currently available knowledge in the field; (b) support for those extramural groups who have the ability but not the resources to develop the areas of inadequate knowledge; (c) internal resources to develop those areas of inadequate knowledge not otherwise being prosecuted; and (d) a continuing review and synthesis of emergent knowledge with subsequent reevaluation of its efforts in the preceding categories.

It must pursue its inquiries wherever they may lead, not duplicating activities and facilities available elsewhere, but certainly not being inhibited in acquiring competence in techniques hitherto characteristic of some other group or academic field but necessary for the job. Much of the work can be expected to lie at a fairly basic or fundamental level, and one of its characteristics will be the search for early and sensitive indices of bodily response to environmental stresses.



IMPAIRMENT —
1. INCREASES WITH AGING
2. INCREASED AS RESIDUAL OF ILLNESS
3. INCREASED BY EXCESSIVE ENVIRONMENTAL STRESS

TIME SCALE: "ACUTE"— SHORT TIME FROM CAUSE TO EFFECT, "CHRONIC"— DELAYED EFFECT. DETECTION AND MEASUREMENT OF IMPAIRMENT MOST IMPORTANT FOR DEVELOPMENT OF PREVENTIVE MEASUREMENT.

As has been implied in the foregoing pages, recognition of this pursuit as fundamental and essential to occupational health has been slow to develop, with the result that such information as has accumulated is still scattered and unorganized. Just how much really new effort will be necessary, and along what lines it is most needed, will not be clear until some systematization has been attempted. History suggests, however, that many more questions will be revealed than answered in the process. Certainly this type of fundamental and systematic inquiry is the foundation upon which any adequate occupational health program of the future must be erected.

Consideration of the total worker in a total environment

While much of the scientific study of human responses to environmental factors must necessarily consider the components one at a time, the ultimate fact must be kept in mind throughout that it is the total man, operating in a total environment, with whom the program is concerned. The necessity for ultimate synthesis of the emergent information must be considered both in experimental design and in the interpretation of results. Methods, disciplines, and approaches not now common in studies of occupational health must be introduced. Psychology, sociology, and economics must enter, not only into the implementation of preventive measures but also into the basic study of how man--the total man--reacts to environmental stresses, and how his reactions affect his realization as a member of society.

The techniques for obtaining a total view of the man-environment picture are far from complete. Considerable attention must be given to the techniques of synthesis even before there is much in the way of information to synthesize. A forward-looking program will place this item very early in its development, since progress is likely to be slow and arduous. In general, two types of procedure can be envisaged. Certain types of information, particularly of a quantitative nature, can be integrated by mathematical techniques sometimes called operational analysis. Other types of information are best synthesized by the roundtable technique--the repeated matching and attempted intellectual integration of information into a more meaningful whole, separated by periods in which the individual contributors have the chance to rework or expand their evidence in terms of the last discussion.

As an example of the necessity for considering the combined action of environmental variables, one may cite the current belief that the progress of chronic degenerative diseases is influenced, not merely by diet, or workload, or psychological pressures, or past infective diseases, or genetic constitution, or age, but by all of these things acting together.

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The contribution of the occupational situation to the progress of a degenerative disease in a given individual, or in a group of employees, can be properly evaluated only in the light of the nonwork factors. The significance of noise on work efficiency must similarly be seen against a background of numerous other physical, psychological, and social factors affecting efficiency. When we depart from the killing or grossly disabling consequences of specific occupational conditions, we find ourselves increasingly handicapped by lack of knowledge on how the total man responds to all of the various stresses inherent in his total environment. This deficiency must be remedied.

EVALUATION OF EFFECTS ON HUMAN HEALTH AND EFFICIENCY

In the previous subsection we were concerned with the basic nature of human responses to the spectrum of environmental influences operating singly and in combination, and the establishment of methods for assessing the significance of these reactions for human health. In this subsection we will be concerned with the more specific objectives of evaluating stated environmental conditions for stated groups of people. Many of the methods to be described here as necessary to specific evaluations are applicable as well to the more basic studies already described.

Evaluation from general principles

As the more generalized knowledge discussed in the preceding subsection advances, and as the data obtained in specific studies accumulate, it becomes progressively possible to make some types of evaluation solely upon the basis of those principles and data. It is possible now, for example, to make some predictions about the reactions of workers to very hot environments, the length of time that they can work efficiently, and the probable rate-of-performance deterioration if work is continued. As knowledge grows, the opportunities for this type of evaluation can be expected to increase, and programs must make corresponding provisions for its use.

Field studies

Examination of employees in their normal occupational environment, where the relevant environmental conditions are known or can be simultaneously measured, has the advantage of providing information under realistic conditions, and usually on large numbers of persons. The disadvantages introduced by the operation of numerous uncontrolled or even unrecognized factors can be offset to a certain extent by adequate statistical procedures. As a standard method of public health inquiry, it has yielded

very valuable information in the past on the status of metal miners, diatomite workers, and granite cutters. It has established the essential causative relationship between uranium mining and an increased incidence of lung cancer. It needs to be continued and applied to those industries which are amenable to it. But new and more sensitive methods of detecting early deviations from normal function, such as blood enzyme profiles, need to be added to the more conventional clinical survey techniques as they emerge from the more basic studies.

Experimental studies--human

These, by contrast with the previous studies, examine the reactions of selected subjects to the operation of graded stresses, singly or in small combinations, under conditions that are otherwise controlled. They yield information on the precise and quantitative effects of specified environmental factors, but usually on comparatively few subjects and under necessarily artificial conditions. The resultant information needs to be carefully matched with that obtained by the previous method, and discrepancies subjected to further examination. This, the classical method of scientific investigation, must continue to constitute an important part of any research program. It has yielded valuable, sometimes critical, information in the past on the operation of such environmental factors as heat, sound, vibration, and workload. It must be extended and applied to the operation on multiple factors, including the psychological.

Experimental studies--animal

It is virtually impossible to expose human subjects deliberately to many of the potentially injurious environmental conditions that need to be studied, at least with intensities and for periods that will give significant results. Much of our knowledge concerning the toxic properties of chemical substances, ionizing radiation, and physical agents has necessarily come from animal experiments. Such experiments have the great advantage, also, that large numbers can be exposed, and proper statistical account taken of variability. Unfortunately, animals by no means always react to environmental conditions in the same way as man; in fact, different species of animals may react in markedly different ways from each other. Animal experimentation must continue, perhaps on an even bigger scale, especially with primates, but provision must be made for very careful comparison of the results so obtained with what can be learned about human reactions, and final interpretation made in conjoint terms. The growing use of experimental animals for investigation of psychological situations will extend both the use and the significance of this type of evaluation. As more is learned about the techniques of animal care, and the importance of standardizing the non-experimental

aspects of their environment, the facilities will necessarily become more elaborate and the supervision call for more specialized professional care.

Clinical studies

Medical examination of persons suffering from diseases believed to be associated with occupation was, of course, the original method of investigation, and it will continue as long as employees get sick. It is still an important weapon in the armamentarium, and adequate facilities for its prosecution are essential. But it is now increasingly supplemented by the other lines of inquiry described here, and its own methodology is becoming increasingly complex, to the point that it may be hard to distinguish at times between clinical and other types of injury. Here, as in field studies, there is a continuing search for more and more sensitive indices of altered physiological function, which can be applied to their detection at earlier stages of displacement.

Epidemiological studies

Review of statistical information on the incidence of death or disease has been one of the standard methods of determining the existence, extent, progress, and possible causes of disease in given populations. The basic data may be gleaned from published vital statistics, hospital or clinic records, field studies, special census, or insurance returns. It necessarily deals with events that have already taken place, are recognized as such, and have been recorded. It cannot take account of the undeveloped, the unrecognized, or the unrecorded. Nevertheless, it will continue to be a major tool in the investigation of occupational health, and provision must be made in any comprehensive program for its increasing use as the volume of recorded data increases, better methods of detection are devised, and quantitative information is derived from more and more fundamental aspects of the disease (or nonhealth) process.

Economic evaluation

The real cost to the individual, the industry, the community, and the Nation must be known if public health resources are to be allocated in optimal fashion, attention focused on the economically important problems, and the most economically effective control measures selected. Techniques for adequate analysis are still in the developmental stage, and much remains to be discovered about the guiding principles. Nevertheless, progress is substantial, so that a realistic program for the future must include provision for very significant activity in this respect.

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DEVELOPMENT OF PREVENTIVE MEASURES

Determination of standards of acceptability

It would be unrealistic to demand that all traces of all potentially deleterious influences be removed from occupational situations, or to insist on control measures that cannot be economically sustained, unless the threat to health were grave indeed. Some levels of intensity which are acceptable must be set, and control procedures developed to meet those levels. In many cases more than one level may need to be set for a given environmental condition, depending upon the duration and frequency of exposure, other coincident and influential environmental conditions, age and sex of persons exposed, national necessity, etc. Much work has been done in the setting of limits for the gases, vapors, and fumes encountered in industry, and for certain dusts developed in mining and kindred trades. But close examination shows many inadequacies in both the determination and the application of such standards. For example, the data derived from animal experiments are not usually backed by any substantial body of information derived from human reactions, the effect of rate of work on the toxicity of inhaled material is seldom taken into account, the methods used for determining air concentrations are not always well adapted to the particular material, and the evidence upon which to base decisions is sometimes very scanty. Much the same sort of criticism can be made about current standards for such things as tolerable hot conditions, noise levels, illumination qualities such as glare, vibration, and other physical factors in the environment. Virtually no standards have been devised for acceptable psychological conditions. An adequate program in occupational health must provide for marked improvement of standard setting, and extension of this process over a much wider range of environmental conditions. The high dependence upon animal reactions needs to be offset by careful examination of human evidence; and the various conditions such as work stress, heat, age, prior exposure, and simultaneous exposure which may markedly affect tolerance must be much more carefully defined.

Development of engineering control methods

Engineering procedures such as ventilation, directed airflows, noise suppression, heating and cooling devices, air filtration and precipitation, and regulation of illumination will probably continue to be the mainstay of environment control practice. They will, however, need frequent revision to meet the changing needs of industrial situations, and to incorporate the benefits of technological advance. Associated with this more classical type of engineering are the newer techniques often

termed "human engineering", in which the design of tools, machines, procedures, and installations is adapted to the characteristics and capabilities of the man who operates them, to maximize his effectiveness and minimize the stress placed upon him. Both classical and human engineering must find a prominent place in both the principles and practice of industrial engineering.

Pharmacological methods of control

As we get to know the detailed ways in which bodily processes respond to or are affected by environmental stresses, we begin to see how they may be helped or protected by the administration of substances having specific pharmacological action. To take a simple example, if it is demonstrated that a particular substance owes its toxicological properties to the fact that it blocks the transmission of impulses from nerve to muscle, then a rational method of treatment and perhaps of prevention would be to administer a substance which facilitates the transmission, or some substances that would lock with the toxic material and prevent its action at the junction. Or again, less drastic vasodilators than nitroglycerin might very well be used to counteract the weekend effects of temporary deprivation experienced by nitroglycerin workers.

Organizational methods of control

In spite of the general tendency to rely more and more on automatic detection devices and regulators, prevention, in the final analysis, arises from a human desire and by human decision. A great deal can be done, by so arranging layout that employees are placed in positions of least hazard, by explaining to employees the toxic potentialities of the materials they handle, by inculcating an appreciation of control measures, and by inducing a rational organization of the work regime. Insufficient attention has been given to a study of the personal factors involved in requiring, devising, operating, and monitoring control procedures, or in training employees in proper attitudes toward prevention. Some place must be found for this type of study in a developing occupational health program.

