

# Human Rights Impacts of Phthalates



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## Impacts of Phthalates Pollution on People

“Phthalates” are a group of industrial chemicals that are linked to a range of adverse health effects on sexual function and fertility, the reproductive system, and the prenatal and postnatal development [reproductive and developmental toxicity].<sup>1</sup>

They can be found in food as a result of packaging, cosmetics (perfumes, shampoos, deodorants and products applied directly to the skin), toys and children’s products, vehicles upholsteries and wires, housing tools (furniture upholstery, flooring and other building material), various plastic products, clothing, medical devices,<sup>2</sup> lubricating oils, solvents, and detergents.<sup>3</sup>

Phthalates are often used as plasticizers to provide flexibility and durability in polymer products such as polyvinyl chloride (PVC). As the phthalate plasticizers are not chemically bound to PVC matrix (or other materials), they can be partly lost, leach, migrate or evaporate -during the all life cycle stages (production, transport, storage, formulation and processing) and the final dumping of the products- into indoor air and atmosphere, water, foodstuff, and other goods.<sup>4</sup>

Phthalates are suspected to cause cancer [carcinogen] and interfere in the normal hormone activity of human body [endocrine disruptor]. For instance, they can hinder the development of the reproductive system in children (e.g. causing genital malformations in males, decreasing semen quality and fertility, influencing the age of puberty in girls), as well as their mental, psychomotor, and behavioral development. Phthalates are also be associated with obesity, asthma and diabetes.<sup>5</sup>

They are divided into two different groups (respectively, low and high phthalates,<sup>6</sup> depending on their molecular weight, and so their applications and toxicity), and when ingested, they often change into other forms, called metabolites, that can be observed in urine.<sup>7</sup>



Because of the extensive use of phthalates, the general population can be constantly exposed, and the ubiquitous nature of these chemicals could lead to a most harmful “cocktail effect”. In the US, for instance, 13 phthalate metabolites were measured in the urine of more than 2,600 participants aged 6 years and older within the U.S. National Health and Nutrition Examination Survey (NHANES), indicating that phthalate exposure is widespread in the population.

Exposure to phthalates can occur from different sources (air, water, soil, biota, food, sediments, objects) directly, through contact and use, and indirectly, through other products’ leaching, or because of a contamination in the environment.

Human exposure can take place by:

- ingestion (especially to the high-molecular-weight DEHP and DINP),<sup>8</sup>
- inhalation (to the more volatile phthalates like DEP and DMP),<sup>9</sup>
- dermally (to low-molecular-weight phthalates such as DEP, DBP, BBzP),
- and by intravenous injection through medical devices.

It can occur during a person’s lifetime (e.g. at home, work, and hospital), and also during the fetus development.<sup>10</sup>

DEHP, one of the most widely used phthalates, can affect fertility (it acts as a hormone disruptor, it is toxic to reproduction [anti-androgenic]<sup>11</sup> and decreases fetal testosterone production) and induce malformations in male newborns.<sup>12</sup> Moreover, it is assumed to be carcinogen, with growing evidence of causing breast and testicular cancers,<sup>13</sup> and was listed as “*reasonably anticipated to be a human carcinogen*” by the U.S. National Toxicology Program.<sup>14</sup> DEHP is also suspected of neuro and immune toxicity,<sup>15</sup> related with Autism Spectrum Disorders.<sup>16</sup>

Similarly to the majority of endocrine disrupting chemicals, effects of exposure to low doses of phthalates cannot be accurately predicted by the effect of higher doses, making it impossible to establish a safe level of exposure.<sup>17</sup>

- Children are most vulnerable to adverse health effects from phthalates. There is concern for children “*with regard to testicular effects, fertility, and toxicity to kidneys*”.<sup>18</sup> They are exposed to phthalates from a variety of sources, including food (e.g. baby food, infant formula, and food and beverage packaging, milk obtained through milking tubes containing phthalates, and even through breastfeeding), toys and teethingers,<sup>19</sup> and other sources.
- Unborn babies can also be exposed as fetuses through maternal exposure.<sup>20</sup>
- Women can be exposed to phthalates through cosmetics, and “*exposure to diethyl phthalate, the parent compound of MEP, may be associated with increased risk of breast cancer*”.<sup>21</sup>
- Special concern for testicular effects, fertility, and toxicity to kidneys, has been expressed not only for children, but also for workers.<sup>22</sup> A 2012 study on women working in the automotive plastic sector, with a 10 years exposure to phthalates, showed they had nearly five-fold increase in the chances to develop pre-menopausal breast cancer.<sup>23</sup>
- Consumers can be exposed to phthalates in everyday life use of plastic products, packaged food and beverages, building materials and furnishings, as well as when treated with some medical equipment (for which DEHP is still the most commonly used phthalate worldwide).<sup>24</sup>



