



## Editorial

# [Translated article] A more sustainable pharmacy

## Por una farmacia más sostenible



The year 2022 was a turning point in the way we use pharmaceuticals. Environmental awareness is gaining momentum at all levels of society. This is particularly true in the European scenario, as evidenced by the implementation of the acclaimed 'Green Deal', which includes an ambitious zero-pollution action plan. More specifically, the Green Deal is a specific strategy for reducing the environmental impact of pharmaceuticals<sup>1</sup>. Researchers at the University of York recently conducted the study «*Global Monitoring of Pharmaceuticals*» to assess the extent of pharmaceutical pollution in the world's rivers. For such purpose, concentrations of pharmaceuticals were measured in rivers across 138 countries. The study revealed that the occurrence of pharmaceuticals in freshwater is a global challenge<sup>2</sup> and represents a threat to the environment<sup>3</sup>.

In October 2022, the European Commission launched the Water Framework Directive (WFD)<sup>4</sup>. Although most health providers and pharmacists are unaware of this directive, it includes a fundamental novelty. For the first time, a set of drugs (several antibiotics, anti-inflammatory drugs and estrogens, among others) have been included in the list of priority hazardous substances. Their inclusion in the list involves that environmental quality standards will be established regarding concentrations of these substances in water, sediments and biota. To protect the environment, these concentrations cannot be exceeded, and failure to comply with these standards may result in significant legal penalties.

It was in this crucial year, 2022, when the Spanish Society of Hospital Pharmacy opportunely adhered to the United Nations' Global Compact.

Nowadays, pharmaceuticals are considered one of the most relevant pollutants of emerging concern, since their properties render them dangerous to the environment. Firstly, pharmaceuticals are designed to exert pharmacological effects at low concentrations, which can affect the different ecological niches. Secondly, they are designed to be relatively stable and reach and interact with specific pharmacological targets, most of which are phylogenetically conserved (i.e. they are not exclusive of human beings). It is estimated that near 4000 active substances are currently used in humans and animals. Such an amount had never been used before in history. The last update of the «*Pharmaceuticals in the environment*» database published by the German Environment Agency reveals the presence of 992 drugs in the main environmental matrices (rivers, lakes, oceans and even drinking water), but also in soil and air, among others. Some pharmaceuticals also accumulate in biota. Recent studies demonstrate that pharmaceuticals accumulate in wild water animals at doses equivalent to human doses. This may result in plasma concentrations exceeding human

therapeutic concentrations<sup>5</sup>. Moreover, pharmaceutical pollution may prevent countries from achieving several Sustainable Development Goals<sup>6</sup>.

Pharmaceutical pollution is a complex challenge in which multiple stakeholders with differing interests are involved. As in the Dutch Chain Approach on Pharmaceuticals<sup>7</sup>, action should be taken at the different stages of a drug's life cycle. The first step is to adopt measures at origin to reduce the volume of pharmaceuticals that reach water treatment plants. For such purpose, it is necessary to update the definition of "rational use of pharmaceuticals" proposed four decades ago, for it to incorporate the 'One Health' approach. Hence, we should not forget about pharmaceuticals once they have been excreted by patients<sup>8</sup>. The 'One Health' philosophy, which emerged in the context of animal health, is frequently constrained to resistance to antimicrobials. Of course resistance to antimicrobials deserves our attention; however, the 'One Health' approach is also applicable to other therapeutic groups. Why should 'One Health' not be applied to psychiatric drugs, estrogens, anti-inflammatory drugs, or statins<sup>9</sup>?

Although health professionals have long ignored the problem (with some honorable exceptions), our understanding of pharmaceuticals may be useful. One of these exceptions is the proposal of giving priority to environmentally hazardous human drugs as potential pollutants<sup>10</sup>.

In 2014, Christian Daughton, the former Chair of the United States Environmental Protection Agency, proposed the term "eco-prescription" or "sustainable prescription"<sup>11</sup>. This revolutionary idea proposes that physicians adopt environmental considerations when prescribing. With some notable exceptions (<https://klokalistan.se/>; <https://ohbp.org/>), this proposal has not been received with enthusiasm, despite it being a novel approach that deserves further attention. Considering the environmental impact of pharmaceuticals when prescribing may be a turning point in pharmacotherapeutics<sup>12</sup>.

In line with the proposal of the European Commission<sup>1</sup>, it is essential that health professionals receive training in environmental sustainability. In the framework of the *Basque Sustainable Pharmacy* project, the University of the Basque Country has created a new postgraduate program called «*Expert in pharmaceutical pollution*». Active healthcare professionals and students should be aware that the anthropocentric scheme LADME is only the tip of the iceberg, as pharmaceuticals do not disappear once they have been excreted by the patient. We seize the opportunity to invite all hospital pharmacists interested in environmental sustainability to join this postgraduate program next year.

Further relevant regulatory changes are expected in the coming years. As it occurs with veterinary drugs, will new regulations require that environmental impact is considered in the risk–benefit analysis during the process of authorization of human drugs? Will other issues unrelated to the active substance<sup>13</sup> be considered in environmental

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risk assessment? Will the increased demand for pharmaceuticals resulting from off-label use or pandemics be considered?<sup>14</sup> Another relevant point is pharmaceutical waste disposal in hospitals, where there is probably room for improvement. Reuse of returned/unused medicines under strict safety conditions has also been proposed<sup>6</sup>. In some cases, and when sufficient alternative options are available, a two-fold benefit – to patients and the environment – would be obtained from reducing the number of medicines available<sup>15</sup>.

Measures at origin can be complemented with other end-of-pipe measures when pharmaceutical waste enters water treatment plants. Priority should be given to the development and application of new technologies to drug disposal at hotspots (i.e. hospitals). Thus, new technologies could eliminate pharmaceutical products and resistant bacteria from waste water.

Definitely, our society has benefited, is benefiting and will continue to benefit from pharmaceuticals. However, drugs should be used rationally by adopting a 'One Health' approach.

It is time for health professionals to consider the environmental impact of pharmaceuticals.

### Ethical considerations

Not applicable.

### Funding

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### Conflict of interest

None.

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