PRACTICAL APPLICATIONS

Knowledge must come first, but knowledge alone is not enough. The employee's health will not be improved unless the knowledge is applied with appreciation, understanding, and patience. It is essential to the practice of occupational health that there be a strong, active, informed, and smoothly coordinated machine for putting knowledge to work at all

levels of responsibility through Federal, State, county, city, and industrial organizations. At each level several modes of operation are necessary, and all must find proper representation in the program.

Investigative and advisory services

A public health service, by definition, must be ready to provide service to the Nation in accordance with the current state of the art, and on a scale commensurate with the significance for the national interest of the problems presented. This may take the form of a direct service by PHS personnel, assistance to State or local health authorities, support of the same authorities, or collaborative activities with them in varying proportions. Labor and industrial organizations will have similar claims upon PHS service, although policy may dictate that such service be given through or with the consent of the State and local authorities. The individual taxpayer has some claim to consideration also, and some provision should be made for answering, or at least directing, such inquiries into appropriate State or local channels. The service to be rendered may range from simple answers to specific queries, through short-term investigations of trouble spots, to long-range studies of unresolved problems affecting a wide section of the Nation. While some such services can be integrated with on-going deliberate research, others may present a competition for available personnel. Nevertheless, the program and the organization set up to conduct the program must make adequate provisions for such services, and their use should be encouraged. This is one of the major delivery points of the system, and everything must be done to make it effective. At the present time this service is not as highly developed as it might be, partly because of limited resources, and a reluctance to promote requests that may have to be denied; but partly also because of a lack of appreciation by those who could be helped of their needs and opportunities.

Elaboration of codes and guides

The translation of scientific and technical information into practical action is often hampered by the difference between the ways of thinking customary to the two groups involved. A very important step in such translation is the development of illustrative codes or guides for the control of undesirable situations, which can be used by the health authorities, industrial health programs, safety associations, etc., as a basis for drawing up specific regulations or instructions for local use. PHS personnel are in a particularly advantageous position to assist in this essential translation, if they can be assured of sufficient freedom from other duties.

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Technical instruction

The provision of trained and informed personnel to meet the national needs in occupational health is a matter which will be taken up in a later section of this report; but mention should be made at this stage of the provision that a PHS program must make for technical instruction in its normal operating program. There are certain types of instruction, particularly of the short-course, technical type, which universities are unwilling or even unsuited to undertake. Intensive training in dust counting, lead analysis, ventilation control, thermal assessment, air-sampling techniques, and kindred severely practical procedures are illustrative of the training that PHS facilities can very well provide. More fundamental instruction in areas of specialization in which individual PHS officers happen to be authorities constitutes another field in which training might be offered with advantage. Beyond these, there are areas in which PHS personnel may well cooperate with universities in conjoint instruction, either because of special knowledge or equipment, or in the development of courses which would afterward be handled by the universities alone. During the period of growth in occupational health activities, considerable demand can be expected for this type of training. At a later date the demand may settle down to a steady, but still very significant level. These demands must be foreseen and adequate provisions made in any definitive program.

Publication

The national belief in the importance of the printed word is certainly as well justified in the application of public health knowledge as in other fields. Both as a means of dissemination, and as a record of what was actually reported or advocated, publication stands supreme. Proper provision is essential in every occupational health program for the preparation, printing, and dissemination of information of various types: research and professional papers, monographs, technical bulletins, statistical tables, technical reports, and instructions, popular articles, handbooks, and exhortative leaflets, to name only a few. The common tendency to leave the preparation of material to odd moments reluctantly snatched from "real" work, and to provide insufficient resources for the costly business of reproduction, must be corrected if a program is to be adequately known, appreciated, and used by the potential beneficiaries across the Nation.

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Public information service

The individual, as well as the involved groups, has a claim to know the current events and beliefs in this field, not only through his right as a taxpayer but also as a member of that mainstay of democracy, an informed public. While it would be impossible for a service to deal with a hundred million individual inquiries, it can and should provide mass educational material for public information. This, too, costs money and effort, for which adequate provision must be made in a comprehensive program.

SPECIFIC PUBLIC HEALTH SERVICE PROGRAM

The preceding section presented the broad objectives of a realistic, forward-looking Public Health Service program. This section will be concerned with formulating such a program in specific terms. The program items will take the order: intelligence (1), research (2-7), services (8,9), technical training, (10), grants (11), and ecology (12). Item 11 will deal with the support of research and training by universities and other appropriate institutions or groups. The remaining items will deal with direct operations by DOH and work done under contract by external organizations or individuals.

EVALUATION OF TRENDS IN OCCUPATIONAL HEALTH

Background

The planning of research, the rational allocation of resources, and the evaluation of preventive efforts demand that the information be constantly available as to new or potential environmental hazards, the patterns of illness or death as related to occupation or industry, and the resources available for the study and control of hazards in the work environment.

Present status

Information on current industrial practices is obtained only from incidental contacts in the course of investigations, and a rather unsystematic examination of industrial literature. There is no organized network for the acquisition of information on current trends, let alone ideas

scheduled for development, and thus little or no foreknowledge of situations which may be created by new materials or processes. Vital statistics of a routine character are obtained from the Bureau of Old-Age and Survivors Insurance (BOASI) and census returns, and some special information can be obtained by arrangement with these agencies. Data are beginning to come in from the recent addition of occupational information to the National Health Survey. Information on relevant articles published in foreign countries is beginning to come in through the recently established CIS plan.

Five-year goals

a. Completion of the analysis of preliminary data obtained as a result of adding occupational information to the National Health Survey.

b. Application of Bureau of Old-Age and Survivors Insurance cohort analyses to studies of mortality and disability in four or five specific industrial groups.

c. Coding and storage for retrieval of pertinent information on old and new industrial chemicals and physical agents now being filed in the Occupational Health Information Exchange.

d. Completion of cooperative pilot study of one or more major health plans in which occupational information and health experience of subscribers will be surveyed.

e. Development of an effective method for the international exchange of information on occupational health hazards and studies.

f. Development of an effective file of information on medical care programs and environmental health research programs of all major American industries.

g. Development of trial surveillance procedures for the recognition of new or potential problems in selected industry.

Ten-year goals

a. Publication annually of statistics on occupational relationship in BOASI mortality and morbidity records.

b. Incorporation of occupational data in reports of major medical care plans.

c. Assignment of an individual trained and experienced in occupational health intelligence surveillance in every region.

d. Institution of surveillance network in selected industry to provide information on the appearance of new or potential problems.

CLINICAL AND EPIDEMIOLOGICAL STUDIES OF OCCUPATIONAL DISEASE

Background

Disease, disability, and impairment must be studied to the extent that they are revealed by vital statistics, case records, or clinical examination as identifiable entities, and by persons who are in constant touch with clinical realities, to whom the data represent something more than a set of statistics, although statistical methods will be employed to the limit of their usefulness. The results of such studies need, in turn, to be linked with other types of evidence, and further studies of a similar nature, in the attempt to complete our understanding of the incidence, severity, progress, causation, and prevention of the disturbances examined.

Present status

While such studies have classically constituted the primary mode of attack on problems of recognizing occupational diseases, modern data processing methods have greatly extended the scope of the information that may be extracted from the data, and the ease of handling large masses of data and of establishing correlations between events. At the same time, increased understanding of the fundamental nature of the disturbances of function set up by environmental conditions has increased the range of phenomena on which data can be obtained and analyzed by these techniques.

Five-year goals

a. The development of teams trained and competent in a number of specialized areas of occupational health, prepared to participate actively in clinical research and in epidemiological studies. Examples of areas where competence will be needed include:

1. Occupational dermatology.

2. Occupational pulmonary diseases, with plans for the systematic study of selected groups exposed to industrial dusts, irritant gases, mists, or fumes, to obtain quantitative data on the long-term

effects of such exposures upon the lungs. Concern here is not only with the pneumoconioses, but also obstructive emphysema, chronic bronchitis, and aggravating effects on other chronic disease. Specific occupational groups needing study include workers exposed to cotton and other vegetable fibers, to coal dust, and to asbestos.

3. Systemic disease, dealing with the systemic effects of environmental conditions and substances resulting in clinical disease.

b. The initiation of surveys of major occupational or industrial groups to define potential areas of risk to health, current and projected preventive health programs. Each survey, in cooperation with industry, would lead to a monograph containing practical information useful to engineers, physicians, and other health personnel.

c. Development of clinical facilities, preferably in a Public Health hospital, for the study of problem cases selected for special study or referred for evaluation from a Federal agency.

d. Constant availability of a medical and industrial hygiene team for prompt and effective study of suspected outbreaks of occupational diseases.

Ten-year goals

a. Continued development of clinical and laboratory groups oriented toward specialized areas of occupational health.

b. Expansion of clinical facilities, with provision for regular rotation of clinical staff members.

TOXICOLOGIC STUDIES IN LABORATORY AND FIELD

Background

It is imperative that PHS be in a position to evaluate critically all available information on the toxicity of substances and materials to which workers may be exposed, to carry out impartial laboratory and field studies where indicated, to resolve conflicting evidence, to evaluate the risks of submitting familiar materials to new processes, to develop techniques for the early recognition of deleterious effects in man, and to apply this information precisely and quickly to the formulation of

standards and the issuance of advice on preventive measures. When multiple exposures, concomitant physical agents, infectious agents, and inherited metabolic derangements are considered, the permutations which require consideration are almost infinite.

Present status

Considerable activity has been maintained, as evidenced by recent studies on the toxicology of vanadium, ozone, nitrogen peroxide, and fluoride, and by current studies on oil mists, toluene diisocyanate, and intermetallic compounds. Increased attention has been given more recently to an investigation of the basic mechanisms by which substances produce toxic effects and by which bodily tissues respond. But there is no systematic survey of new materials. The larger chemical firms do a considerable amount of work toward establishing the toxicity of new substances before they are released to the public, but this is not so well done in the case of the smaller companies. Substances with toxic potential which get on to the market without adequate screening come up for examination only after deleterious effects have been produced.

Five-year goals

a. An expanded program both in toxicologic evaluation and in studying mechanisms of action. Emphasis will be placed on combinations of chemical agents or of chemical and physical agents known to occur in industry.

b. Development of techniques which will facilitate the interpretation of animal behavioral reactions for the estimation of human reactions to and tolerances for toxic substances.

c. Exploitation of promising leads to determine the usefulness of biochemical criteria, including enzyme patterns, as early indicators of toxic reaction in animals and man.

d. Studies on the effects of fatigue and other body strains upon a susceptibility to toxic actions.

e. Strengthening of mechanisms for the coordination of laboratory toxicology and studies of exposed employees.

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Ten-year goals

a. Continued development along the same lines, with techniques employed dependent upon results of earlier programs and substances to be tested dependent upon current industrial practices, number of persons exposed, character of observed reactions and criticality of the process.

b. Increased attention to development of methods for determining in advance unusually susceptible individuals, which may be found dependent upon now unsuspected genetic differences.

