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Current Understanding of Toxins and Toxicity Associated With Novel Detection Methods

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Editor Note

The rapid growth of pharmaceutical and chemical industry has unleashed a tidal wave of toxins into the environment. Prior to harnessing the ever-increasing array of synthetic compounds for commercial or agricultural use, it is imperative to be cognizant of all the potential adverse effects associated with these chemicals. This is where toxicology comes into the picture, toxicology is the study of the interaction of various compounds (chemical or biological) with the biological system (be it at organismal level or environmental). Over the years, toxicology has played a vital role in the screening newly developed drugs before they can be used in humans; scientists are able to follow the drug behavior prior to their use in humans. Toxicology testing can be performed on cell-lines and on a wide variety of animals such as mice, rats, and hamsters.

Toxicology: Open Access publishes the latest findings in the field which broaden the horizons in terms of our current understanding of toxins and toxicity associated with commonly used compounds. The current issue of Toxicology: Open Access presents some exciting reports on varied topics such as: drug iatrogenesis, toxicity of Iron oxide nanoparticles (FeNPs), mycotoxins, and jelly fish toxins. Moutaouakkil et al. [1], have authored a review on drug iatrogenesis. Zhang et al. [2], investigated the nanotoxicity of dimercaptosuccinic acid (DMSA) coated iron oxide nanoparticles. Li et al. [3], reviewed the currently available high throughput methods of mycotoxin detection. Bais et al. [4], authored a review on Jellyfish toxins, and treatment strategies in response to the sting of a jellyfish.

Drug iatrogenesis is a condition which refers to a harmful pathologic condition or clinical manifestation induced upon the administration of one or more drugs. Iatrogenic effects are commonly observed in almost all the major organs of the body such as: lungs, liver, kidneys, gastrointestinal system etc. Adverse effects such as kidney disease, neutropenia, anemia, liver injury, and immunologic reactions are very common. Such negative effects of drugs have started worrying researchers and medical professionals. Several studies estimate that drug related adverse reactions account for about 0.5% to 2% of the outpatient consultations and are responsible for 4% to 10% of all hospital admissions. Moutaouakkil et al. [1], have reviewed this phenomenon of drug iatrogenesis and provided the epidemiological data available in this field.

In the past decades, the synthesis of Iron oxide nanoparticles (FeNPs) has been developed intensively not just for the fundamental scientific studies, but also for many technological applications, such as magnetic resonance imaging (MRI), targeted drug delivery, thermoablation, magnetic hyperthermia, and bio sensing. Therefore any potential nanotoxicity associated with FeNPs should be investigated thoroughly. Zhang et al. [2], investigated the nanotoxicity of dimercaptosuccinic acid (DMSA) coated iron oxide nanoparticles. This studiy revealed that at high concentrations the FeNPs exhibited cytotoxicity and induced apoptosis in THP-1 and HepG2 cells. Furthermore, these FeNPs also interfered with the genes responsible for iron homeostasis inside the cell. The overall, results suggest that FeNPs are safe to use at lower concentrations, but at higher concentrations, they induce cellular cytotoxicity.

Mycotoxins are low-molecular-weight secondary metabolite compounds produced by certain fungi. The toxic effect of mycotoxins in animals and humans is referred to as mycotoxicosis; the severity of mycotoxicosis is in turn dependent on the extent of exposure, the toxicity of the mycotoxin, the age and nutritional status of the person, and probable synergistic effects of other compounds/chemicals to which the person might have been exposed. Due to their toxicity, stability, and extensive use in agriculture, there is a pressing need to develop large-scale, rapid yet simple and effective mycotoxin detection techniques. Li et al. [3], have reviewed the currently available high throughput methods of mycotoxin detection. They have focused on both the advantages as well as disadvantages of these methods. Such insights would help further the future development of this field.

Jellyfish belong to the phylum cnidaria, and live in and around the coastal water zones worldwide. A defining feature of this phylum is the cnidae, a markedly specialized, explosive organelle comprised of whip-like penetrant or non-penetrant tubules; specialized cnidae producing penetrant "stinging cells" called the nematoblasts, allow for the deposition of "venom" for into the prey. The sting of jellyfish, whether live or dead, causes millions of nematocysts to enter the skin, causing toxic manifestations such as extreme pain and even death. Jellyfish venom is composed of potent bioactive lipids, neurotoxic peptides, and porins. However, the exact mechanism of action of jellyfish venom is still unclear. Bais et al. [4], have authored a review on Jellyfish toxins, related symptoms, and treatment strategies in response to the sting of a jellyfish in order to expedite the treatment and improve the survival rates.

References

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