

Editorial Note on Occupational Toxicology Chih-Chang Chu*

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Department of Medicine, Florida State University, USA

Editorial

The work environment with its chemical and biologic hazards plays a role in the occurrence of adverse human health effects. Toxicology plays an important part in the prevention of work related disease. Occupational toxicology is the application of the principles and methodology of toxicology toward chemical and biologic hazards encountered at work. It focuses on substances and conditions that occur in workplaces, where inhalation exposure and dermal exposure are most important, there is often exposure to mixtures of chemicals whose interactions are complex, health effects are influenced or confounded by other environmental and individual factors, and there is a focus on identifying early adverse effects that are more subtle than those presented in clinical medicine. The scope for control of risks depends on knowledge of likely adverse effects and the availability of technical and managerial means for reducing exposure.

Occupational toxicology generates data that is used to identify hazards and their physiological effects, and quantify dose–response relationships. A major use of these data is for establishing standards and regulation. These may take the form of occupational exposure limits, which are based on ambient concentration levels of toxicants. They also include biological exposure indices, which are based on bio monitoring of a toxicant, its metabolites, or other biomarkers. Toxicologists have a large role in determining what biomarkers may be used for bio monitoring during exposure assessment and workplace health surveillance activities. Toxicological studies have the benefit over epidemiology that they can study new substances before there is exposure in commerce, or when epidemiological data are not available. Workplaces are complex environments where many chemicals may be in use at the same time, so it is important that occupational toxicologists understand and can recognize the potential dangers of simultaneous exposure to more than one type of chemical. Occupational toxicology is complimentary to occupational epidemiology, to a greater degree than toxicology and epidemiology in general. For example, outbreaks identified through epidemiological studies such as exposure assessment case studies or workplace health surveillance may inspire toxicological study of suspected or confirmed causative agents.

*Corresponding author: Dr. Chih-Chang Chu

✉ cc62@cornell.edu

Department of Medicine, Florida State University, USA.

Tel: +234800000000

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Occupational toxicology has the challenge of performing studies that mimic actual workplace conditions, for which inhalation exposure and dermal exposure are most important although in medical industries, injection exposure through needle stick injuries is a hazard. In particular, experimental inhalation exposure studies require more complex methodology and equipment than for oral administration experiments. Occupational toxicology differs from environmental toxicology in that the former has smaller number of exposed individuals, but with a wider range of exposure levels. Environmental toxicology tends to focus on situations with low exposure levels for larger numbers of people, where adverse effects may be concentrated in people who are especially susceptible to a given toxicant due to genetic or other factors. There is considerable public awareness of the health effects of chemicals due to events such as the thalidomide tragedy and environmental contamination with chemicals.

Many types of measurements may be made in occupational toxicology. These include external measurements of exposure, the internal dose measured via tissues and bodily fluids, the "biologically effective dose" measuring the compound that has actually interacted with host biomolecules such as DNA and proteins, and measuring downstream effects of mutations, cytogenetic effects, and aberrant gene expression.