Investigating Outbreaks Of Occupational Lung Disease: Lessons From Two Decades

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RATIONALE: Much of what we know about new occupational lung diseases is derived from outbreak investigation. Lessons learned about outbreak investigation may be useful to clinicians, public health partners, and research scientists interested in developing actionable knowledge that can result in prevention.
METHODS: We examined examples of outbreak investigation, both by the National Institute for Occupational Safety and Health and by other investigators internationally, that resulted in identification of new causes of lung disease and information needed for intervention and prevention of new and well-recognized diseases. Foci of interest were the triggers for investigation, settings of investigation, epidemiologic tools, challenges, and outcomes achieved by others using investigation findings. Examples included indium-tin oxide-related fibrosis, emphysema, and alveolar proteinosis; flavoring-related obliterative bronchiolitis; flock-related lymphocytic bronchiolitis; hypersensitivity pneumonitis; asthma related to damp buildings; asthma due to pesticide manufacturing; acute silicosis; and interstitial lung disease related to humidifier disinfectant.
RESULTS: Triggers for investigation usually involve suspicion of excess disease based on clinical cases, case reports, worker report about co-worker illness, and sometimes public health surveillance, including mortality data. Follow up of sentinel cases by studies of workforce populations allow examination of risk factors, exposure-response relations, and intervention effectiveness. For epidemiologic associations to be actionable beyond a particular workplace usually requires meeting criteria for causality. Such criteria usually involve additional investigation by others after an outbreak investigation to establish replicability by other investigators and in other work settings or communities, temporality, and biologic plausibility. Useful epidemiologic tools include external comparisons possible by use of standardized questionnaires from population-based surveys; incidence density ratios for common diseases such as asthma before and after employment in an implicated workplace; and exposure indices derived in collaboration with environmental scientists. Limitations or challenges include statistical power; poor response rates; healthy worker effects; inability to reconstruct past exposures; and disease misclassification. Outcomes achieved by motivating further essential work for regulation or developing consensus needed for prevention is seldom under the unique control of the outbreak investigator.
CONCLUSIONS: Care in outbreak investigation increases the likelihood that aggregate scientific efforts fulfill criteria for causal epidemiologic associations required to change the conditions of work by sound guidance for employers and risk assessment needed by regulatory agencies in setting occupational exposure limits.

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