# Screening and surveillance of workers exposed to asbestos

*G.R. Wagner*
National Institute for Occupational Safety and Health, Morgantown, United States

## Introduction

Diseases resulting from overexposure to asbestos persist in both industrialized and developing countries, despite substantial knowledge about both their causes and the means for their prevention. Disease prevention can be achieved through control of worker exposure by application of engineering principles. Control technologies can be supplemented by administrative strategies and the use of personal protective equipment. Medical screening and surveillance are secondary strategies which are also integral parts of an overall disease prevention strategy. All too often, past exposure to asbestos has resulted in current health risk, even in the absence of current exposure. In these circumstances, medical screening may offer the only hope for reducing morbidity and mortality for asbestos-related diseases.

This paper is an effort to provide information useful for the establishment of an effective health screening or surveillance programme. This material has been drawn from a more comprehensive document published by the World Health Organization (WHO) (1).

## Definitions

**Medical screening** denotes the use of medical testing for presumptive identification of disease in an individual at a time before medical care ordinarily would be sought, and when an available intervention can favourably affect the health of the individual. Medical screening is the administration of a test or series of tests (such as laboratory tests, medical examinations, and questionnaires) to individuals in order to detect organ dysfunction or disease at a point when intervention, such as reduction or elimination of exposure and/or medical treatment, would be beneficial. Positive screening tests may indicate the presence of disease or a strong likelihood of disease and the need for confirmatory testing. Screening is conducted before an individual would normally seek medical care and should detect disease in a *preclinical* stage. Goals of medical screening in a particular workplace may vary. However, the ultimate goal of medical screening should be the secondary prevention of disease, i.e., the identification of illness at a stage when its evolution can be reversed, arrested, or slowed.

Medical screening is intended to benefit the individual worker; however, medical screening may also be used to benefit other workers in the same or similar workplaces if cases of occupational disease are seen as *sentinel events*. In these instances, the recognition of an occupational disease such as asbestosis indicates that exposure controls

have failed and further investigation is warranted. Investigation of the workplace and of the health of co-workers can lead to the discovery of previously unrecognized disease, the identification of offending exposures, and ultimately reduction or elimination of hazardous work circumstances.

Detection of disease in an individual through medical screening indicates deficiencies in environmental controls that might otherwise go unnoticed. Periodic medical screening of workers must be tied to intensive efforts at environmental monitoring and control.

**Surveillance** involves the periodic collection, analysis, and reporting of health-relevant information for purposes of prevention. In contrast to individually-directed screening, surveillance is directed toward improvement of health in populations and is an essential component of public health practice.

**Medical surveillance** involves the use of health screening data for surveillance purposes. It is distinguished from hazard surveillance. Surveillance involves the periodic collection, analysis, and reporting of health relevant information to assist in disease prevention. Surveillance systems are established to achieve one or more of the following goals:

- Tracking trends in disease incidence across industries, over time, and between geographical areas
- Defining the magnitude or relative magnitude of a problem
- Identifying new hazards, risk factors, or at-risk populations
- Targeting interventions
- Evaluating prevention efforts/interventions.

Medical screening information can be the raw data of a surveillance system if the screening data are collected over time, analysed periodically, and reported to those in a position to advocate or act in support of change, as well as to those exposed. Other data of potential use in quantifying illness and injury include workers' compensation claims, health insurance statistics, government records of worker illness and injury, hospital discharge information, disease registries, national health surveys, death certificates, and physician reporting. Effective health surveillance systems are characterized by their simplicity, flexibility, acceptability, and timeliness. Surveillance systems should be sensitive indicators of the level of disease in the population at risk.

Ultimately, the utility of medical surveillance is related to programme participation and the adequacy of data collection, analysis, dissemination, and intervention. Surveillance programmes are incomplete without application of data to efforts at disease prevention and control. Disseminating such information so that it is generally available is an important step in achieving its application to prevention and control. Reports which are exclusively internal in administrative agency, company, or union files do not fulfil this goal. The value of a surveillance system increases the longer it is in place, due to the cyclical process of data collection, analysis, and reporting.

## Disease and test characteristics

In order to be a reasonable target for medical screening, a disease should cause significant morbidity or mortality, must be identifiable at a presymptomatic stage before the individual would ordinarily seek medical care, must respond to an acceptable, available, effective intervention or treatment and must be prevalent in the population undergoing screening.

The tests used must be acceptable to those at risk for disease, have acceptable sensitivity, specificity, and predictive value in the screened population, be available at reasonable cost, and be sufficiently standardized to be performed with consistency, accuracy, and reproducibility.

The diseases caused by exposure to asbestos fibres include asbestosis, pleural fibrosis (with discrete or diffuse pleural thickening), benign pleural effusions, chronic bronchitis, chronic airflow limitation, malignant mesothelioma, respiratory tract cancers, and gastrointestinal cancers (2). Of these, all but pleural plaques and benign pleural effusions are potential targets for screening. Tests which have been proposed and evaluated for screening include questionnaires, physical examinations, chest radiography, other imaging techniques such as computerized tomography, measures of lung function, sputum examination, bronchoscopy and broncho-alveolar lavage, and stool examination for occult blood.

The degree of asbestosis, chronic bronchitis, and airflow limitation in asbestos-exposed workers are related to the intensity and duration of exposure, even though all conditions can progress following the cessation of exposure to asbestos. The progression of these conditions may be reduced if exposures are stopped after early identification. In addition, pulmonary fibrosis and airflow limitation (often referred to as Chronic Obstructive Pulmonary Disease–COPD) appear to increase risk of lung cancer (3). Many therefore use conventional radiographs (with standardized interpretation using the ILO system for classification of radiographs for pneumoconiosis) (4) and periodic spirometry along with questionnaires to screen for these conditions. Efforts are currently underway to standardize classification of chest abnormalities using newer imaging techniques and to test their usefulness in improving detection of asbestos-associated abnormalities. Although the use of imaging techniques other than conventional chest radiography for screening of asbestos-exposed workers was not recommended by a 1993 WHO expert committee (1), technological and scientific developments since then justify a reexamination of the evidence.