ERGONOMICS AND STRESS EVALUATION

Background

The physiological processes of the body constitute the essential mechanism on which environmental stresses operate to produce the disturbances that eventually lead to the departure from normal that is termed disease. Every stress evokes both deteriorative and compensatory reactions. The conditions which determine the balance between them must be known, measures for measuring the net balance devised, and the ultimate significance for the individual determined. Understanding of these processes and their reaction to environmental conditions is basic to occupational health studies such as toxicology and occupational medicine.

Present status

Much is known about the major physiological responses to the more important environmental factors considered singly, or in very limited combinations, but little is known about their operation in multiple patterns. Studies of the responses to stress have been largely confined to rather crude measures of general reactions, or to the behavior of the endocrine system as judged by relatively indirect measures. Recent research has greatly increased the opportunities of studying the responses of the body cells, but this has not yet been applied to assessment of the strain developed in man as a result of environmental conditions.

Five-year goals

a. Initiation of studies on the nature and incidence of impaired pulmonary function in various workers, in collaboration with clinical staff, as related both to environmental and constitutional factors.

b. Preliminary investigation into the effect of thermal stresses upon tolerance to chemicals, susceptibility to infection, response to allergens, and capacity to perform physical and mental work.

c. Definitive studies on neurophysiological responses to noise and vibration.

d. Evaluation of the relative effects of environmental factors upon work capacity and efficiency, with emphasis upon alertness and responsiveness.

e. Study of bioclimatological aspects of occupational environments as indicated in recent reports to the Interdepartmental Committee on Atmospheric Sciences.

f. Formulation of indices for the evaluation of environment involving more than one mode of stress.

Ten-year goals

a. Further development of the above.

b. Active participation in the ecological program (item 12).

STUDY OF THE IMPACT OF PSYCHOLOGICAL, SOCIAL, AND ECONOMIC FACTORS UPON THE HEALTH AND EFFICIENCY OF WORKERS

Background

As the impact of major toxic and physical factors in the work environment is reduced, and automated procedures are introduced, the significance of psychological and social factors not only becomes more apparent but increases in absolute value. For the assessment of the effect of the total environment upon the total man, not only must these influences be understood and taken into account but the effects produced by their operation must be integrated with the effects produced by the other environmental factors into a composite picture.

Present status

No more than isolated and somewhat specialized attempts have been made to study the impact of the psychological and social factors on workers, and these have mostly been in relation to the more dramatic instances, such as very busy communication and control centers, and have followed

the pattern developed in military studies. There is a very wide scope here for studies ranging all the way from the basic aspects of motivation to specific problems of psychological breakdown. The techniques are far from frozen, and in the matter of synthesis have still largely to be worked out. Goals can be pointed out, but the method of attainment will largely have to be developed as the studies proceed.

Five-year goals

a. Psychomotor studies, particularly directed at effective information-response sequences.

b. Studies of motivational psychology, directed especially to the role of motivation in worker satisfaction and control.

c. Anthropological investigations of man-machine relationship in the causation of impaired health or efficiency.

d. Sociological studies designed to elucidate the significance of extra-occupational conditions in occupational health.

e. Economic evaluations of impairments caused by occupational factors and of proposed control measures.

Ten-year goals

a. An increase in activities along the foregoing lines.

b. Active participation in the ecological program (item 12).

METHODS OF ENVIRONMENTAL EVALUATION AND CONTROL

Background

The central objective of an occupational health program is the prevention of disease and disability, or, more positively, the preservation of health. Knowledge needs to be translated into practical methods for achieving these ends. This, in turn, depends in part upon the adequacy and sensitivity of instruments for detecting and measuring the intensity of relevant environmental conditions, and on the full use of the technological arts in the suppression or removal of those conditions which are judged deleterious.

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Present status

Good use is made of current technology in the selection, design, and use of detecting and measuring equipment, to the extent that the judgment of the PHS personnel is frequently sought in the selection of equipment. Industry designs control apparatus, but PHS maintains a watching brief on the adequacy of the systems devised and makes known practices which are considered inadequate.

Five-year goals

a. Initiation of a critical review of current dust sampling and counting techniques, and development of the outline for a definitive manual of recommended practices.

b. Development and maintenance of reference standards for materials and substances of importance in occupational health investigations.

c. Continued development of techniques for the analysis of multiple samples to replace long and complicated methods, without undue loss of precision and sensitivity.

d. Development or modification of existing instruments for monitoring various aspects of the physical environment, such as radiant heat, vibration, noise, and pressure, and their evaluation for industrial hygiene purposes.

e. Development and application of techniques as needed for epidemiologic or clinical studies.

Ten-year goals

a. Completion of review of dust sampling and counting techniques and publication of manual of recommended practices.

b. Continuation and expansion of program set as 5-year goal, with further development of concepts of preventive engineering, such as inclusion of essential controls in the actual design of industrial equipment.

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RESEARCH ON TYPES OF OCCUPATIONAL HEALTH PROGRAM FOR STATE AND PLANT USE

Background

Serious practical difficulties are often encountered in translating knowledge and principles of prevention into actual health programs at the State, local, or plant level. Objective study is required of the factors which affect this translation, of methods for overcoming the difficulties, and of the economic aspects. The problem is akin to some that are encountered in operations research.

Present status

The most serious deficiency is in the provision of adequate preventive measures for workers in the small plants of less than 500 employees, which account for over two-thirds of the work force. In several States the provision for the control of occupational environments is below the level considered adequate for a variety of economic, professional, and operational reasons. Of the 584 persons employed full or part time in occupational health in State and local units in February 1961, 58 percent were in 6 States; the remaining States had either no programs or inadequate ones.

Five-year goals

a. Establishment of the factors which militate against the development of occupational health services.

b. Analysis of the economic aspects of occupational health services.

c. Development of model programs and the setting up of pilot projects under contract with research supervision.

Ten-year goals

Completion of the research aspects of occupational health program establishment.

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DEVELOPMENT OF STANDARDS FOR THE WORK ENVIRONMENT

Background

Determination of the environmental conditions which can be tolerated, or, better still, of the environmental conditions which are to be recommended for optimal health, productivity, and performance, is basic to the operation of an effective occupational health program. Without this, every move to control environmental conditions is apt to be met with demands for proof as to why the particular value taken was chosen, and not some other value more favorable to the party posing the question.

Present status

Organizations and groups such as the American Conference of Governmental Industrial Hygienists, the American Standards Association, and the American Industrial Hygiene Association engaged in setting standards look to the PHS for advice, assistance, and support; but the resources to meet these demands are meager.

There are now no agreed standards for the work environment with respect to allergens, substances absorbed through the skin, or carcinogens. The same thing applies to psychological conditions. The current standards for noise, vibration, heat, and cold are unsatisfactory. Those used for toxic substances cover only a limited number of substances, and are too often based on evidence of a rather tenuous character.

Five-year goals

a. To work with the organizations named above and with other divisions with responsibilities in environmental health in a critical reevaluation of the philosophy, criteria, and applications of current standards for the occupational environment, with the definition of areas of needed information and the provision of specific staff and other assistance as needed. Special attention will be given to revising and strengthening the bases of threshold limits and maximum acceptable concentrations (MAC) at present in wide use.

b. To develop mechanisms for effective and sustained international cooperation and interchange of information in the field of standards for the occupational environment, such as an expansion of the present cooperative activity with CIS.

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Ten-year goal

In cooperation with appropriate committees or organizations, to develop standards for the work environment in areas not now covered.

TECHNICAL SERVICES AND ASSISTANCE

Background

PHS has 50 potential clients in the States, and several more in the various Federal departments and agencies. Few of these have sufficient resources or sufficient need to set up full-scale technical organizations capable of making all the investigations and solving all the problems of occupational health that may develop in their respective spheres. Even where the resources exist, individual institutions of any magnitude would lead to unnecessary overlapping, and unwarranted drain on the national resources, especially of expert manpower. A central research and investigation facility, at this stage of development, can maintain a wider range of expertise, and provide a greater variety of services rather than several smaller institutions, and keep those services in close contact with research developments across the Nation. Beyond the State and Federal agencies lies the mass of industry itself, and beyond it the general public, who also desire service and assistance in matters of occupational health.

Present status

From its current resources, DOH furnishes three types of service: (a) technical information and advice; (b) problem-solving teams; and (c) assistance to States in the building up of their own programs. These resources are, however, limited. The technical information service relies on a manual storage and retrieval system of relatively small bulk; requests for visits by problem-solving teams may have to wait several months before the required personnel are free from prior commitments: and only two officers are currently assigned to States for program assistance.

Five-year goals

a. The installation of at least a semi-automated information storage and retrieval system, for the provision of technical information to States, industry, and the public on environmental hazards associated with occupations.

b. The provision of sufficient skilled personnel to be able to maintain two teams of four technologists in the field at all times for problem investigation.

c. The assignment of a physician, engineer, or nurse, trained in occupational health, to at least 20 of the 50 States, on a basis of need, opportunity, and evidence of adequate support.

d. The fiscal support of an occupational health program in each State.

e. The continued development of effective working relationships with industry, labor unions, local agencies, and appropriate Federal agencies aimed at the fair and equitable attainment of recommended environmental standards in both large and small industry.

f. The development of a trained and experienced staff for consultation in the development of the health aspects of union contracts.

g. The development and use of effective methods of educating workers and the general public in the possibilities of and necessity for sound occupational health practices.

Ten-year goal

Complete development of the above goals, and particularly the establishment of an effective occupational health unit in each State, with close collaboration with PHS.

DIRECT TECHNICAL TRAINING

Background

The pursuit of studies or the implementation of programs in occupational health require many techniques, items of information, points of view, or specialized knowledge, which are seldom acquired in the course of routine professional training for engineers, physicians, nurses, or scientists. It is essential that there be some organization which can provide this training, in conjunction with the regular professional training, as a postgraduate course, or on the job.

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Present status

A few universities offer postgraduate courses in industrial medicine, occupational health, or industrial hygiene; but these require one or more academic terms of full-time instruction, and are not sought by many students. DOH provides 1- or 2-week technical courses for industrial hygienists, industrial engineers, safety engineers, and plant medical officers, which are usually oversubscribed. There is an obvious need for providing still further short-term classes, and for cooperation with universities in attracting more students to the long-term professional courses.

Five-year goals

a. Increased activity in the presentation of short-term courses for physicians, chemists, engineers, nurses, and other health workers in general and specialized aspects of occupational health.

b. An expanded educational program for health practitioners in the diagnosis, treatment, and prevention of occupational disease.

c. Continued education of workers and the general public in the importance and methods of preventing occupational disease.

d. An expanded program of cooperation with universities in promoting graduate courses in occupational health.

Ten-year goal

Extension of the same.

GRANTS

Background

Universities, non-profit research organizations, technical institutions, and some private groups are actively engaged in both research and training relevant to the advancement of occupational health. This is the foundation upon which the PHS helps to build an adequate national activity in occupational health. In keeping with the role ascribed to it, the PHS must encourage them in meeting the national needs, especially in relation to the more basic aspects of occupational health problems and activities, and must render substantial support to these activities.

REPORT OF SUBCOMMITTEE ON OCCUPATIONAL HEALTH

Present status

The award of grants for research in occupational health have come under the purview of DOH in the last year, and a substantial increase in funds has been made available for this fiscal year. As this is a relatively new departure, it remains to be seen to what extent the national pool of talent can effectively use these funds. For the research as well as for the proposed increased occupational health activities in Federal, State, local, and industrial agencies, a much larger number of trained persons will be required than are at present in sight. It is doubly important, therefore, that immediate action be taken to attract a larger number of good personnel into training, not only for occupational health itself, but also for the sciences and technologies upon which it is based. The DOH is concerned, however, primarily with those courses which relate directly to occupational health activities, depending upon the National Institutes of Health and others for the support of the training in the contributory disciplines, for whom this field will be one of many competing employers.

