ACUTE TOXICITY

Summary

- Acute toxicity describes the effects arising from a single or limited number of exposures; such as may occur for example following an accidental release.

- The onset of symptoms arising from acute exposure is generally rapid and can be reversible (on cessation of exposure).

- The nature and severity of the effect will depend on a number of factors, which include exposure route (oral, dermal or inhalation) and level of exposure, together with intrinsic properties of the chemical; which will determine the bioavailability and mechanism of toxicity.

- Although the effects of primary interest will be systemic, local effects, such as irritation of the skin, lungs or gastro-intestinal tract may also be observed, depending on the exposure route.

- It is not possible to predict likely acute effects from repeated dose toxicity studies.

Introduction

Acute toxicity is an important area of toxicology and its significance can often be overshadowed by the longer term effects arising from repeated daily exposures. However there are many substances which, although considered to be "harmless" and even beneficial when taken in smaller doses over a protracted period of time, can be acutely toxic. For example, vitamins and salt are acutely toxic although essential in smaller dose levels for health and well being.

In this short session aspects related to acute toxicity will be covered and in particular, why it is not possible to predict likely repeated dose effects from acute toxicity data and vice versa.
1. Acute toxicity

Acute toxicity refers to those adverse effects that may result from a single exposure to a relatively large amount of substance over a short period of time. Typical examples of such exposures include accidental spillages, etc.

The nature and severity of acute effects, which can range from reduced motility, narcosis to sudden death, depend on a number of factors which include exposure route, level of exposure and the intrinsic properties of the chemical.

1.1 Usefulness of acute toxicity

Knowledge of acute toxicity provides insight into the likely effects should a single high dose exposure occurs; as in the case of an accidental spillage or leak in the workplace. Test data results can also be helpful in the selection of appropriate doses to use in longer term studies. Furthermore, acute toxicity data also gives an indication of whether or not absorption occurred via the exposure route that was tested.

1.2 Can acute toxicity data be used to predict likely repeated dose effects?

This is a commonly asked question and unfortunately it is not possible to do. A given substance may have a very large LD50 value but this tells us nothing about any likely long term effects. The reason for this is that although both acute toxicity and repeated dose toxicity arise as a result of systemic exposure to a chemical, they are not the same.

Acute toxicity describes the effects arising from a large single or very limited number of exposures over a short time period; and is typically reported as a LD50 or LC50 result, depending on the exposure route.

In contrast, repeated dose toxicity is as a result of intermittent or continuous exposure over a lifetime. These exposures are usually orders of magnitude smaller than the exposures described by acute toxicity. Furthermore, these types of toxicity can manifest themselves in different ways, involving different target organs/biological processes, thus giving rise to different adverse effects.