

## The Impacts of Emerging Pollutants on Human Health and Environment

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### Abstract

The emerging pollutant is a long-lasting challenge. This paper was aimed to discuss the past literature on the subject of the impacts of emerging pollutants on human health and environment. The electronic search was conducted in the databases: CINHALL and EBSCO. There were over 700 compounds gathered in 20 classes of emerging pollutants. Amongst emerging pollutants, a type of general concern is represented by pharmaceuticals because of the huge volume used to treat a wide range of illnesses and their diverse physical, biological and chemical characteristics. The antibiotics used to treat illnesses and infections become less active as a result of environmental pollution. On the other hand, it is very difficult to evaluate the long-standing effects of most of the emerging pollutants on the human and environment health. A road map was formed to integrate the environmental health with all aspects of the nursing profession. The vital goal ought to be to improve our knowledge and environmental monitoring capabilities.

**Keywords:** Emerging Pollutants; Environment; Pollution

### Introduction

Pollution is serious and growing danger to human health. Recently, it is considered the main environmental source of health problems in the world, accountable for an about 9 million premature deaths annually [1]. It results in massive losses in the economy, weakens economic improvement plans, and delays accomplishment of the Sustainable Development Goals (SDGs) [2]. Similar to depletion of the world's fresh water supply and climate change, pollution threatens the stability of the earth's support systems and the permanent survival of human communities [3].

Until recent time, pollution was ignored at the global development planning level and in the international health agenda. For a long time, pollution was considered as the inevitable price of economic development [4]. Currently, this claim is no longer reasonable, and it was refuted by several countries experiences [4]. And it became inappropriate with the increase availability of renewable sources of energy with low cost and progress in green chemistry.

The environmental pollution comes to be one of the greatest challenging and human daily life problems. Through the urbanization and industrialization, the quality of the environment developed worryingly. Different types of pollutants, such as persistent organic (pharmaceuticals, endocrine disrupting agents, personal care products, pesticides) and inorganic (e.g. heavy metals) are serious problems at the international level; they can disturb both fauna and flora and the health of humans [5].

Water is considered one of the greatest threatened environmental parts; subsequently, water pollution becomes a problem of extreme concern and interest at the global level. According to the 3<sup>rd</sup> world water forum in Kyoto, Japan, every day nearly 2 million tons of pollutants of different kinds (sewage, agricultural and industrial waste) are discharged into water all over the world, an amount that nearly equals the weight of the global population. As a result, generates 1500 km<sup>3</sup> of waste water [6].

Emerging pollutants were described as naturally or synthetic occurring chemicals that are not usually observed in the environment; however, it is possible to pass in the environment and may lead to suspected or known environmental and human health harmful impacts [7]. It comprises products used every day in homes, industry and other anthropogenic activities (degradation products and surfactants, plasticizers and gasoline additives, pharmaceuticals and personal care products, etc.) [6].

The emerging pollutant is a long-lasting challenge, as the costs of monitoring are substantial and can impose limits on the monitored substances. Actually, the launch of wide-ranging databases on emerging pollutants is an open issue, as they would offer data on the properties of emerging pollutants and their metabolites and for motivating member states to include emerging pollutants in water quality surveys [6]. Such methods would be requirements for the development of a suitable treatment of water and sustainable approaches for the elimination of these pollutants from the environment, fundamental for environmental and human health protection [6].

### Aim of the Study

The present paper was expected to discuss the preceding literature on the subject of the impacts of emerging pollutants on human health and environment.

### Methods

#### Search strategy

The electronic examination was conducted in the databases: CINHALL and EBSCO. The searching terms were: "emerging pollutants", "environment", and "pollution".

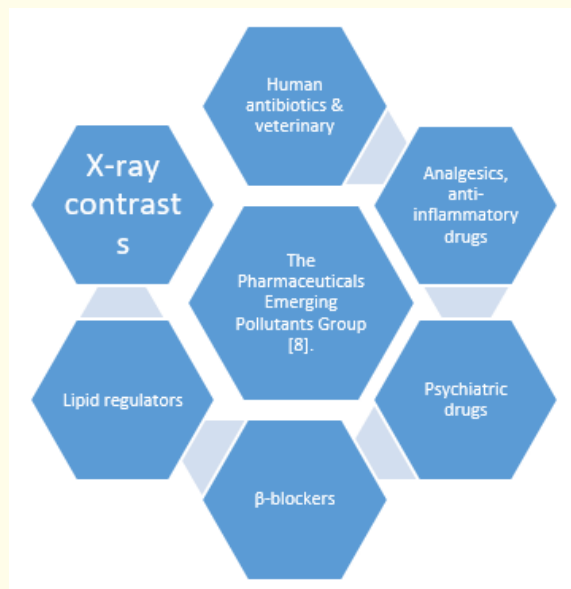
Studies published in the English language in 2005 and more discussing the topic of the impacts of emerging pollutants on human health and environment were included in the review.