Five-year goals

a. The support of research in fields relevant to occupational health to be conducted in universities, technical institutions, nonprofit organizations, and appropriate private groups, to the extent that worth-while projects can be conducted by the available talent.

b. The introduction of research training grants and fellowships to encourage and support capable personnel according to their needs during the period of training in research.

c. The introduction of training grants to similar organizations for the development and conduct of courses in subjects relevant to occupational health, for physicians, engineers, scientists, industrial hygienists, and nurses.

d. The introduction of traineeships to encourage and support capable personnel according to their needs during the period of training in occupational health science and technology.

Ten-year goal

Development of the above in accordance with the available talent.

REPORT OF SUBCOMMITTEE ON OCCUPATIONAL HEALTH

DEVELOPMENT OF ECOLOGICAL PICTURE OF OCCUPATIONAL HEALTH

Background

As with most fields, the tendency has been to concentrate on the pursuit and conquest of the more easily recognized, isolated, and urgent problems to the exclusion of adequate efforts toward maintaining a unified conspectus of the field. This tendency has been accentuated by the absence of well-defined procedures for integrating independent observations on the simultaneous operation of multiple factors. In spite of the difficulties, however, such an integration is vitally necessary, since the worker, who is the prime object of concern, is and reacts as a whole man, and not as an isolated system responding to stimuli one at a time. Such a conspectus is necessary not only for the completion of an intellectually satisfying concept of the object of study, but also for the organization of activities within DOH in a manner best suited to the overall purposes of the organization. The development of this ecological viewpoint is the more essential as attention passes from the dramatic effects of single environmental conditions to the more subtle but more far-reaching effects of multiple coincident factors.

Present status

Very little attempt is made at the present to derive an integrated picture of the total worker in a total environment, beyond the intuitive and almost casual picture that any keen administrator develops in his own mind. Two kinds of techniques are available, although in still rather undeveloped form: (a) mathematical procedures based on probabilities such as factorial analysis, symbolic logic, and game theory; and (b) round-table integration, in which experts from various fields meet periodically to attempt dialectic synthesis, with progressively penetrating review of the evidence between sessions.

Five-year goals

a. Development of a pilot system whereby an ecological picture may be established of the total worker in his total environment from the information available in the several contributory disciplines.

b. Determination of ways in which this activity can be linked with corresponding activities in other Divisions and at Bureau level.

c. Development of methods by which the ecological information may be applied to DOH program operations.

REPORT OF SUBCOMMITTEE ON OCCUPATIONAL HEALTH

Ten-year goal

Establishment of definitive activities in the above, related to the Center type of conjoint activity.

Document B

OCCUPATIONAL HEALTH IN THE PUBLIC HEALTH SERVICE*

by

Luther L. Terry, M.D.
Surgeon General, Public Health Service
U.S. Department of Health, Education, and Welfare

Rarely does a meeting afford us so fully the privilege reserved to Janus of viewing the past and at the same time, peering into the future. Your session yesterday presented an impressive prologue of the challenges and the opportunities facing us in occupational health in the years ahead.

The gains made during the past half century demonstrate how private and public enterprises can work together in a common endeavor. Today, it is especially fitting to pay tribute to a representative of each of these sectors--the Industrial Hygiene Foundation, on the occasion of its 28th anniversary, and our sister agency, the U.S. Department of Labor, celebrating its 50th year of outstanding service on behalf of the worker.

Incidentally, next year our own Division of Occupational Health in the Public Health Service will mark its 50th year of effort to improve the health of the worker. The work of all three organizations has proven mutually beneficial and complementary in the past. And we look forward to even closer ties in the sixties.

Occupational health, as a product of our swiftly changing society, has undergone a striking evolution. Once characterized as an art in its infancy, industrial hygiene has emerged as a distinct profession, supported by other specialty disciplines. It has had to keep pace not only with occupational health problems which are growing in number and complexity, but also with new scientific knowledge which has illuminated our understanding of these problems. Even more important, it now operates from a very broad base: namely, preventive health services for the whole man.

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OCCUPATIONAL HEALTH IN THE PUBLIC HEALTH SERVICE

Today, occupational health stands at the threshold of even more vigorous growth. The potentialities are enormous, but only if we display the kind of zeal that characterized the very early years of this movement.

A social conscience, shocked by the wholesale disabling and killing of workers in unprotected trades, gave a fervor and momentum to the early development of industrial hygiene. The problems were specific and dramatic. Most occupational health hazards today are less apparent, less clear-cut in their causal relationship to the job--but no less insidious. Subtle though the influences in the work environment may be, they profoundly affect the worker's health, vitality, and productivity. Because more workers are involved, in fact, today's occupational problems probably have a greater economic and social impact than the more spectacular disasters of the past.

To be sure, it will still be necessary to deal with outbreaks of frank occupational disease. In the main, however, such situations will be the consequence not so much of the lack of basic knowledge but of the failure to apply what we now know. Occupational health must be prepared for these eventualities, but it cannot confine itself to such "fire fighting" functions. It must push forward to new frontiers which are just as challenging by their complexity as were the older ones by their intensity.

The changing pattern of occupational disease calls for more refined methods of study to uncover subtle injury and disability that may develop from low levels of on-the-job exposure and stress over a working lifetime. Epidemiologic studies of workers become increasingly important in obtaining such information. Today it is rarely possible to find answers through a one-time cross-section approach. The new epidemiologic study must be longitudinal, encompassing equivalent exposures of a working lifetime, supplemented with data from morbidity and mortality records. Information will need to be collected over a long period of time without excessive commitment of resources or interfering with management procedures.

The historic practice of dealing with diseases that have frankly declared their presence had two serious limitations: the essential beginnings were obscured; and emotional reactions already developed in employer, employee, and the public. The more we can learn about early responses to undue stress--before disease is apparent and fears are engendered--the more quickly we can build that basic understanding essential to rational action. Recent work by the Division of Occupational Health in soft coal mines, hot industries, and asbestos plants has shown that both labor and management will cooperate in such basic studies, once the need is pointed

out and certain misgivings are allayed. Such studies also provide an excellent opportunity for a wide spectrum of medical and engineering specialties to work together on common problems.

The activities planned by our Division of Occupational Health for the sixties are geared both to the study of the newer problems and the most effective application of knowledge in a complex field. As a first step, we need to identify areas of research and survey the trends--in industrial development as well as in patterns of illness. We are, for example, devising methods for studying the long-range impact of the working environment on health, including the effects of chemical, physical, social, and psychological factors.

This will enable us to enlarge the scope of our field studies and to encompass a variety of occupations. We have already made a beginning in this direction. A current project, for instance, seeks to determine whether and to what extent noise affects the learning and performance of a complicated task.

A related study is probing more deeply into how health and productivity are affected by work in industries where extreme heat is a problem. In spite of considerable effort over the last 60 years, there is still no satisfactory index to predict the effects of heat on well-being or on work performance.

A major piece of field work is the study of soft coal miners which got underway last January in West Virginia. Eventually it will cover the whole Appalachian region. Increasing evidence points to the existence of chronic pulmonary disease in soft coal miners that is related to dust exposure. If this suspicion is confirmed, through clinical and environmental studies, information will be designed to prevent, diagnose, and treat these diseases, and to rehabilitate the miners who are affected.

You may be interested, too, in knowing that our long-range study of health hazards in uranium mining continues in its 13th year. Close surveillance of a group of more than 3,000 miners shows a trend of increasing lung cancer deaths, believed to be due to the radiation exposure in the uranium mines. The Service has been working with the States and industries concerned to do more definitive checks and to develop appropriate preventive procedures. As a result, we are beginning to see an encouraging lowering of the radon levels in many mines.

Perhaps nowhere are the fruits of our prolific technology more evident than in our growing chemical world. Scientists are hard put to keep abreast of the toxic potential of the 400 to 500 new chemicals which are

introduced in industry each year. To close this gap, we all need to accept more fully the view that new materials must be as well understood for their biological potentialities as for their physical and mechanical properties. Much more research must be devoted to this end.

Toxicologic research in the Public Health Service will continue to examine the intimate processes of cell metabolism. Here, we believe, lies the key to the multifaceted disturbances from occupational exposures. Research in cell metabolism demands entirely new scientific competencies, modes of investigation, and technical resources. And we intend to strengthen our staff capabilities in the Division of Occupational Health to permit such studies.

What may we expect from this increased emphasis on cellular study? For one thing, we may be able to recognize environmentally-induced disturbances at their very outset, or, better still, to identify those individuals who would respond adversely before they are actually exposed. Specific enzyme systems are essential to the detoxification of certain compounds, and their development is often genetically controlled. Methods are becoming available for detecting those who lack such systems, and who consequently should be kept away from exposure.

Our recent work on predictive tests of hypersusceptibility to hemolytic chemicals and drugs shows that this area of exploration is promising. If susceptibility to other chemicals can be similarly detected, this finding would have great significance for industry, where approximately one million workers are involved in the manufacture of industrial chemicals and several times that number are exposed to chemicals through handling and use.

In addition to the work done in our own laboratories, we support research conducted by non-governmental scientists, through grants. Research grants, as you know, represent a practical and efficient means of utilizing the services of thousands of scientists throughout the country in solving the Nation's health problems. The occupational health component of the extramural research program is relatively small at present. We are currently supporting 75 projects, for a total of about $2 million annually. These projects are being conducted primarily in schools of medicine, public health, and engineering.

Much of the success of the research grants program in occupational health, however, depends on finding ways of enlisting the interest and competence of scientists, engineers, and managers in industry. Industry should become actively engaged in research in occupational health. And I believe procedures can be worked out which would permit public support

of such research in a harmonious fashion. It seems to me that industrial participation in occupational health research is one of the important goals for the coming decade, and I commend it to your serious attention.

Research is the basic first step. But we must be even more vigorous in applying new knowledge on behalf of better health for the worker. We are aware that in many communities occupational health programs developed by private enterprise stand in the forefront of the public health movement. Unfortunately, however, the problem of the small business establishments --in which more than two-thirds of the Nation's workers are employed-- has been long neglected. Small firms have neither the programs nor the professional people needed to prevent and control occupational hazards.

This is a difficult problem and I confess that we in the Public Health Service have not yet come up with any satisfactory answer. There seems little doubt, however, that certain types of occupational health services can be extended to small plants through better use of community resources. We hope to encourage this development and to work with community agencies to bring it about.

Last year, for example, in collaboration with the National League for Nursing, the Service conducted a study of part-time nursing services provided to industry by visiting nurse agencies. As an outgrowth of this project, a guide will be prepared to facilitate and improve such services.

Training is another tool we plan to use more widely in the 1960's. The Division of Occupational Health offers short-term training, not provided elsewhere, that runs from basic courses in industrial hygiene engineering and chemistry to advanced study in evaluation and control of heat and noise. We make this training available to industry whenever possible-- as you know from the joint courses we have presented with the Industrial Hygiene Foundation.

We plan to expand our training programs for physicians and nurses particularly. The nurse is a key figure, and sometimes the only professional person, in occupational health programs. Many more well-trained nurses will be needed in the decade ahead to staff current programs as well as new ones that will be organized. We hope to fill some of the gaps through our own training courses and through collaborative efforts with educational institutions.

