NIOSH and the coal mine industry

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"THE FIRST PRIORITY AND CONCERN of all in the coal mining industry must be the health and safety of its most precious resource—the miner." Thus begins the Federal Coal Mine Health and Safety Act of 1969. The Federal agency responsible for safety under this act is the US Department of the Interior whose Bureau of Mines is well known in the coal industry. Less well known, however, is the National Institute for Occupational Safety and Health (NIOSH) which is concerned primarily with health problems in the mines. (Here we are speaking only of research; NIOSH has no enforcement responsibility.)

NIOSH itself was created under another act, the Occupational Safety and Health Act of 1970, which gave the Department of Health, Education, and Welfare prime responsibility in the area of occupational health and safety research. This function was delegated to NIOSH upon creation of the Institute. Though NIOSH conducts safety research across all industrial groups, in the area of mining the USBM assumes responsibility for safety research, and NIOSH for health research.

Drs. William H. Kroes (left) and Bruce Margolis describe new ways of spotting black lung.

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The main group within NIOSH involved in the coal mine health research program is the Appalachian Laboratory for Occupational Respiratory Diseases (ALFORD) which is located in Morgantown, W. Va. The primary research at ALFORD concerns coal worker pneumoconiosis (black lung). Studies are in progress seeking to identify the mechanisms involved in the development of coal workers' pneumoconiosis and the determination of more effective methods for early detection of the disease.

Among the programs at ALFORD best known to the coal mining industry are those dealing with autopsies and medical examinations of coal miners. Less generally well known are programs of coal mine health research involving several fields of medicine and the physical sciences. Only the more widely known programs are mentioned here.

Section 203 of the Federal Coal Mine Health and Safety Act of 1969 provides for (a) periodic medical examinations, including chest x-rays of coal miners, (b) individual protective measures at the discretion of the employee in the event a miner shows evidence of pneumoconiosis, and (c) the postmortem examination of miners with permission from the miner's widow or surviving next of kin. The medical examination program applies to persons who work in or at an underground coal mine.

Medical examinations

Miners, under the Act, are to be afforded an opportunity to have a chest x-ray and such other tests as the Secretary of Health, Education, and Welfare deems necessary within 18 months of enactment, a second examination within three years thereafter, and subsequent examinations at intervals not to exceed five years prescribed by the Secretary. Results of these examinations to Sept. 26, 1972 are presented in the accompanying table. By law, these examinations are to be arranged by the coal mine operator. If he is unable to make suitable arrangements, the government provides the examination and charges the cost to the operator.

New miners are required to be given a first examination no later than six months after commencing work, and a second examination three years later. In the event there is any evidence of the development of coal workers' pneumoconiosis, another examination must be scheduled two years later.

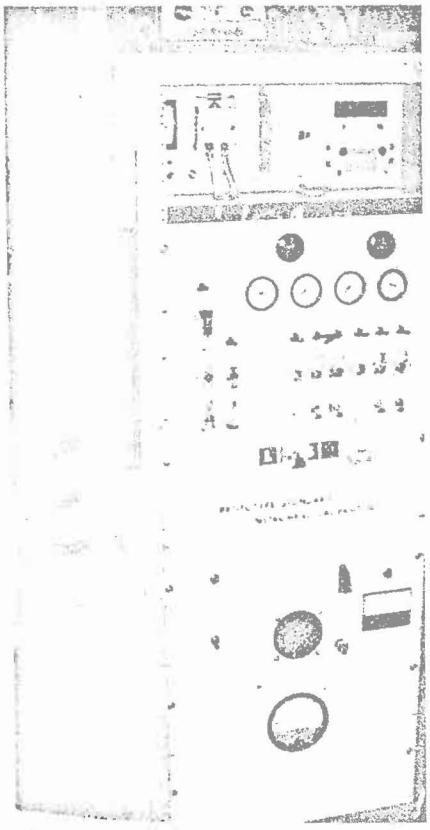
These examinations are required to be made at no cost to the miner, in a manner (time and place) convenient to the miner, by persons and in facilities approved for the purpose. Further assurances are given that the results will be handled in a confidential manner between the miner and the government and, with the miner's permission, his designated physician.

