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The Workplace and Communal Health

Stephen C Bondy*

Division of Occupational and Environmental Health, Department of Medicine, University of California, Irvine, CA 92697-1830, USA

Evolution of Recognition of Occupational Hazards

Historically, public health has received more attention than occupational health. Since entire populations were vulnerable, including the affluent, interest in communal health preceded that of issues relating to specific trades. The importance of sanitation and clean drinking water were recognized early on but this was largely lost in the Middle Ages. Epidemics were the subject of fear and the concept of spread of contagious disease is very old. However, there were many wrong hypotheses concerning how disease was transmitted and what the harmful agents underlying infection disease actually were. The causality of disease remained speculative until the identification of bacterial pathogens.

The relatively slow development of any interest in workplace hazards is in part due to the fact that although it was well recognized that many trades involved great hardships, many of the most dangerous occupations were predominantly carried out by slaves and thus the perils associated with them were not considered very important. Dangers associated with specific livelihoods such as mining were noted but little was done to improve working conditions. On occasion, workers made attempts to protect themselves. For example workers used facemasks made of animal bladders in an attempt to protect themselves from dust and lead fumes. The use of defensive armor in combat, which has a very long history, also represents an effort to reduce occupational risk.

In the sixteenth and seventeenth centuries more documentation concerning working conditions emerged. The German writer Georg Bauer (Georgius Agricola), published De Re Metallica in 1556, and this described all aspects of mining including the importance of mine ventilation. In 1700, Bernardo Ramzzini wrote a book entirely dedicated to industrial medicine. "De Morbis Artificum Diatriba" (The Diseases of Workmen) listed a wide range of work-related perils, and also laid out a range of preventive possibilities. In this seminal work, Ramazzini described mercury poisoning in goldsmiths and mirror manufacturers, as well as lead poisoning in potters He also proposed means of protecting workers by the use of shielding gloves and masks as well as bathing, and gymnastics. In addition, to discussion of acute hazards, this work also includes a description of the need for sedentary workers ("chair workers") to exercise, and of the dangers of repetitive motion. Ramazzini was the first writer to put the study of occupation medicine on a scientific basis. Further rationalization of the discipline required recognition of the importance of analysis of numerical data relating to mortality and disease. John Graunt who published a book entitled "Political Observations Made upon the Bills of Mortality" in 1662 was the first to recognize the value of statistical methods but the implications and value of this was largely unrecognized and unexploited for a further 200 years. Eighteenth century attempts at mitigation of workplace hazards were not initiated by political states but rather by employers who were most affected by the cost of occupational diseases among their workers.

The health of workers became a more urgent matter as the value of labor increased with the onset of industrialized manufacturing in factories. In this manner, the industrial revolution, the cause of much loss of well-being, also helped to disseminate the concept of workplace health. Josiah Wedgwood put forward the idea that bottled pure oxygen within his factories would ensure that his workers breathed "good" air and that this might prevent some of the common respiratory diseases associated with factory work.

When hazards of materials used in the workplace were better appreciated, it was possible to legislate maximum levels and durations of permissible exposure to toxicants below which adverse effects were considered "negligible". The first broad legislation of this kind was the English Factories Act of 1833. However this had been preceded by the more selectively targeted Chimney Sweepers Act of 1788.

Knowledge Gained from the Workplace has Benefitted Communal Health

Large numbers of workers in relatively small spaces, all exposed to similar hazards, allowed epidemiological conclusions to be drawn. There exist good descriptions that were assembled in the nineteenth century, of characteristic ailments relating to exposure to coal tar, silica dust, cotton dust, and aniline dyes. Later on quantitative evidence for harmful nature of several chemicals and radiation was collated. More recently, human toxicity of pesticides, solvents and a range of metals have been documented using health data derived from an occupational setting.

These workplace studies profited from a relatively homogeneous population. This facilitated observation of adverse health outcomes characterizing distinct work conditions. Later such a relatively invariant population provided the basis for detailed studies involving comparisons between workers and appropriate control groups. Since contact with high levels of harmful agents was often pronounced in these early industrial settings, epidemiological evaluation was facilitated and this ultimately led to the development of relevant animal models to test the toxic consequences of such exposures. The use of animal models, which stems from vaccine development pioneered by Louis Pasteur, resulted in a more clear understanding of the vulnerable mechanistic pathways selectively disrupted by a particular toxicant. Such biological information was useful in determining what constituted a dangerous level of exposure, and in allowing development of protective and antidotal strategies.

Public health issues have often first been recognized in an occupational setting where the harmfulness of specific agents has been the most evident. Many of the toxic agents found in relatively high amounts in a workplace setting are also present more generally in the

***Corresponding author:** Stephen C Bondy, Division of Occupational and Environmental Health, Department of Medicine, University of California, Irvine, CA 92697-1830, USA, E-mail: scbondy2@gmail.com

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environment. Due to the diverse nature and habits of the total residents living within an area, epidemiological studies on such populations have been less successful in enabling the identification of toxic materials. For example, the carcinogenicity of radiation was first recognized among workers using radium to paint luminous watch dials but this hazard was recognized to be germane to the population in general. Similar transitions following identification of a hazard at the workplace level being expanded to a more general health viewpoint are found with many agents including lead, asbestos and aluminum.

Conclusion

Both communal and workplace health have been adversely affected by the neglect of old knowledge. Important information is identified, disseminated and then forgotten, sometimes for centuries, until it is once again rediscovered. This is true of lead poisoning and also the importance of clean drinking water both of which were known in ancient times, then overlooked and disregarded, thus requiring more investigation and repeated relearning. One example of this is the recent formulation of Fetal Alcohol Syndrome as a new discovery. However, the Old Testament (Book of Judges, chapter 13, verse 7) contains the text; "behold thou shall conceive a child. Now drink no wine or strong liquor", suggesting that this correlation was known over 2500 years ago. It is important that new knowledge of health hazards not only be documented in scientific journals but to ensure the widespread dissemination of findings to those stakeholders not reading scholarly articles. The nature of the ultimate target audience, namely those immediately responsible for establishing and maintaining a safe workplace environment should not be overlooked. It is at this point, not merely at the legislative level, that the most important protective procedures must be applied.