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Since the 1980s DEHP was found to be an animal carcinogen and substituted by other phthalates such as DINP in several countries.<sup>25</sup> Nevertheless, DINP and DIDP may represent risks for human health, being endocrine disrupting chemicals as well.<sup>26</sup>

The European Union prohibited the use of certain phthalates in toys and childcare articles since 1999 above a specific threshold,<sup>27</sup> and since 2011 BBP, DEHP, DBP, and DIBP were added in the EU list for authorization under the Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Four phthalates are furthermore restricted under the Restriction of Hazardous Substances Directive (RoHS directive), since 2015. Nevertheless, substances such as DEHP are still largely used in medical equipment and in many other applications across the world. Similarly, in the US, DEHP, DBP, and BBP are restricted in children's toys and some child care articles. DINP, DIDP, DnOP are also restricted but on *ad interim* basis, and only in children's toys that can be placed in a child's mouth. These phthalates as well as DIBP and DnPP are included in the US Environmental Protection Agency's Phthalates Action Plan<sup>28</sup> for further investigation.

Broadly speaking, most of the studies on phthalates were made in Western countries, and according to estimates,<sup>29</sup> although DEHP is not the most commonly used plasticizer in Europe anymore, it still represents almost 50% of the consumption worldwide, having extensive production and uses in countries like China, India, the Middle East, Africa and Latin America and other Asian countries.<sup>30</sup>

## Human Rights Implications

### *Right to life*

Under Article 6 of the ICCPR, *“Every human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life.”* In addition, Article 6 of the Convention on the Rights of the Child (CRC) also recognizes that *“every child has the inherent right to life” and that the survival and development of the child is ensured to the “maximum extent possible”*.

According to the UN Human Rights Committee, *“[t]he expression “inherent right to life” cannot properly be understood in a restrictive manner, and the protection of this right requires that States adopt positive measures. In this connection, the Committee considers that it would be desirable for States parties to take all possible measures [...] to increase life expectancy, especially in adopting measures to eliminate malnutrition and epidemics.”* (CCPR General Comment No. 06, 1982). Given the linkages between certain phthalates, non-communicable diseases and reduced life expectancy, the right to life is interlinked and interdependent upon the realization of numerous other human rights discussed below.



### *Right of children and adults to the highest attainable standard of health*

Under article 12 of the International Covenant on Economic, Social and Cultural Rights (CESCR), *“The States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.”* CESCR also recognizes the right of workers to healthy working conditions.

Specifically with respect the rights of children, under Article 24 of the Convention on the Rights of the Child (CRC), *“States Parties recognize the right of the child to the enjoyment of the highest attainable standard of health [...] taking into consideration the dangers and risks of environmental pollution”*. Article 10 of CESCR also calls for *“special measures of protection and assistance should be taken on behalf of all children and young persons without any discrimination.”*

As phthalates act as endocrine disruptors, their impact are particularly concerning to fetus and children’s physical and behavioral development. For instance, phthalates are related with Autism Spectrum Disorders.<sup>31</sup> They can also cause irreversible physical effects such as reproductive tract malformations in male newborns, reduction of anogenital distance,<sup>32</sup> nipple retention, and reduced semen quality. These adverse effects are related to decreased fetal testosterone production in the male reproductive system interfering with androgen-mediated development.

Exposure to endocrine-disrupting chemicals, including certain phthalates, is increasingly recognized as a contributor to obesity and diabetes, independent of diet and physical activity. In the EU, a recent study estimated with a 40% to 69% probability, that phthalate exposure causes 53,900 cases of obesity and 20,500 new-onset cases of diabetes in older women, with €15.6 billion and €607 million in associated costs, respectively.<sup>34</sup>

DEHP is the most frequently used phthalate in medical equipment, patients should have the right to be informed about biomedical materials used for their treatment, especially considering adult patients under long-term haemodialysis, with high exposure recorded (3.1 mg/kg/day).<sup>35</sup>

*“Newborns and infants undergoing particular medical procedures may have 100 to 1,000 times the exposure experienced by the general population.”*<sup>36</sup>

Continued use of phthalates hinders the realization of the right to health and other human rights during adult life.