#### Search outcome

Examining of the literature resulted in 70 headings for review. The last examination leads to 19 studies, not including studies consisting just of abstracts and unrelated studies.

## Results and Discussion

There were over 700 compounds gathered in 20 classes of emerging pollutants such as surfactants, antibiotics and other pharmaceuticals, steroid hormones and other endocrine-disrupting compounds, sunscreens, disinfection byproducts, fire retardants, new pesticides and pesticide metabolites, naturally occurring algal toxins [6] (Figure 1) [8].



**Figure 1:** The pharmaceuticals emerging pollutants group [8].

The occurrence of emerging pollutants in the environment is the consequence of health care activities needed to support human health, advance of industry, uncontrolled urbanization, transport and agriculture and comprise an extensive range of substances produced by humans, considered essential for the present civilization [9].

While some of emerging pollutants have been found in the environment for a number of years, their quantitative and qualitative incidence were investigated merely lately, and they may be dangerous for ecosystems [9-19]. Likewise, several emerging pollutants are not bound by regulations and standards because of the lack of data on the impacts of chronic exposure. The flame retardants and pharmaceutical products, personal care products were some of the most frequently detected emerging pollutants in the environment [9]. Whereas compounds that influence the endocrine system were some of the most explored emerging pollutants. The new analytical methods newly developed and applied give promise of the detection of tremendously low concentrations ( $\mu\text{g L}^{-1}$  or  $\text{ng L}^{-1}$ ) of these compounds in solid and liquid media. By applying these methods, it was possible to identify and quantify about 3000 biologically active chemical compounds in the environment [20].

Amongst emerging pollutants, a type of extensive concern is exemplified by pharmaceuticals because of the huge volume used to treat a wide range of illnesses and their diverse physical, biological and chemical characteristics. Nearly all classes of medications were noticed

in effluents [21]. Pharmaceutical compounds (involving diverse classes: antibiotics, anti-epileptic, anti-inflammatory, hormones, statins, anti-depressants, contrast agents, beta-blockers, etc.), next administration are mostly excreted in the original form or as metabolites and can be found in sewers of the hospital, urban wastewater and surface water [22]. Also, they can reach groundwater or even drinking water, besides the soil from irrigation water. Antibiotics in the environment appear to spread in increasing quantities, including a growing diversity of compounds. Current studies established that concentrations of antibiotic in some rivers of the world surpass the safe levels by 300 times [23].

As stated by the World Health Organization (WHO), antibiotic resistance is the major hazard to food security, global health and development. A growing number of illnesses and infections are hard to be treated, as antibiotics used to treat them convert into less active as a result of environmental pollution [24]. For instance, antibiotic resistant bacteria (*Enterococci*, *Klebsiella Pneumonia* and *Pseudomonas* spp) exemplify a possible hazard for human and animal health and may generate problems in infection control. Past studies showed that even pathogenic bacteria, for example, *Aeromonas* and *Pseudomonas* spp may develop resistance to one or more antibiotics [25-35].

The occurrence of human and environmental health risks associated with emerging pollutants is due to their level of toxicity. Emerging pollutants are considered highly toxic, as Nano gram per liter (ng/L) concentrations may show relative effects to aquatic organisms and human health, for instance, carcinogenicity in lab animals, hormonal interference in fishes, genotoxicity, endocrine disruption and immune toxicity [36-46]. It is very difficult to evaluate the long-standing effects of the most of emerging pollutants on the human and environment health, and this is still a concern, though the awareness on their ecological risks and hazard is inadequate. At hand, emerging pollutants will be evident their toxic impacts, rely on their classification and mixtures (Figure 2 and 3) [47].