Information storage and retrieval will be another major area of expansion in our occupational health program. The "information explosion", as you know, has been a cause of concern among the entire scientific community. Much has been said about the impossibility of keeping abreast

of an increasingly voluminous literature. This applies forcibly to the occupational health field, which cuts across so many disciplines, each with numerous specialty journals. In this connection, I wish to salute the Industrial Hygiene Foundation for its contribution to the more effective dissemination of information through publication of the Industrial Hygiene Digest.

At present, the Division of Occupational Health has a semi-automated information storage and retrieval system and is developing a thesaurus compatible with that of the Defense Documentation Center. Even if we include only the minimum essential items, we estimate that this would mean feeding approximately 1,400 items into the system each month. The cumulative load will obviously require a more fully automated system. Plans for the use of the information include the preparation of reviews and bulletins on occupational health problems of interest to industry and the professions.

In our proposed Environmental Health Center, a central information storage and retrieval system will probably be established to serve the Division of Occupational Health, together with the other divisions of the Service concerned with environmental health problems. A major purpose of this grouping is to avoid the fragmentation of the worker, as the result of more and more specialization. We seem to be imprisoned, separated by barriers of technical language and specialized training. Occupational health services cannot function in such isolation.

The rapid growth of our population, expanding urbanization, and our increasingly complex technology are outstripping our efforts to contain environmental hazards. Changes are occurring so rapidly that the effects on man's health and well-being are not being dealt with as promptly and completely as they should. We need a major new source of strength, and this can best be provided through a major new base of operations--a National Center for Environmental Health. The Center would be a focal point for an integrated program of research, training, technical assistance, and control operations in a concentrated attack on environmental health problems.

Such a Center would be of inestimable value to our effort in occupational health. Chemicals which are important in occupational exposure, for example, frequently also contribute to pollution of our atmosphere and streams. Through an Environmental Health Center, these chemicals can be considered and studied in combination.

OCCUPATIONAL HEALTH IN THE PUBLIC HEALTH SERVICE

Occupational health is concerned with the man--the whole man in a total environment. His reactions to various occupational stresses may have to be studied separately; but the findings must be seen together and combined with other aspects of the work and home environment. There must be a new synthesis along with a greater depth of effort--and this is the essential purpose of the Environmental Health Center.

We in the Public Health Service have high hopes for such a Center. Unfortunately, an extraneous matter--lack of agreement as to its location--has delayed the plans for the Center. We hope that some agreement can be reached soon so that the planning for this urgently needed new facility can proceed in an orderly fashion.

In sketching some of our occupational health plans for this decade, I have touched on certain broad problems of concern to all who are working in this field. I should like, in closing, to comment briefly on what our mutual expectations might be for industrial hygiene in the 1960's.

First, I believe there will be an increased demand for health protection in the work place. This demand will go beyond present standards, both qualitatively and quantitatively.

Secondly, there should be a keener realization by industry that expanded research and more widespread application of occupational health principles will yield tangible and intangible dividends.

Thirdly, I look to management's growing recognition and acceptance of its responsibility in defining significant work stresses. Industry can help provide answers to many pressing questions. It can, for example, directly sponsor research of on-the-job stresses, and make its resources available to other investigators.

We in the Public Health Service welcome the opportunity to be your partners in this endeavor. There are numerous ways we can work together, some of which I have already enumerated. The essential element is the recognition of a problem too vast for any one group to solve by itself, and the will to seek out allies and join forces. It is only by marshalling all our resources that we can hope to fulfill the promise of the sixties.

Document C

WHAT LIES AHEAD IN OCCUPATIONAL HEALTH

A LOOK AT THE NEXT FIFTY YEARS*

by

Honorable John E. Fogarty
U.S. House of Representatives

I am very happy to be here with you today, to pay tribute to the accomplishments of the Public Health Service in fifty years of occupational health activity and to reflect upon what the next fifty years can bring.

It is helpful to have occasions like this during which we measure our progress, as Dr. Hatch has just done so ably for us, and to consider what major tasks lie ahead, as I hope to do now.

It has been well said that thought, or reflection, "steals light out of the past to shed it on the future." In looking at the future, I would like to pass in review, so to speak, the tasks that will confront all who are concerned with occupational health. The progress of the Public Health Service in the next fifty years will be inseparable from the dedication and the success of business, labor, Congress, industrial hygienists, and the many other groups which have made unique contributions to the health of the worker. The objectives of all are inseparably entwined and I would like to take a look at the total program in which the Public Health Service, with many others, will play a part.

From the vantage point of membership on the Appropriations Committee of the House of Representatives, I have observed for many years how Congress has allocated money to various aspects of health activity. From this position, I have seen the total health picture of our nation, as presented to Committee members by experts and in the give-and-take of the

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questioning periods. From this experience -- as well as from a long personal interest in workers and their health problems -- I have taken the measure of industrial hygiene programs as compared with other health activities and I have come to a conclusion I suspect you will be able to agree is both accurate and helpful.

We are not moving forward in occupational health at an adequate pace. While some fields of environmental health have taken tremendous strides in the last two decades, occupational health at this moment commands very little public attention, support, or interest; derives small nourishment, indeed, from public funds; and -- I would say -- is stagnating, in comparison with other fields of environmental health. . . especially when measured against the job that could be done.

A recent issue of Environmental Health Letter commented: "We don't see anything in the Division of Occupational Health's budget of a mere $2,179,000 for extramural research to get excited about. Some excellent research is being conducted by the Division at its Cincinnati facility -- but the sum for extramural support is peanuts, compared to the enormous size of the job which could be tackled." I agree completely.

The future of industrial health could be magnificent. The possibilities are vast. If we resolve to act so that no individual worker will endanger either his life or his good health through the means by which he makes his livelihood, we will have undertaken a large task. I firmly believe, as I'm sure we all do, that no man or woman should be expected to risk physical debilitation, pain, disease of the skin or of the lungs, or a shortening of life, in exchange for the wage received as an employee. But we need to think more imaginatively and generously than this.

There is growing recognition that a country's greatest resource is its people. President Johnson has asked us to wage a war on poverty so that our people should not be poor. We try to prepare each young person for his place in society by giving him the best possible education, so that our people should not be ignorant. Surely an important corollary of these efforts is that our people also be healthy.

I would like to propose that our sights be raised so that employment anywhere -- in the trades, in commerce, in any and all occupations -- will become synonymous with good health. Our goal should be expanded so that the vigor of our working men and women will become a matter of national pride and an accepted part of the culture and heritage we pass on to coming generations.

We are far from this objective at the present time, and we are not moving at a pace likely to achieve it soon.

WHAT LIES AHEAD IN OCCUPATIONAL HEALTH

The primary reasons for our lack of progress lie in a whole series of complexities, such as jurisdictional barriers between programs which should be closely knit; inadequate staffing of State occupational health programs; the inability of small plants, in particular, to provide health services to their employees; and a general slowing down of the initial enthusiasm and effort which has lulled the public and many of us, too, into behaving as though there were no more big challenges in occupational health.

These barriers and roadblocks to progress have been discussed by leaders in the field for years, in some instances, but so far no one has had the temerity or the motivation or been able to generate the forces, to attack them, sweep them away, and demand, for occupational health programs, the vitality, the budget, the staffing, and the drive which can bring about really solid accomplishments. It is my belief that the time is here to attack the ancient enemies -- ignorance, apathy, and confusion -- which we have allowed to remain in our way. We need to determine some priorities, plot a course of action, and summon the support of all who should be concerned.

With more than 70 million workers to consider, our planning must be broad and yet realistic, bold and yet down-to-earth.

For example, what do we really know about the current health of these 70 million workers? What do we know about the causes of illness, and the actual incidence of sickness and death, by occupation? We know too little. There is no efficient reporting of occupational morbidity and mortality rates at the present time. Although the importance of gathering data, as a foundation for adequate planning, has been accepted for years, in this field the job is not yet being done.

In this day of rapid machine calculation, of inputs, outputs, and stress on scientific communication, it is ridiculous and unnecessary to lack the essential figures on accidents, illnesses, and deaths as they relate to the victims' occupations.

Don't we need a comprehensive reporting system? I'm sure, if we gave more attention to the need for data and how to get it, and then to publicizing our convictions, an adequate information network could be achieved in the near, rather than the distant, future.

Knowing what our occupational health problems really are would give us a solid start toward parcelling them out and coordinating them through the many agencies that have, and will continue to have, a hand in occupational health.

WHAT LIES AHEAD IN OCCUPATIONAL HEALTH

It is obvious that in any major effort to determine a course of action, and to follow through on it we will need to coordinate the activities of a variety of programs -- workmen's compensation; old age, survivors', and disability insurance; Federal and State Health programs; industry programs; union health programs, and others. We all know that these programs could achieve better results by working together than by pursuing their separate, and sometimes even competing, ways. There is an overlapping of functions and of expense in our present lack of cooperation. We are paying more than once -- and sometimes more than twice -- for the same activity, performed by different agencies, and still not getting the quality of service we should. We should be welding the efforts of industry, the universities, government, unions, doctors, nurses, technicians and all industrial hygienists to bring about the best results for improving individual health.

The start can be made almost any day and -- as you know -- could be as simple as dialing the phone number of a cooperating agency or mailing a report to a newly assembled mailing list. These are the raw materials of coordination upon which large achievements can be built. They are used too little.

For years we have been talking about the difficult problem of providing health care to workers in small plants, where some 80% of American employees work. But there is no concerted action at the present time to bring to these employees the benefits of on-the-job health care and protection. Although some of the large plants have provided diagnostic and preventive services far beyond what is required by the law, there are no in-plant health programs for the majority of workers.

Health protection must be delivered to the worker on his job, or to some point reasonably near his job. It's a tremendous task, but it could be done. It could be done, in some instances, through mobile units. They have provided a happy solution to many other problems where scattered populations, unable to travel to a common center, had to be given vital services. In somewhat more consolidated areas, might not a single center -- located in a central location -- serve employees from a number of plants, large and small? There are usually a variety of ingenious and economical answers possible when the problem is identified, stated, and given serious, unrelenting attention.

The problem of providing health services to small plants is so big, we cannot stop hunting for solutions even when some that we try don't work. In some instances, we have set up mobile units and geographical centers and they haven't sufficed. There must be ways, then, that we haven't

thought of yet and ways that we haven't tried. It is a big challenge for you people here. If the old ideas are inadequate, can you and others like you think of something new?

Certainly you need the assistance and support of many more trained industrial hygienists than are available now. I am sorry to find that this nation is so understaffed, insofar as industrial hygiene is concerned. Many of you here who have worked for government agencies and then gone to work for industry are personally familiar with the situation I am describing.

The Federal government, I know, has trained many industrial hygienists, relied on their services, and then benefitted from their work when they left to become staff members of important industries. The complaint is not that industry has attracted able employees. The pity is that there have not been adequate replacements for those who are gone. Where, for example, are the young people in industrial hygiene?

State and local government units, particularly, are crippled by the lack of available top-notch technical and professional personnel. This applies to all professions -- engineers, physicians, chemists, physicists, toxicologists.

We must figure out ways by which training and education can be stepped up to produce larger numbers of industrial health specialists and we must highlight inducements which will influence some of the best students to choose industrial hygiene for their career.

