

Research gap: nano occupational epidemiology studies

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Abstract: The development and spread of nanotechnologies in manufacturing work worldwide calls for close attention to the potential health risks for workers who might be exposed to nanometer-scale materials. Since no systematic epidemiologic studies of workers exposed to nanomaterials have yet been conducted, it is urgent to understand health effects of nanomaterials to workers to begin this occupational epidemiology study.

Keywords: Nanomaterials, Occupational epidemiology, Health effects

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1. Introduction

Despite extensive investment, increased commercialization, and development in nanotechnology over the last decade, insufficient understanding remains about the environmental, health, and safety aspects of nanomaterials^{1, 2}. Without a coordinated research plan to focus on managing and avoiding potential risks, the future of safe and sustainable nanotechnology is uncertain. Nanoparticles are increasingly tested in cellular and laboratory animals for hazard potential, but there is a lack of health effects data on human exposure to nanoparticles. Risks of hazardous materials are often manifested and recognized initially in occupational workers, these exposures can be at high concentrations and for extended periods of time³. The result of the study indicates that workers may be at increased risk of exposure to engineered nanomaterials⁴. It is very important to control nanomaterials exposure to prevent possible health effects, and exposure measurement is critical for assessing the health risks with the determined concentration levels as well as evaluating the control effectiveness⁵. Identifying new risks due to new technology is a process that involves many uncertainties in which a balance must be found between a dynamic and a careful approach. The challenge is to prevent any occupational damage to health without creating unnecessary concern⁶. The development and spread of nanotechnologies in manufacturing work worldwide calls for close attention to the potential health risks for workers who might be exposed to nanometer-scale materials and our limited knowledge of exposure assessment means that further research in this field is urgently needed⁷, especially occupational epidemiology.

2. Materials and methods

Based on the current study results of nanomaterials, this article described the importance of nano occupational epidemiology and discussed the current situation of population-based nano studies.

3. Results and discussion

The information about occupational exposure to nanomaterials is a crucial component of risk assessment and risk management framework aimed at ensuring human safety and health. Occupational epidemiology may have a strong impact on the risk assessment of a new occupation standard and epidemiologic studies form an important link in understanding health outcomes associated with exposures to potentially hazardous materials. The design of a successful epidemiologic study of nanomaterial workers is very important, and there have been no systematic epidemiological studies among workers involved with nanoparticles till now. The lessons learned from studies of other particulates (asbestos, fine particulates in air) suggest that early attention to health effects in the context of epidemiologic studies should at the very least be considered. Epidemiologic studies have the potential to be quite valuable in determining links between different types of occupational exposure to nanomaterials and the development of health problems. In addition, if properly designed, these studies could provide the ability to identify adverse health outcomes much earlier than if not conducted⁸.

To give an idea of the perceived risk associated with the spread of these new technologies, a survey of 1536 US adults found that only about half had ever heard about nanotechnology⁷. A survey among representatives of workers and employers from 14 EU countries suggests a high level of ignorance about the availability and use of nanomaterials for the construction industry and the safety aspects and the market may now face a growing number of downstream users who are not informed about the type and content of NPs in the products they use⁹. Despite testing and risk assessments adverse health effects might appear after the introduction of new technologies. It should be attention to the potential health risks for nano-workers, using the methods of occupational epidemiology. The problem of

occupational exposure to nanoparticles has raised many questions which remain unanswered today and it is not easy to answer these questions at the present time, but it is important for us to understand what is at stake, and the limitations on what they can do about it¹⁰. So it is the right time to necessarily begin nano occupational epidemiology studies and small cross-sectional or panel studies might be more appropriate and feasible. These two approaches could be done separately or, combining these ideas, one could start by enumerating a cohort and then use smaller, transitional studies to validate biomarkers within the framework of the cohort study. Our research of nano occupational epidemiology is still in the very preliminary phase, therefore, the health effects of nano-workers should be done urgently.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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