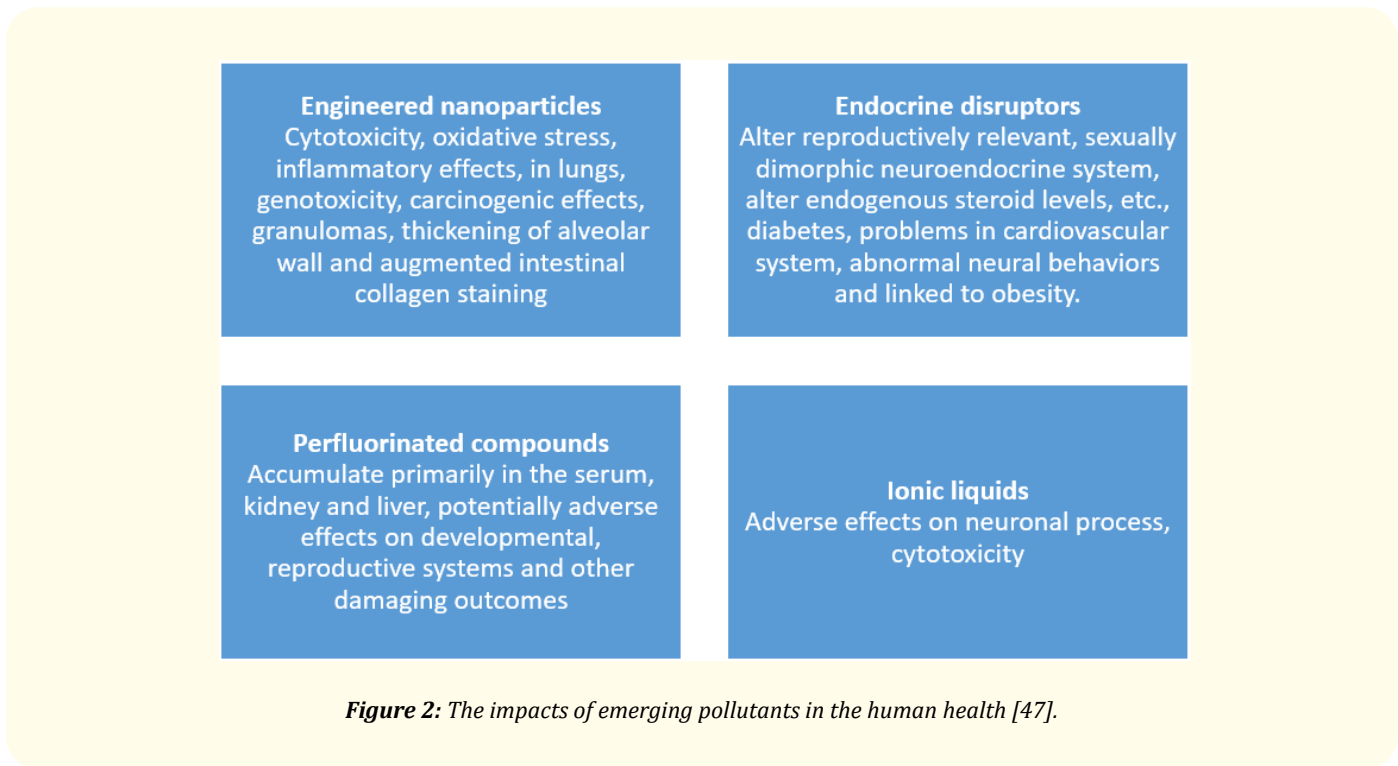
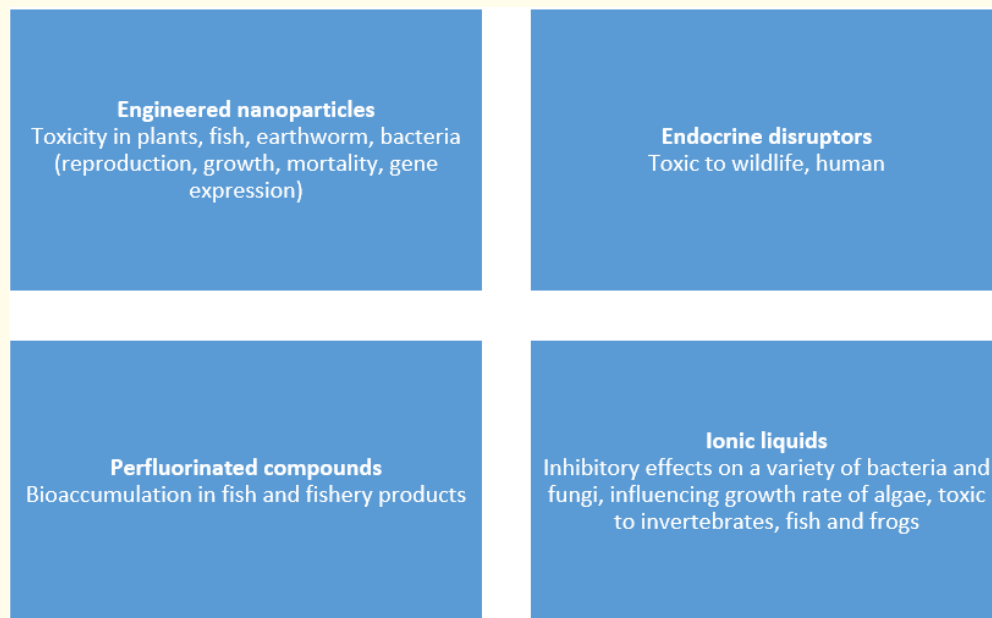