If the field of occupational health keeps pace with the national movement to equate opportunity with ability, regardless of the race, creed, or color of professional applicants, we will have another source of dedicated, enthusiastic, and able professional people. We must make sure that able members of minority groups are given opportunities in occupational health commensurate with their ability to serve. We can ill afford in the world today to disregard the potential contribution that exists in our so-called minorities. We are cheating ourselves; we're missing a great deal anytime an able person is denied education or professional position because of his race, the color of his skin, or his religion.

I think some outstanding people will be attracted to occupational health simply by the resurgence of dedication and purpose which I am saying should be brought about. There will be need for new and vigorous leader, as the years go by, and for the very best in technical skill, brain power, and knowledge of scientific and social complexities.

WHAT LIES AHEAD IN OCCUPATIONAL HEALTH

We are all aware that many industries and jobs have so increased in complexity that large amounts of money must be invested in training the individual worker. The more costly it becomes to have a man off the job, the more important it will be, from an economic point of view, to insure that he stays well.

Humanitarian motives aside, it is good business -- for industry and the community -- to prevent illness and accidents, no matter where they occur. Thus the artificial barrier between the health of the man at work and away from work is crumbling. This may be the most important single development of the coming half century.

Workers spend some forty hours a week on the job as compared with more than 120 off. The health effects of the off-duty environment have increased over the decades as the hours of the work-week have diminished. Also, in today's world, off-duty health risks are sometimes greater than on-the-job risks.

I recently noticed an item which stated that the 100,000 workers of E.I. du Pont de Nemours & Co. were 22 times as safe on the job as off, on the basis of 1963 injury rates. Surely the challenge of occupational health is to extend the gains made on the job to the environmental hazards which exist in the community. The tools and the techniques are there, awaiting only their proper application.

Congress and the public have heard a great deal in recent years about the subtle insults to health from a variety of environmental hazards -- polluted air, contaminated water, radiation, food poisoning, and many others. We have begun to get the point that we are living in an entirely new, and very complex, world, in which chemicals and nuclear power and other forces -- somewhat outside the comprehension of most of us -- may affect our health and the health of future generations.

The industry of the future -- with its emphasis on automation, electronic and chemical operations, and nuclear energy -- will undoubtedly bring about health problems which will have more far-reaching effects than those of the past. While early hazards affected only the workers directly exposed, radiation and chemicals may produce effects on generations yet unborn in the families of exposed workers.

Occupational health research has made, and can continue to make, major contributions to medicine in general and, in turn, can benefit from developments and findings in other areas of medicine. For example, the tests recently devised for diagnosing hypersusceptibility to certain common chemicals in industry have implications far beyond the limits of the workspace. They have important meaning for the entire field of

medical genetics, for red blood cell research, for determining drug sensitivity, and so forth. In due time, they could reach into the office of the private practicing physician for general application.

This can be done, however, only if there is more communication and a greater interplay between occupational health and the preventive health practitioners outside the plant, with medical research at large and others with whom research and practice are allied. Let us not make the mistake of isolating occupational health outside the mainstream of American health protection.

In that connection, let me urge that occupational health broaden its scope and raise its sights to make itself part of the dynamic movement we call environmental health.

Let me emphasize that by living under the big tent of environmental health, occupational health is not sacrificing its own identity in any sense. It is, on the contrary, taking on a larger responsibility, one which brings it more fully into the search and control of health hazards presented in common in today's complex physio-chemical environment.

Occupational health, with its vast experience and know-how, can be a central force in stimulating a unified attack on those hazards.

There is a readiness, I believe, to undertake much more extensive and sophisticated research on the environment than ever before. There is a realization that the laboratory equipment and the techniques for conducting this research will have to be much more refined and expensive and complex than any we have yet known.

Also, we must find out just what part occupation plays in aggravating certain diseases that are common to the adult population. It may well be that the combination of breathing smog, smoking cigarettes, and working in a particular occupational environment, will have a unique and damaging effect on certain workers. One could choose other examples, using different combinations of drugs, cosmetics, food additives, insecticides, radioactivity, and other pollutants of the environment to which we are all exposed, to different extents, in our daily lives.

Whereas in earlier days, concern over an occupational health hazard was likely to develop only after deaths or serious and obvious illness occurred in sufficient numbers to bring the problem dramatically to public attention, we cannot afford to rely on such an approach today. The new factors, frequently introduced first into the work environment

and later into everyone's environment, are too potent, the effects are too subtle, and the consequences too grave and irreversible, to permit gambling on prolonged exposures.

Congress has just recognized this principle in passing the "Clean Air Act," to fight smog and other community air pollution. We are also giving serious and continuous attention to the water supply of the nation and to control of water pollution. Radiological health protection always finds a receptive audience.

Now someone needs to speak up for industrial hygiene. You know that the worker is the one who experiences "first exposure" to many of the ingredients that later become the big commonplace environmental health problems of the total population. We see, in the pesticides area for example, how knowledge gained from study and protection of the workers manufacturing, transporting, and applying these chemical poisons gives valuable assistance in protecting, or reassuring, the public now that pesticides are found in the general environment.

We need to impress upon people who do not know this fact of life that the occupational environment is the best place, often the only place, to study human exposure to certain chemicals, stresses, heat, fatigue, and other health-affecting factors.

Protecting the worker from new health hazards can redound to the benefit and protection of us all. This is the message we need to get before the nation so that we will be permitted and authorized to do the kinds of studies and undertake the kind of activity we know should be done. We would be doing our country a great service by awakening its conscience once again to the urgent needs of the workplace.

Because we have eliminated the worst of the abuses which characterized the early days of unlimited hours, child labor, sweat shops, and the absence of legal protection for workers -- and because America is superior in so many areas of technology and commerce -- there appears to be a general assumption that we have mastered the big problems of occupational health.

Actually our unsolved problems -- as I have tried to point out in this brief presentation -- are many. Some I have sketched here. Others will appear only with time. Many of them will not be solved in the next half century, but they can be kept within control by valiant effort.

Three years ago, John F. Kennedy addressing himself to the serious tasks facing the nation said, "All this will not be finished in the first one hundred days. Nor will it be finished in the first one thousand days, nor in the life of this Administration, nor even perhaps in our lifetime on this planet. But let us begin."

WHAT LIES AHEAD IN OCCUPATIONAL HEALTH

That message is for us, here. We can look back upon a half century, and more, of work well done in industrial hygiene. We have learned a great deal and most of us have a fairly clear idea of what still needs to be done. The present challenge to us, as a nation, is to put to use -- on behalf of workers' health -- all that we now know. This is not being done to the fullest extent possible. We must carry our work forward at an increased pace, commensurate with the gravity and importance of the task.

So, let us begin.

Document D

OCCUPATIONAL HEALTH -- THE COMPLEMENTARY APPROACH TO ENVIRONMENTAL HEALTH*

by

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BACKGROUND

The pattern of growth and the subdivision of man's activities tend to follow his urgent interests rather than conform to a strictly logical scheme. The term "environmental health" is used to cover those public health problems which arise from the impact of environmental conditions, as distinct from those that arise by association with others and are subsumed under the term "community health". Within the activities described as environmental health subdivision is again pragmatic rather than logical. Air pollution, water pollution, and food protection are short, if somewhat inexact, names given to three programs in environmental health which deal with major and easily visualized segments of man's environment. Radiological health, by contrast, pursues the special environmental factor of ionizing radiation in whatever part of the environment--air, water food--that is relevant, and so cuts across them all. Environmental engineering starts with a technology and applies it to problems of environmental control, again in any appropriate segment of the environment. Occupational health makes yet another approach by directing its attention to a particular group of people, the gainfully employed, and the environmental conditions associated with their employment.

Illogical though this structure may be, it does provide something that a linear subdivision would lack--the opportunity to look at the impact of environment from two points of view; that of specific environmental factors acting on a wide variety of people, and that of individuals exposed to a wide variety of environmental factors. The cross-check, an

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*Based on an article to be published in Public Health Reports later in the year.

essential part of any accounting system, is provided by those activities which cut across the three categorical programs (air, water, food). Of these cross-checks, the most extensive and potentially the most valuable is that provided by occupational health. The gainfully employed, or any stipulated group of them, provide a defined cohort of persons whose health and productive activity can be followed through time. In many instances the hazards to which these individuals are exposed at work are simply special cases of those which may affect people in ordinary life. The intensities are often greater, and, in the case of new products, may affect workers earlier than the population at large. These differences in intensity and time help considerably in projecting the probable effects of the lesser contamination of the general atmosphere. The circumscribed and repetitious nature of the work environment permits it to be studied more intensively and accurately than the wider world, so that a firm base can be laid from which the problems of the general environment can be approached more confidently.

THE CHANGING FACE OF INDUSTRY

Occupational health was born in the early years of this century as public conscience took note of the heavy mortality associated with certain occupations. The causes of these dramatic episodes were discovered and appropriate preventive measures devised. Human imperfections still permit similar outbreaks, and vigilance is still necessary, but these dramatic occurrences no longer dominate our concern. But man's divine discontent drives him on to new chemical adventures and new potential hazards as fast as his past errors are corrected. A conservative estimate puts at 500 the number of new substances developed each year, of which an important fraction is likely to have toxic properties. Fortunately, our increasing chemical and toxicological knowledge enables us to forecast the probable action of many of these, and screening procedures built up over the years pick out many more that might in the less sophisticated past have escaped to affect the worker or population. But some get through, and unexpected intoxications occur. New products call for new processes, and while the end-product may be innocuous, some of the intermediaries may be far from harmless. As a rule a number of individuals must be affected before an occupational origin is suspected, especially if the affection is slow in developing. We are now beginning to realize that certain people are hypersusceptible to specific agents, and to develop tests for recognizing them before they get a critical exposure. Those who are recognized can avoid exposure, those who escape detection at least serve as an early warning system for the rest.

OH--COMPLEMENTARY APPROACH TO EH

Physical hazards are equally important with the chemical. To the well known noise of jet engines must be added the continued hiss of compressed air valves, the clatter of falling metal scrap, and the multitudinous noises of any machine shop. Intense radiant heat is a marked feature of aluminum plants, steel mills, and the like although methods of personnel protection are being increasingly used. The introduction of the laser and plasma torch have brought with them a range of hazards as yet only partially appreciated. In addition to the risk of direct contact, the power of reflected radiation, and (in the case of the torch) X-ray and ultraviolet emanations may be formidable.

But perhaps the greatest change is in the psychological environment of the work place, a change which is far from simple. In the first place, we are still in mid-course of the movement started early in the century for the general psychological and social improvement of the work place. Cleanliness, illumination, neatness, attractive toilet facilities, eating places, social clubs, recreation facilities, etc., are now common, although by no means universal. But the years that have witnessed these improvements have also beheld another phenomenon--a progressive increase in the demand level, or a decrease in the tolerance level for poor conditions. Lest this be used as an argument against misplaced charity, it should be realized that this increase in demand level seems to be true for the population as a whole, perhaps as a by-product of the affluent society. People just will not put up with conditions today that were taken for granted twenty years ago, as witness the current insistence upon air conditioning. Many of these improvements have ceased to be a stimulus to productivity; it is rather that their absence is now a marked detriment to productivity. This shift in attitude toward amenities as an entitlement instead of an extra may call for a realistic re-evaluation of some industrial welfare programs.

