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Toxicology of Chemical Hazards in Workplace

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Occupational toxicology is an application of toxicology to the chemical hazards of the workplace. Focusing on the substances and conditions encountered in the workplace where inhalation and skin exposure are most important, exposure to a mixture of chemicals with complex interactions, health affected by other environments and individual factors focuses on the effects of, or the identification of early aspects, more subtle effects than those found in clinical medicine [1]. It has a close interface with other sub-areas of occupational safety. Occupational epidemiological studies can stimulate toxicological studies of pathogens, and toxicological studies are important for establishing biomarkers for workplace health monitoring. Toxicology studies in the workplace can suggest or assess risk management used by occupational hygienists. Toxicology research is also important information for conducting occupational risk assessments and setting standards and regulations such as occupational exposure limits. Toxicological studies are laboratory studies of biological responses to substances and biological pathways and can generate data used in other occupational health and safety activities [2]. Occupational toxicology produces data used to identify risks and their physiological effects and quantify dose-response relationships. The main use of this data is in setting standards and regulations. These can take the form of occupational exposure limits based on the concentration of toxic substances in the environment. This includes the bioexposure index based on biomonitoring of toxicants, their metabolites, or other biomarkers [3]. Toxologists play a major role in determining biomarkers that can be used for biomonitoring during exposure assessments and occupational health surveys. Exposure to a mixture of chemicals often occurs, but the effects are simply additive, as different toxins can interact in ways that increase or decrease toxicity compared to either toxin alone. The mixture may contain impurities that are not needed by one or more products that deviate from the manufacturer's specifications. Exposure is not always acute, but can remain low for decades [4]. Workers may be exposed to more toxic substances than the general public exposed primarily through consumer products and the environment. It is often the case to establish a causal relationship between a worker's illness and working conditions, as labor-related illnesses are often indistinguishable from other causes and can have a long time lag between exposure and onset [5].

Toxic doses are a strong predictor of health outcomes, but occupational diseases are affected or disrupted by other environmental or individual host factors, such as existing health status, host genetics, and worker behavior patterns. They affect the relationship between the concentration, duration, [6] and frequency of exposure and the actual toxic dose that reaches the target tissue and interacts with metabolic processes. For example, in the case of inhalation exposure, the final dose depends on the respiratory rate and volume, and in the case of skin exposure, the final dose depends on the rate of absorption through the skin and is affected by the chemistry of the chemical [7]. There are several types of chemical hazards in the workplace. While there are several classifications for these chemical hazards, many of these hazardous chemical substances fall within several of these classifications. Asphyxiants is chemical asphyxiants [8] deprive the body of oxygen; interrupting the transfer and use of oxygen by the bloodstream. Then we have Chemical corrosives cause visible and/or irreversible changes to the composition of a material due to direct contact. Similarly, these can also cause a localized reaction in the human body at the point of contact. However, corrosive chemicals also have the potential to produce systemic chemical exposure away from the point of contact when mixed with other substances. Chemical hazards that are classified as irritants cause harm to the eyes, skin, or respiratory tract of a person [9]. Irritants are either highly, moderately, or slightly water-soluble. The hazards can manifest as redness, rashes, inflammation, coughing, or hemorrhaging. Irritants are mostly short-term severe illnesses but can also have long-lasting side effects in some people [10]. People can also have an allergic reaction to some of these chemical materials with long-lasting health impacts or even be fatal.

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