Figure 2: The impacts of emerging pollutants in the human health [47].



**Figure 3:** The impacts of emerging pollutants in the ecology [47].

Regarding the environmental health and nursing, a road map was formed to integrate the environmental health with all aspects of the nursing profession in the course of the Institute of Medicine (IOM’s) 1995 report (Nursing, Health, and the Environment) [48]. Recommendations comprise integration into education, research, practice and advocacy/policy. In basic and advanced nursing education, environmental health is beginning to be found in texts and curricula. Teaching about assessment of the environment and environmental health risks is being integrated into undergraduate nursing education courses, for example, health assessment and community health. Nursing students are educated to use environmental health indicators to evaluate the health of a community. In basic health assessment courses, adding environmental health to the taking of history assisted nurses recognize possible etiologies that had not been measured before. Furthermore, nurse researchers are becoming principle investigators on environmental health investigations and are supporting communities to protect health. In the policy field, nurses affect the changes at the local, state, national, and international levels, and are valued as trustworthy sources of data on the impacts of the environment on human health [48-58].

Finally, there is at present a universal agreement among health and environment policy decision makers that emerging pollutants must be addressed in an organized and comprehensible method. Likewise, it is generally believed that there is a necessity for an early warning system capable of playing the role of the overseer. Such a system should expect the risks connected with the dynamic change in the chemicals use in an attempt to prevent the environmental effects of chemical substances before they turn into “emerging pollutants of concern”. The vital goal ought to be to improve our knowledge and environmental monitoring capabilities [49,59-79].

**Limitations of the Study**

The limitations of the present review paper of this nature was the dependent totally on past published studies and the accessibility of these studies by means of the method outlined in the search strategy and the suitability of these studies with the inclusion/exclusion criteria.

### Conclusion

The environmental pollution comes to be one of the greatest challenging and human daily life problems. Emerging pollutants are extensively present and distributed in the aquatic environment. They comprise different groups of pollutants, for example, pharmaceuticals, personal care products, industrial additives, pesticides and surfactants, besides their metabolites and hormones. Many of emerging pollutants are not efficiently removed in wastewater treatment plants and residual concentrations are reaching surface and ground waters. The occurrence of human and environmental health risks associated with emerging pollutants is due to their level of toxicity. Some of emerging pollutants are known for their toxic impacts and their endocrine disrupting activity. However, it is difficult to evaluate the long-standing effects of most of the emerging pollutants on the human and environment health, and this is still a concern. On the other hand, a plan was formed to integrate the environmental health issues with all aspects of the nursing profession. There is a universal agreement among health and environment policy decision makers that emerging pollutants must be addressed in an organized and comprehensible method.

### Recommendations

Future researches should focus on:

- The identification of those chemicals that will have the greatest danger for human's health and ecosystems to limit the potential risks.
- The identification of new pollutants and their possibly new sources and pathways and the continuous development of the detection methods and analytical instrumentation down to trace levels.
- Improving the drinking water and wastewater treatment processes and, if needed, re-planned so as to successfully eliminate as many as possible emerging pollutants.
- Evaluation the long-term exposure effects and separate impacts of single or multiple emerging pollutants on aquatic life.
- Carrying out additional investigations to give a solution to numerous uncertainties, e.g., it is not known which bacteria are subjected to potential mutations and for which antibiotics.
- Developing more reliable databases by conducting more ecotoxicological studies, toxicity tests and related risk assessment.

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