The same section of the Act which authorizes the medical examination also provides for autopsies of miners and former miners. The Coalworkers' Autopsy Study guarantees payment to pathologists for performing the autopsy. While there are three purposes to this program, the paramount one is to assist widows or next of kin in determining eligibility for black lung benefits under Title IV of the Act. Another is to further medical research, and the third is to provide assistance in ascertaining factors contributing to accidents or diseases. In all cases to be autopsied, the approval of the miner's widow or surviving next of kin is required. In calendar year 1972, 313 autopsies were submitted by pathologists.

Research programs

The main research center of NIOSH is located in Cincinnati, Ohio. Several programs conducted there under the auspices of the Div. of Laboratories and Criteria Development have direct relevance to coal mining. One program concerns the adoption of a health standard for noise. Noise generated in the work place in coal mining is being surveyed and quantified. At the same time, the prevalence and extent of loss of hearing among coal miners is being evaluated. It is intended that from the relationship between the two, criteria can be developed for setting noise exposure limits. This work is being carried on cooperatively with the Bureau of Mines. By July of this year the planned field work should be completed.

Several programs are also under way relating to the coal mine dust problem, in particular its sampling and measurement. The recently lowered respirable dust exposure levels, which are more difficult to achieve, emphasize the need for



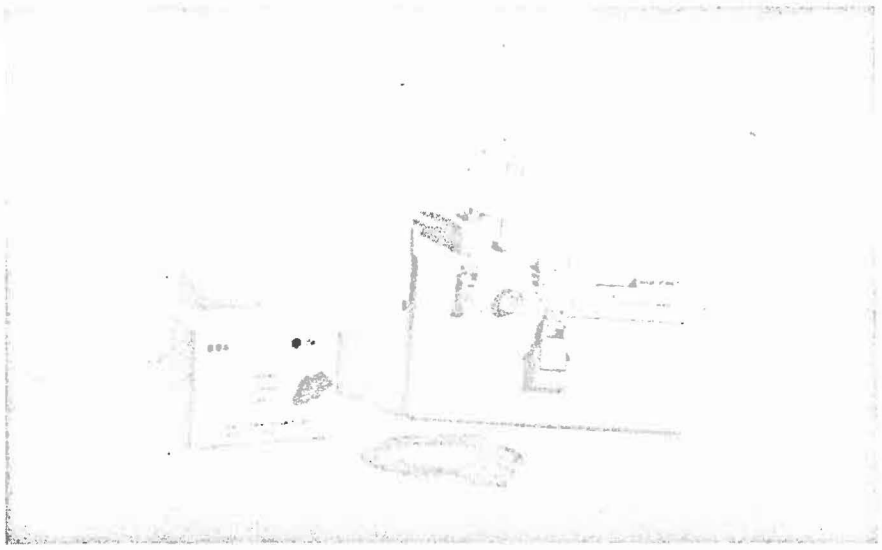
Dynamic coal dust chamber for sampling.

Coalworkers' pneumoconiosis—participation and prevalence by states

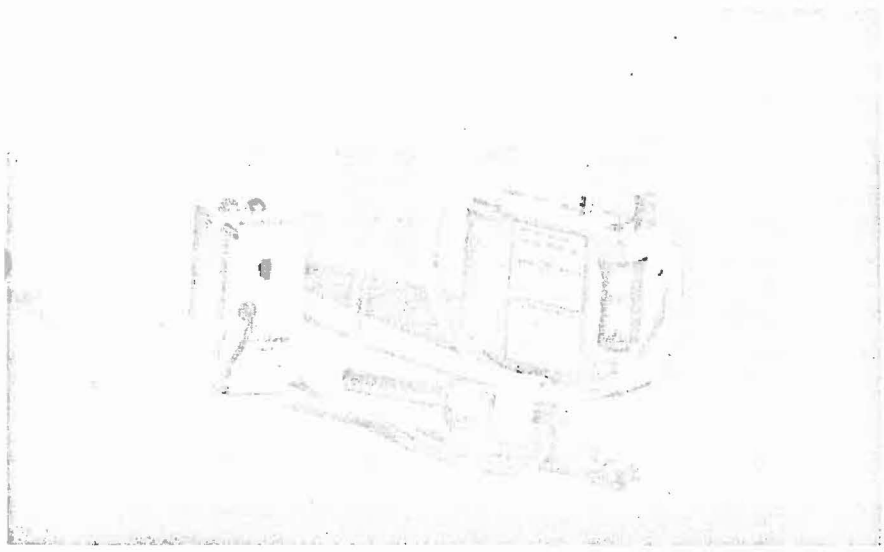
(As of Sept. 26, 1972)

