

EVALUATION OF ENVIRONMENTAL RISK FACTORS – RESEARCH QUESTIONS

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Abstract

The Public Health Toxicology is responsible for two distinct areas of public health concern: the identification of potential health hazards resulting from exposure to certain chemical or biological agents, and the assessment and subsequent recommendations to abate or reduce any resulting health effects. The use and presence of various chemicals in the living and working environment has been a serious long-term environmental problem that will also be present in the future. Therefore, all professional should be well aware of all the necessary information on the long-term and chronic effects of xenobiotics in general.

Toxicology is a field of science that helps us understand the harmful effects that chemicals, substances, or situations, can have on people, animals, and the environment. Some refer to toxicology as the “Science of Safety” because as a field it has evolved from a science focused on studying adverse effects of chemical exposures, to a science devoted to studying safety.

Toxicology uses the power of science to predict what, and how xenobiotics may cause harm and then shares that information to protect public health. When talking about toxicology it is important to keep a few things in mind.

A toxicologist is a scientist who has a strong understanding of many scientific disciplines, such as biology and chemistry, and typically works with chemicals and other substances to determine if they are toxic or harmful to humans and other living organisms or the environment. **Toxicologists:**

- participate in basic research using the most advanced techniques in molecular biology, analytical chemistry, and biomedical sciences;
- work with chemical, pharmaceutical, and many other industries to test and ensure that their products and workplaces are safe, and to evaluate the implications of new research data;
- work for local and federal governments to develop and enforce laws to ensure that chemicals are produced, used and disposed of safely; work in academic institutions to teach others about the safe use of chemicals and to train future toxicologists.

A toxicologist working in the pharmaceutical industry, for example, might work to make sure that potential new drugs are safe for testing in clinical trials for humans.

A toxicologist working at the SMU might be involved in designing and overseeing studies that create a controlled environment that replicates exposures that humans may encounter. The toxicologists work to identify hazards from the chemicals or substances they

are studying.

Toxicology provides critical information and knowledge that can be used by regulatory agencies, decision makers, and others to put programs and policies in place to limit our exposures to these substances, thereby preventing or reducing the likelihood that a disease or other negative health outcome would occur.

Other benefits of toxicology include:

- Government agencies have a sound scientific basis for establishing regulations and policies aimed at protecting and preserving human health and the environment.
- Companies, such as pharmaceutical and chemical, are able to develop safer products, drugs, and workplaces.
- Consumers have access to information that helps them make decisions about their own health and prevent diseases.

Wise use of chemicals is an essential component of the high standard of living we enjoy. The challenge to toxicologists is to ensure that we are not endangering our health or the environment with the products and by-products of modern and comfortable living. As a career, toxicology provides the excitement of science and research while also contributing to the well-being of current and future generations. Few other careers offer such exciting and socially important challenges as protecting public health and the environment.

Hardly a week goes by without hearing that a chemical may potentially threaten our health—pesticides in the food we eat, pollutants in the air we breathe, chemicals in the water we drink, toxic dump sites near our homes. Chemicals make up everything around us. Which chemicals are really dangerous? How much does it take to cause harm? What are the effects of a particular chemical? Cancer? Nervous system damage? Birth defects?

Finding scientifically sound answers to these very important questions is what toxicologists do, using the most modern techniques available. Toxicology combines the elements of many scientific disciplines to help us understand the harmful effects of chemicals on living organisms.

An additional, important aspect of toxicology is determining the likelihood that harmful effects will occur under certain exposure circumstances, sometimes called “risk assessment.” If the risks are real, then we must be able to deal with them effectively. If the risks are trivial, then we must ensure that valuable public resources are not spent ineffectively. Toxicologists are ready to develop new and better ways to determine the potential harmful effects of chemical, biological and physical agents.

Many toxicologists, especially in academic and

nonprofit institutions, are principally involved in the discovery of new knowledge concerning how toxic substances produce their effects. There are many subspecialty areas in toxicology research: chemical carcinogenesis, reproductive and developmental toxicology, neurotoxicology, immunotoxicology, inhalation toxicology, risk assessment, and many others. Researchers use laboratory animals, human and animal cells in culture, and other test systems to examine the cellular, biochemical and molecular processes underlying toxic responses

Many industries employ toxicologists to assist in the evaluation of the safety of their products. For therapeutic drugs, food additives, cosmetics, agricultural chemicals and other classes of chemicals, federal laws often require that the manufacturer provide adequate testing of the product before it is released into commerce. Tests to determine if a chemical has the potential to cause cancer, birth defects, reproductive effects, neurological toxicity or other adverse effects. When the information is available, toxicologists also utilize studies of human populations (the science of epidemiology) to assist in the evaluation of the safety and potential risks of the chemical products and by-products of modern society.

SMU team of experienced, highly-educated scientists, experts in toxicology, clinical chemistry and immunology conducted studies in the highest quality standards and meet international regulatory requirements (EMA, FDA, OECD).

We are a fully accredited GLP facility and conducts all studies to GLP standards, monitored by quality assurance.

We perform a range of monitored and unmonitored regulatory in vivo studies on Rodents:

General Toxicology Studies: The test battery provides information on the health hazards likely to arise from short-term exposure to a test substance by different administration routes.

One of the most important efforts of toxicologists in academic institutions is the training of future generations of toxicologists in basic and applied research, data interpretation and evaluation, and risk assessment and regulatory affairs.

Identifying a graduate training program that is best for you requires some advanced planning. First, you should establish a potential career plan. Consider the various subspecialties in toxicology, such as chemical toxicity, carcinogenesis, teratology, etc., to determine if there is a specific field of research that is of particular interest to you. Attending regional and national scientific meetings will help you explore areas of interest. Although choosing a specialty early in your graduate education certainly does not commit you to this direction, it will help you in deciding which programs are most likely to meet your needs. It is also useful to talk with toxicologists in local universities, industries and governmental agencies to help you in your selection of a training program and future career direction.

If you've already completed a magister degree in a public health or biomedical science, you can enter the field of toxicology by spending three years as a PhD student in a toxicology laboratory. PhD education of a toxicologist takes many forms depending on the goal

of the scientist.

PhD study can further enhance the marketability of a toxicologist. Recent toxicology graduates may lack experience in project management, people management and grant-writing, and experience in these areas can be gained during PhD study

Good laboratory practice, project management skills and statistics experience were also viewed as important. An important part of any science is communicating results and discussing implications. The tremendous growth in public awareness of chemical hazards over the last two decades has resulted in the passage of many laws governing the production, use and disposal of chemicals. An increasingly important area of toxicology is in public communication of chemical risks.

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