Bronchoscopy is excessively invasive, and the use of sputum cytology has not been demonstrated to add value to mass population screening programmes. Malignant mesothelioma has not been sufficiently responsive to available therapies to justify screening.

The benefits of screening for respiratory tract cancers have been an area of significant controversy. Large clinical trials in the U.S. were originally widely interpreted as failing to support mass screening of high-risk populations (5). Recently, the original data have been reevaluated as demonstrating potential benefit, and the original conclusions have drawn criticism (6). In addition, recent reports on the use of newer imaging and intervention techniques in the early identification and treatment of lung cancers in high-risk groups have proven promising (7–10). The data from these studies merit evaluation in

consideration of medical screening for early identification of lung cancer in asbestos-exposed workers.

Large bowel cancer does respond to early intervention and screening has been successful in some populations. Cultural or educational factors may influence the acceptability of the test. Test sensitivity and specificity vary with specific methods and test kits employed and may also be influenced by other factors such as diet, drug use, alcohol consumption patterns, and rates of intestinal parasites.

While the sufficient benefit to the individual to justify mass screening for asbestos-related diseases remains controversial, there have been successful population-based prevention programmes built on ongoing surveillance of exposed workers with aggressive workplace interventions when any disease is identified.

## Programme elements

In addition to focusing on appropriate disease(s) and identifying reasonable tests to use in screening for these diseases, other issues must be addressed before the establishment of a programme of medical screening. These programme elements have been described in detail in the WHO monograph (1).

## Conclusions

An expert committee assembled by the World Health Organization in 1993, with the cooperation of the International Labour Office, formulated general recommendations for screening of mineral dust-exposed workers, based on the assumption that workers were initially free of symptoms or signs of disease, and that effective exposure controls are in place. The committee recommended the following testing for early detection of non-malignant respiratory disease in asbestos-exposed workers:

> A chest radiograph [classified using the ILO method (4)] should be performed at baseline, then every three to five years for workers with less than 10 years since first asbestos exposure; every 1 to 2 years for workers with over 10 years since first asbestos exposure; and annually for workers with over 20 years since first exposure. Frequency may be adjusted depending on the age of the worker and duration of dust exposure. A radiograph classified as ILO category 1/0 is considered abnormal. Ideally a respiratory symptom questionnaire, physical examination, and spirometry should be performed annually; alternatively, they should be performed at the same frequency as the chest radiograph. Ideally, health surveillance should be lifelong (1).

While screening for lung cancer was not recommended at that time, the developments in the fields of chest imaging (potentially improving early detection) (7–10) and the benefits of early resection of non-small cell lung cancers documented in the scientific literature (11, 12) justify re-examination of the 1993 recommendations.

No single set of guidelines is applicable to all situations. Generally, the feasibility of adopting a particular programme will depend substantially on the specific conditions of the country, region, or industry in which the programme will be conducted. No matter

what the specific circumstances, however, it is critical that programmes for screening and surveillance should only be implemented in conjunction with, but not as a substitute for, effective measures for primary disease prevention such as engineering controls of hazardous exposures and hazard monitoring are in place.

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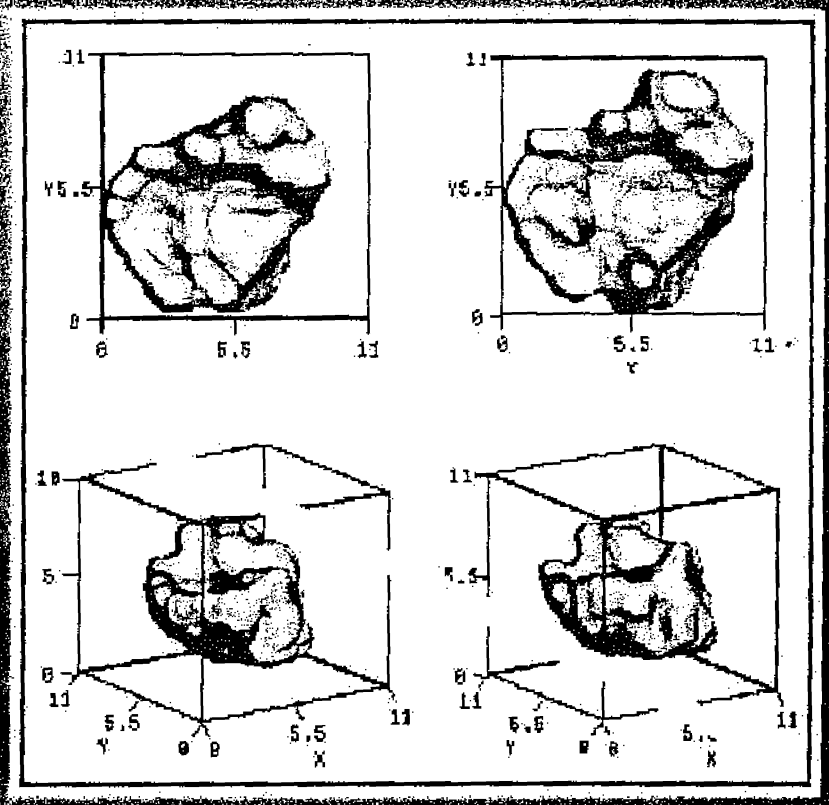

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