State	No. men Examined	Coalworkers' Pneumonoconiosis, Category* 0	1	2	3	Per cent Complicated
Pa. anthracite	984	57.0	18.1	7.7	0.7	5.7
Pa. bituminous	12,769	74.3	9.8	4.0	0.3	1.6
W. Va.	20,004	86.9	7.7	3.8	0.3	1.3
Va.	4,466	93.4	6.1	2.2	0.3	1.0
Ky.	10,185	90.9	6.8	1.6	0.2	0.5
Ala.	830	88.7	9.4	1.2	0	0.7
Tenn.	266	88.3	7.9	3.8	0	0
Md.	39	82.1	16.4	2.6	0	0
Ind.	141	88.6	7.8	3.6	0	0
Ohio	2,029	94.2	4.1	1.2	0.1	0.5
Ill.	3,517	88.8	8.3	2.0	0.2	0.7
Colo.	722	94.6	2.8	1.1	0.1	0.4
Utah	593	92.1	5.7	1.2	0	0.8
Ark.	27	77.8	18.5	0	0	3.7
Iowa	43	97.7	2.3	0	0	0
Mont.	14	100.0	0	0	0	0
N.M.	30	83.4	10.0	3.3	3.3	0
Okla.	20	95.5	5.0	0	0	0
Wash.	19	100.0	0	0	0	0
Wyo.	33	89.0	3.0	3.0	0	0
Total	56,731	87.6	7.9	3.1	0.2	1.2

*Category 0 denotes an absence of x-ray evidence of the disease; categories 1, 2 and 3 simple pneumoconiosis indicate increasing amounts of dust retention. Complicated pneumoconiosis is a more serious matter because of the development of fibrotic tissue in the lungs.



Instantaneous respirable dust monitor.



Personal respirable dust monitor.

precise and more rapid dust sampling methods. An instantaneous detector for respirable coal mine dust has been developed and is being evaluated. The dust concentration, at any given time, may be determined in about a minute. Once this instrument has been proved to be reliable, it should be invaluable as an adjunct to evaluating the amount of dust produced during various phases of the mining cycle and for determining peak exposures.

In another project conducted cooperatively with the AEC-Los Alamos Scientific Laboratory, a standard instrument calibrator for evaluating coal mine dust samplers was constructed. This device generates clouds of known concentrations of coal dust of specific size. The instrument will be used as one part of the quality-control procedures for newly built personal dust samplers.

Dust monitors and respirators

The 10-mm nylon cyclone which is extensively used as part of the personal dust monitors worn by coal miners is being reevaluated to determine the effects of pump pulsation, mass loading, positioning, electrostatic charge, and humidity on its performance. Simultaneously, the validity of the empirically determined and widely used conversion factor between the personal monitor and the MRE instrument which is named in the Act is being investigated.

By agreement between NIOSH and USBM, the approval of respirators for use in coal mines is a joint effort between NIOSH and the USBM. All other respirator types are approved solely by NIOSH. Developmental work on such protectors continues.

Virtually complete is a study of the effectiveness of respirators, including disposable respirators, in coal mine use. Face fit has been a long-standing problem in designing respirators. An anthropological study is under way to develop more effective respirator size and shape specifications. Supplied air respirators have advantages in comfort and ease of breathing but, because of the need for an air hose, frequently introduce hazards from restricted mobility. Sometimes they also interfere with hearing. Studies have been started to develop supplied air respirators suitable for use in coal mines.

Another research effort just beginning is an interview survey of miners to identify the major psychological variables which enhance or impede the underground coal miners' health motivation. In-depth interviews at 30 mine sites will be conducted to elicit responses from the coal miners and other company personnel that will allow conclusions to be drawn about miner health-consciousness and attitudes toward existing health procedures.

In summary, NIOSH research on coal miner health has taken three directions. Our research staff at ALFORD has been investigating the medical problems of coal mining, especially the mechanisms by which pathology is produced by coal dust. The NIOSH engineers at Morgantown and Cincinnati have been investigating ways of modifying the physical environment or improving personal protective devices of the miner. And the behavioral scientists at Cincinnati-NIOSH are investigating those psychological aspects of coal mining which influence coal miner health. We feel the program is broad in perspective and intensive in effort, and though much has been accomplished, much remains to be done. ■