The tremendous strides that have been made in the acquisition, transmission, and presentation of data over the last quarter century have brought about a serious psychological crisis, none the less important for directly affecting only a few at present. The amount of detailed information that can be and often is delivered to any one individual is quite beyond his absorptive capacity. If he attempts the impossible, he is subject to severe stress, both from the primary confusion and from a sense of failure. If he confines himself to the possible, and selects certain data from the morass, he may well be haunted by the fear of omitting important or even crucial information. If really critical decisions hang on his evaluation of the data, such as diverting planes from a collision course, or preventing the mixture of incompatible chemicals, he may well lie awake at night with his fears.

Allied with this situation is the problem of maintained vigilance. How can the dial watcher gaze at instruments presenting non-significant information for indefinite periods of time, and still maintain the alertness: (a) to recognize a significant situation when it occurs, and (b) to take appropriate and immediate precise action? And what is the effect upon his vigilance of temperature, noise, and lighting conditions?

To all of this must be added the changing type of employment required in modern industry. The much discussed automation is simply the latest step in a change that began with the industrial revolution. The demand for unskilled labor is steadily diminishing, and even the semi-skilled is under some threat. It is not so much that machines displace people, as that they call for different people. The distinction, however, is academic for those who are in danger of losing their jobs. A deep-seated uneasiness must prevail in their ranks, which is only partly relieved by the possibilities of re-training. The presence of a persistent uneasiness in even a small segment of a work force must have repercussions on the rest, affecting both efficiency and general welfare. Aging, with its inevitable decline in efficiency, must intensify the spectre for some of these, although it provides an ultimate grim statistical relief.

OCCUPATIONAL HEALTH RESEARCH AND INVESTIGATION

Like many industries, occupational health has developed a duality which creates some problems of internal organization, but which is essential to its role. On the one hand there are the research and investigatory functions which seek to capture and systematize existing knowledge, develop new knowledge of their own, solve type problems, and render special non-repetitive services to public agencies. On the other hand, there are the programmatic functions which seek to develop models and examples of monitoring, preventive and remedial activities by State, local and industrial organizations, and to provide the statistical background necessary to the discharge of those functions. Training and grants activities have affiliations with both main divisions, but perhaps more with the former. Here we will consider only those research and investigatory activities that have grown up in response to recognized occupational health problems, before passing on to problems extending to wider segments of the communal environment.

OH--COMPLEMENTARY APPROACH TO EH

Toxicology is one of the three classical bases of investigation in this field. Starting from a natural desire to know the toxicity of various substances to which the man may be exposed, it quickly discovered the great complexity of the apparently simple question, and now considers, not only the effect of a large number of circumstantial variables inboth environment and man upon toxicity, but also the detailed mechanisms of tissue response, defense, and repair that follow exposure. Extensive animal experiments, epidemiology of human exposure, pharmacodynamic inquiry, genetic studies of hypersusceptibility, and vital microscopy are part of the toxicologist's armamentarium. Tentative "standards" have emerged, but much more needs to be known before they can be made really satisfactory.

Occupational medicine has from the beginning supplied the essential clinical interest and approach although it tends to be fragmented, the interest in trauma passing to one group, that in pneumoconioses to another, that in dermatology to a third, and so on, with only relatively sporadic concern for the systemic intoxications, skeleto-muscular dysfunctions, and neuro-endocrine disturbances. The physicians who see occupational cases as part of a more general practice, the specialists in occupational medicine, and those who are primarily concerned with preventive medicine in an occupational setting need to get closer together. This closer intercourse is necessary not only for the interchange and integration of medical information, but also for contact with the related medical sciences. These sciences have information and ideas to impart, but they also need guidance and constructive criticism from the clinicians.

Engineering is the third leg on which occupational health traditionally stands. Measurement of the physical factors in environment (particulates, air movement, heat, noise, illumination) engineering controls (ventilation, sound absorption filtration), and the whole range of industrial hygiene services are traditionally grouped together for mutual interaction and support. Technical breakthroughs such as the plasma torch, the laser, use of ionizing radiation, ultra-sonics, etc., have greatly extended the range of responsibilities for this group, and at the same time have markedly increased the scope of instrumentation. Old problems, such as measurement of atmospheric particulates, are getting an entirely new examination in the light of modern knowledge and technology.

With the increase in complexity of both problems and knowledge, new specialities have grown out of or been added to the classical trio. Analytical methods have become so complex (and expensive) that separate specialist provision has become necessary. The mass spectrograph and gas chromatograph now yield in glamor to nuclear magnetic resonance and

neutron activation analysis; the electron microscope reaches for a resolution of a few Angstroms; and the analyst finds himself with the vital miscroscopist in problems of molecular biology.

Physiology brings specialist studies different from those familiar to most clinicians, and under the umbrella of psychology come at least two other types of highly specialized inquiry--responses of the special senses to specific environmental stimuli (sound, light), and behavioral responses to the whole gamut of environmental situations. Inevitably other specialities appear in intermediate positions between the older recognized disciplines, of which neuro-endocrinology is perhaps the best example, partaking as it does of physiology, medicine, and biochemistry.

The result of this multiplication would be chaos but for two things; first, the developments are still attached to a central concept, occupational health; second, the common goal has necessitated still another development, but this time one with cohesive and centripetal properties. This last development, sometimes referred to as "ecology", is simply a conscious continuing process of comparing the information from various lines of investigation, seeking the interconnections, searching again for the missing pieces, and generally trying to see the worker, not as a man exposed to a particular chemical, but as a total man in a total environment.

THE WIDER ASPECT

The phrase "total environment" is relative. In a narrow concept of occupational health it would begin each day when the man came to work and end when he left. But a very little consideration shows the futility of such a limitation. The man at work is not an isolate. He is still angry with the neighbor who let his dog tear up the new bushes, or worried about the big bill that is four months overdue; he still has the cold the kids brought home from school, and then there was that late party last night! The deafness he is inclined to attribute to his job may really be brought on by helping his neighbors with power-saw, or his dizziness by an unidentified medicine supplied by a well-meaning aunt.

We must concern ourselves with the other three-fifths of the employee's life, even when our interest is strictly one of occupational health. From this point it is very easy to move into the non-working environment as far as is necessary to provide a cross-section of the more general

environmental effect, and thus make the cross-linkage that separate considerations of air, water and food would lack. Some examples of current studies in occupational health will illustrate the opportunity.

Coal miners' chest diseases

The focus of this major study is naturally the miner, but the miner lives in the Appalachian hills, exposed for the major part of his life to their atmosphere with its own pollutants, liable to whatever respiratory infections strike the area, subject to economic fluctuations which may, at times, affect his nutrition, intimately affected by any economic and social stresses of the region, and at least partially circumscribed by the customs, hygiene, and mores of the community. For the disentanglement of these interactive factors one must make parallel studies of non-miners, miners' wives, men who have left mining for other employment in the area after various periods, and miners in regions with quite different surroundings from those typical of the Appalachian area. The investigations themselves cannot begin and end with the physical state of the examinee. A detailed occupational and clinical history is essential, of course, but one must go further and take note of the social situations under which the individuals live and seek possible correlations between these and the incidence or progress of the disease. In short, what started out as a study of miners becomes essentially a community study involving general atmospheric quality, and perhaps even that of food. And yet the objective is still the elucidation of coal miners' chest diseases!

Industrial chemicals

Let us take some actual incidents but attach them to a single hypothetical compound X. Small amounts of X, prepared in the laboratory, were found under controlled field conditions to be much more effective than its simpler predecessor Y. The manufacturing processes were modified. Several complex side-products developed, but the yield of X was good, so further refinements were not sought. It was only a couple of years later that it was found that a large proportion of the employees in that particular part of the plant were developing severe skin lesions. Further investigation showed that some of the men with skin lesions also had signs of more marked biochemical disturbance, some of it potentially fatal. The end product seemed safe enough, but apparently some of the intermediates or by-products were not. A full-scale toxicological investigation was obviously necessary, the possibility of synergism with other exposures outside as well as inside the plant had to be considered, the possibility of escape of the responsible agent to the outside community came up, and operations research had to decide whether to discontinue

operations, change the process, enclose or automate the operation, or rely on protective devices for the worker. Questions far beyond the laboratory were involved. Had the material been a pesticide the further question might have arisen as to whether some of the toxic side products might not be liberated by weathering in the field. In that case we would have to confess that very little study has been made of the effects of crop microclimates on the persistence and effective transmission to man of even the better known pesticides. Once more we are verging on general atmospheric problems where we will undoubtedly cut across studies of air pollution as such.

Noise

The relationship of industrial noise to hearing loss has long been under investigation. The broad features have been established, but there is much that is still uncertain, such as the significance of high intensity peaks in a white noise exposure of lower intensity, and the relationship of temporary hearing loss to the permanent loss that would ensue with continued exposure. But without waiting for the resolution of these unknowns industry is already concerned with less dramatic but more widespread phenomena, such as loss of attention or work efficiency in noise not sufficient to produce deafness. From here it is a small step to the distractive or "nuisance" effects of noise and their possible relationship to productivity. It is similarly a gentle series of steps from the airport maintenance crew exposed to jet noise, to the terminal employees, to the traveling public, and to the community around a large airport. The problems differ only in degree, the methods of measurement and interpretation largely overlap, and skilled investigators are few. If only for the sake of conserving resources, any separation of investigations seems unwarranted.

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DIVISIONAL STAFF REVIEW OF PROSPECTS IN OCCUPATIONAL HEALTH

At the Division of Occupational Health Staff Meeting, held in Cincinnati on 17 February, 1964, and attended by Section Chiefs of the Occupational Health Research and Training Facility, members were asked to give their views of the divisional situation, having regard to the speech made by the Honorable John E. Fogarty, and other presentations at the American Industrial Association Meeting on February 6, 1964, honoring the 50th Anniversary of the Division. The following report based on expressions of opinion was compiled by Dr. Lee, Chief of the Facility, at the request of the Chairman, Dr. Murray Brown. Members of the staff not present at the meeting could undoubtedly have added to the instances cited, but are known to subscribe to the general tenor.

Mr. Fogarty's speech

The speech, "What Lies Ahead in Occupational Health -- a Look at the Next Fifty Years", was constructively critical, and forcibly delivered. The tone is indicated by two paragraphs:

> "We are not moving forward in occupational health at an adequate pace. While some fields of environmental health have taken tremendous strides in the last two decades, occupational health at this moment commands very little public attention, support, or interest; derives small nourishment, indeed, from public funds; and -- I would say -- is stagnating, in comparison with other fields of environmental health...especially when measured against the job that could be done."

and

> "(The) barriers and roadblocks to progress have been discussed by leaders in the field for years, in some instances, but so far no one has had the temerity or the motivation or been able to generate the forces to attack them, sweep them away, and demand, for occupational health programs the vitality, the budget, the staffing, and the drive which can bring about really solid accomplishments. It is my belief that the time is here to attack the ancient enemies -- ignorance, apathy, and confusion -- which we have allowed to remain in our way."

The definite impression was obtained that Mr. Fogarty stands ready to give what assistance he can if the Public Health Service will come up with a realistic plan of firm and comprehensive action.

PROSPECTS IN O.H.

OUR DIFFICULTIES

The numerous difficulties were reviewed at the staff meeting, not as reasons for once more delaying action, but as items to be recognized and circumvented in realistic planning.

