



## Continuing and Emerging Concerns about Contaminants

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Many chemical and microbial constituents that are present in soil and water ecosystems are getting recognized as contaminants a er the evaluation of their potential threat to the environmental health.

in wastewater led to adverse e ects on the local sh, resulting in the domination by females and about 18 to 22 percent of sh exhibiting intersex [13]. High incidence of intersex in the male smallmouth bass

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Emerging contaminants include even the naturally occurring chemicals in soils and waters. In water bodies, algal blooms occur due to excessive accumulation of algae. These blooms contain multiple cyanobacterial toxins (cyanotoxins). Cyanotoxins (e.g., anatoxins, cylindrospermopsins, lyngbyatoxins, microcystins, nodularins and saxitoxins) that are present as few micrograms in a liter can cause allergic, damage to the respiratory tissues, liver and kidneys, and affect the nervous system in mammals. Wood and his coworkers observed interspecific differences, due to the feeding habits, in the accumulation of microcystin in fish and shellfish [18]. Most studies have focussed only on microcystin but the presence of several types of cyanotoxins necessitates the need for innovative assessment methods [19,20].

The impact of agriculture use of lands in watersheds increases the production of cyanotoxins in lakes [21].

Naturally occurring and synthetic nanoparticles are enormously diverse. Both the incidental and engineered nanoparticles that are created by the human activities are increasing in the recent times.

The Nanotechnology Consumer Products Inventory has more than 1,800 consumer products suggesting the commercial acceptance of nanotechnologies [22,23]. The consumer products using nanotechnologies include personal care products, clothing, cosmetics, sporting goods, filtration, sunscreens, and automobile parts, those used in electronics, food and beverage, appliances, and goods for children. Globally, titanium dioxide, silicon dioxide and zinc oxide are the most produced nanomaterials. Nearly 528 products have nanomaterials, suspended in a variety of fluids such as water, skin lotion, oil, and car lubricants. Silver nanoparticles are present in about 438 products, which are essentially for antimicrobial protection [23].

Contemporary public health and agriculture depend heavily on the synthetic chemical substances including nanoparticles for improving productivity and protecting the plants, animals and humans. Indiscriminate and continuous use of these chemical substances can lead to the suitable conditions for microorganisms to evolve, develop capabilities to degrade or even resistance to them. Currently, the development of resistance to antimicrobials in microorganisms has become a serious global issue. By 2050, the global economic cost of antimicrobial resistance (AMR) will be up to \$100 trillion along with 300 million premature deaths [24]. The AMR has become an imminent risk to many life-threatening as well as common diseases in animals and humans. Even, many insect pests have been conferred with resistance to pesticides due to the AMR of their microbial endosymbionts.

The degradation of soil-applied pesticides or antimicrobials (such as fumigants) has been found to enhance, especially due to rapid microbial transformation, mineralization or degradation. Many of these chemical substances including pharmaceuticals and nanoparticles may have deleterious, non-target effects on microorganisms. Since several microorganisms have acquired the capabilities to degrade or resist the antimicrobials through changes in their genomes, the predictability on the environmental fate of chemical substances has become increasingly challenged now. Since the horizontal gene transfer (HGT) is a predominant means of gene exchange among microorganisms, the spread of AMR among different microbial groups can be rapid and alarming, beyond the geographical and ecological borders. The challenges in the future will continue to be on gaining a better scientific understanding of the environmental consequences of contaminants in soil, air and water and their effects on diverse organisms.

## References

**Citation:**