State prerogatives -- The appropriate authorities in each state have the legal responsibility for making and enforcing laws controlling industrial conditions. Not all states have adequate staff and facilities for this purpose. Not all states exercise that degree of supervision and enforcement that is desirable. But DOH does not intervene without the concurrence of the appropriate state authority unless it is a matter involving the Walsh-Healy Act, when action would be in conjunction with the U.S. Department of Labor. A matter of some gravity involving more than one state, or a specific congressional assignment, usually results in state concurrence.

Industrial reticence -- Management cannot be expected to volunteer information on a situation, or invite federal intervention in a matter it feels can be dealt with otherwise. Information is likely to come spontaneously from this source only when a situation is grave, and in any case after the event. Problems will seldom be aired in their potential or early stages. On top of this, management is naturally jealous of its trade secrets, and hesitates to entertain technical persons who might distribute critical information to others. Assurances of confidentiality cover written information, but cannot guard against inadvertent verbal leakages. The semi-confidential information we now get by personal contact is likely to be completely cut off if DOH is endowed with enforcement responsibilities.

Interests in the status quo -- It has long been the practice to compensate workers for hazardous occupations by premium pay. It is difficult to get workers interested in reducing hazards, especially if the effects are not visible for ten years or longer, if it means a reduction in present pay. In plants where the future of employees or of management-labor relations is uncertain, there is a natural fear of any action which may disturb the precarious balance, and a resistance to probing studies of any kind.

University competition -- The contention is sometimes voiced, and in high places, that practically the whole field of occupational health could be covered by the universities, if they were given adequate support. This contention, subversive to the true role of the university though its sweep may be, adds to the difficulty of convincing fiscal authorities of the need for better development of governmental facilities.

PROSPECTS IN O.H.

Industry responsibility -- The view, sometimes expressed, that industry has the responsibility of keeping out of trouble, is partially valid for well-recognized dangers, but makes little provision for the investigation of ill-understood problems and the general field of sub-acute and chronic stresses, requiring long-term studies.

Changing requirements -- With the conquest of old-time toxic episodes and with the swing of industry to automation the spectrum of occupational health problems is changing. Personnel trained to meet the older conditions find difficulty in appreciating or in adjusting to the new requirements. This imposes problems of re-education, change of personnel, and change in equipment on our own organization, that of the state agencies, and that within industry itself.

Wide spectrum -- The range of competencies required for the prosecution of a comprehensive program of research and service in occupational health embraces virtually all medical and paramedical sciences and technologies. The cost of maintenance, let alone of modernization, is increasing rapidly. The spread of resources, always thin, suffices now to cover only parts of the total problem, and that precariously.

Personal attitudes -- Scientists and technologists for the most part have been deliberately trained in detachment, the better to see their technical problems without emotional attachments. Very few are willing to depart from this attitude to deal with the administrative, educative, sociological, and empathetic aspects demanded by a growing technical field in a rapidly changing social environment. Those who are both willing and capable in these wider aspects are few and far between.

OUR STRENGTHS

Our strengths are but two -- competence and goodwill -- but in their effect can far outweight the difficulties; if properly exploited.

Competence -- The Division's total operational staff of about 250 persons includes at least 13 with national and international reputations in specific fields, with many others rapidly developing. In the last 10 years over 450 papers and monographs have been published, and the annual rate is rising rapidly as new programs are reaching the productive stage. Committee assignments range from those of international scientific bodies, through the National Academy of Sciences, to local chapters of

professional organizations. The 35 or so training courses given each year have reached the level of excellence that draws almost uniform enthusiasm from sponsors and participants. In technical aspects, the available equipment is the best that modern technology can bring to our problems, and the industrial health professions are increasingly relying on our laboratories for new and improved techniques of investigation. Twenty offset reports issued over the past year bear ample testimony to the range and quality of technical and scientific services rendered to local, state and federal agencies. Over 500 technical inquiries are answered annually.

Goodwill -- In the absence of enforcement powers, goodwill is the life-blood of the organization. Our clients must feel that they need us, that they can rely on our competence, that they can talk things over without bias and prejudice, that they will get a straight answer, and that we will preserve all confidences.

Almost without exception, wherever we have been we have acquired good-will. In 1962-1963 we rendered services of some kind to 48 states and the Commonwealth of Puerto Rico, in all but one state in the field as well as through our central laboratories. For the first time we have gotten co-operation from industry for a detached study of worker stress, that of heat, without having to wait for a complaint or patent failure. We similarly enjoy the frank co-operation of industry in looking at the possible toxic properties of new materials such as "bertrandite"-type ores, heated plastics, and inter-metallic compounds. At least two industries, faced with a confusion of implications and counter-implications, have invited us in the past year to ascertain the facts and lay them out for both sides to see. In a major mining industry considerable resistance and fear by both labor and management melted away once our operations started and they became directly acquainted with our methods and attitudes.

A number of individuals in industry, universities, labor organizations, and elsewhere have indicated that they would willingly support any move to increase the Division's scope of action if only they could be given a clear idea of its desires and of ways in which they could make their opinions felt. There are doubtless many others who have not spontaneously asked how they could help, but who would join with the rest in any well-defined and planned effort. None of them, however, would want to waste their powder in isolated, ill-directed action, or lend their prestige to a movement that was not paralleled by Division enthusiasm.

OUR OPPORTUNITIES

From these strengths we can face the difficulties mentioned and examine realistically the opportunities before us, as documented in the Report of the Committee on Environmental Health Problems (Gross Report) and the Surgeon-General's address to the Industrial Hygiene Foundation, and as urged by the Honorable John Fogarty at the recent testimonial meeting of the American Industrial Hygiene Association.

That the present activities should be continued without any diminution of effort or interest and gaps closed may be taken for granted. It is the feasibility of additional effort and new activities that will be stressed.

Information on the industrial situation -- Certainly every attention should be given to developing a reporting system which would indicate the incidence at least of recognized disease, poisoning and injury. But such data are after the event and limited to well-defined entities. They need to be supplemented from the start by information of a kind that does not lend itself readily to statistical compilation and processing. Information is required on the environmental conditions, hazardous situations and practices, potential problem areas, new materials and processes coming into use or projected for the future. Reporting systems will generally need legislative support, and this takes time. The second type of information can be collected by personal survey and inquiry, and although it would undoubtedly require a period of evolutionary growth, the information that is obtained would be valuable from the start. It does not have to wait upon the collection of data over a wide range or a period of years. Trained individuals, of suitable personality, can obtain much valuable information by personal observation and conversation without interfering with normal industrial operations or raising fears of punitive invasion. These duties could be combined with others such as the conduct of research studies, assistance in problem solving, and advisory services. It should be entirely possible to organize such an information-gathering system as a national network parallel to, but not identical with, the networks set up for data on air and water pollution.

Practical demonstration -- The demonstrations we now make at professional meetings or to visiting groups are very largely to the converted or easily convertible. It is to the influential unconverted that more effort needs to be directed. The organization of a demonstration service to small plants has often been mentioned, but seldom attempted. With the co-operation of state and local authorities such an operation could be set up in a suitable area, and provision made for phasing it out as a self-supporting effort as it became established and accepted. The

present limited policy of giving technical and advisory services to state and local authorities only when requested could be liberalized by active promotion, as another method of demonstrating the real value of occupational health activities. The present output of informational literature could be greatly increased, particularly to middle and lower management. The present systematization and expansion of our technical information services could be greatly accelerated, and the service actively promoted in health, management, and labor circles.

Broader interpretation -- In its narrowest sense, the term "occupational" would refer strictly to the work place, and the term "health" to the absence of disease. But, in the words of the Committee on Environmental Health Problems, "as individuals, and from the standpoint of total national welfare, both economic and in terms of deeper human values, every opportunity must be taken to raise (the workers') level of health in a positive sense, over and above the mere elimination of negative health factors." Moreover, this century has been characterized by a marked change in the level of public acceptance. Lack of disease is not enough, "decency" has become a bench-mark of tolerance. Cleanliness, good lighting, low noise levels, absence of odors, and numerous like features are now demanded. In their absence, personal reactions are bad, work poor, absenteeism high, tensions increased, and health (even in the narrowest sense) affected. Continued dissatisfaction, whatever the cause, can only result in deterioration. Occupational health has given little attention to the psychological aspects of work conditions, and virtually none to these broader connotations. There is considerable scope here for action -- but with new competencies and new methodology.

As pointed out in an article, "Occupational Health -- The Complementary Approach to Environmental Health", to be published in Public Health Reports, the health of the worker cannot be properly studied if consideration is limited to conditions at the work place. His health is at least equally affected by the conditions attending the other two-thirds or more of his working life at home, at recreation, and in transit. Conversely, the conditions at the work place may well interact with, modify, or aggravate bodily responses initiated in the non-work environment or by disease of metabolic origin. In the total field of environmental health, occupational health occupies a position complementary to the three categorical segments of air, water, and food pollution. In addition to its focal interest in the worker it provides the opportunity of studying the reaction of a well-defined group of identifiable persons to the whole range of environmental conditions, and particularly to those conditions in interactive patterns. This cross-linkage needs to be actively developed and utilized to the mutual advantage of all operating segments of environmental health programs. Occupational health programs wouldbenefit

in turn, not merely through closer association with other operating segments, but in having a reason for the study of industrial populations which does not reflect on the adequacy of management's concern for the worker. As pointed out earlier, we have found management very cooperative when we can go to them without implied criticism of their health practices.

LINES OF ACTION

Almost any prosecution of these opportunities requires increased resources. Any substantial increase in resources depends upon a more sympathetic attitude to the field by those who control finances. This attitude depends in turn, partly upon our being able to present a convincing case, partly upon visible support by the section of the community concerned--the work force, labor organizations, the medical profession, state and local health officials, and management. To win this support education and publicity are essential, but the basic requirement is a well-conceived, carefully reasoned, and forward-looking plan.

To start with the last, the essential components of a plan are given in the Report of the Committee on Environmental Health Problems (Gross Report). Little modification is required. What is most needed is a plan for popularizing the plan. As pointed out above, we have a large number of friends who would be glad to promote our image -- if they were given firm and coherent direction. The mode of approach, as their mode of assistance, would vary with the group; but all such approaches should be consistent. General publicity, whether to the worker or to the community, should similarly be consistent, continued, and convincing. Active prosecution of cross-linkages, considerately handled, should revitalize the appreciation of colleagues in our mission and renew their interest in helping to develop the program. Now is the time to start!

Feb, 1964
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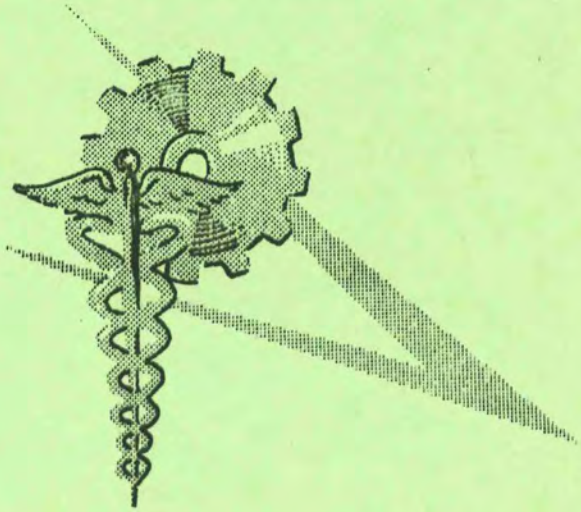
THE WAY AHEAD FOR OCCUPATIONAL HEALTH

FIVE DOCUMENTS



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Division of Occupational Health