### *Right to adequate housing*

Under article 12 of the International Covenant on Economic, Social and Cultural Rights (CESCR), *“The States Parties to the present Covenant recognize the right of everyone to an adequate standard of living for himself and his family, including adequate [...] housing, and to the continuous improvement of living conditions.”*

Indoor air, where people spend 65-90% of their time, is often highly contaminated by various phthalates.<sup>37</sup> Phthalates are released into the indoor environment from commonly used indoor products, such as furniture, upholstery, wall coverings, flooring, aromatic and deodorant aerosol products.<sup>38</sup> As a result of its wide use in building material, DEHP seems the most abundant,<sup>39</sup> and it can be found in house dust and detected in children urine, especially in boys.<sup>40</sup>



For instance, “[t]he findings [of a recent study] indicate that the use of soft PVC as flooring material may increase the human uptake of phthalates in infants.”<sup>41</sup>

Among the health effect on indoor exposure to phthalates, studies in Bulgarian children reveal that DEHP contributes to asthma symptoms<sup>42</sup> and alters the response of nasal mucosain allergic people.<sup>43</sup> “Because of its ubiquity, DEHP appears in almost every house dust sample”<sup>44</sup>, and exposure to phthalates in the indoor environment negatively impacting the enjoyment of the right to adequate housing around the world, particularly by young children, with implications for many other human rights.

### *Right to access information*

Under, Article 19 of the ICCPR, “everyone has the freedom to seek, receive and impart information and ideas of all kinds.” Where human rights are violated due to toxic chemicals, gaining access to information is essential in order to give effect to other rights, such as due process, guarantees to a fair trial and the right to a remedy. There is wide recognition of the public’s right to know about toxic chemicals in their environment.<sup>45,46</sup> In addition, the ILO’s Chemicals Convention (c.170) recognizes that workers have right to information about the hazards of chemicals used in the workplace, and employers have a duty to inform workers in this regard.<sup>47</sup> Under Article 17 of the CRC, State Parties “shall ensure that the child has access to information and material from a diversity of national and international sources, especially those aimed at the promotion of his or her ... physical and mental health.”

Phthalates are commonly used in plastic products; however, products are seldom labeled as containing phthalates, depriving consumers of their right to access to information.

### *Access to effective remedy*

Under Article 2 of the ICCPR, everyone has the right to an effective remedy for the violation of human rights. The third pillar of the UN Guiding Principles on Business and Human Rights is on the duty of governments to realize the right to an effective remedy, with several principles to aid in implementation.

For victims of adverse effects resulting from exposure to certain phthalates, accessing an effective remedy is fraught with obstacles. In fact, it is arduous to isolate one source of exposure, because of the ubiquitous nature of phthalates, and because adverse effects could appear after decades of exposure. It is furthermore almost impossible to track the products containing phthalates (especially those used in old housing tools), even though some are likely to contain the phthalates that are currently restricted. The understanding of “cocktail effect” of a multiple exposure being largely unexplored, the effects of phthalates are made even harder to identify, further complicating the access to effective remedy.





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### Workers Rights

In addition to the rights of workers mentioned previously, including the right to information, under Article 18 of ILO c.170 “[w]orkers shall have the right to remove themselves from danger resulting from the use of chemicals when they have reasonable justification to believe there is an imminent and serious risk to their safety or health.” In addition, workers also have the right to “information on the identity of chemicals used at work, the hazardous properties of such chemicals, precautionary measures, education and training.”

Concern for testicular effects, fertility, and toxicity to kidneys, has been expressed for workers<sup>48</sup> “on repeated exposure and developmental toxicity as a consequence of inhalation and dermal exposure during production, processing and industrial end-use of preparations or materials containing DEHP.”<sup>49</sup> Moreover, studies have been conducted on the possible association of testicular cancer with occupational exposure to PVC plastics, and a link between DEHP concentration in ambient air and the adverse effects in sperm motility and chromatin DNA integrity was shown in workers of a PVC pellet manufacturing plant.<sup>50</sup>

There is strong evidence of occupational exposure to certain phthalates during manufacturing of a wide variety of products, including the synthesis of industrial chemicals.<sup>51,52</sup>

Due to the diverse and diffuse use of phthalates in many products, workers exposed to these toxicants belong to a very large variety of industries not limited to workers of processing industries. For example professional drivers may be exposed to phthalates use in auto vehicles. All of these workers may not have access to appropriate information on the risks of phthalates exposure in occupational settings, nor resources to monitor exposure level in violation of their rights.

### Right to Food and Water

According to Article 25 of the Universal Declaration of Human Rights and Article 11 of CESCR “Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food”. The right to adequate food and water is established also in the Food and Agriculture Organization (FAO) Voluntary Guidelines to support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security,<sup>53</sup> and the “access to, and consumption of, adequate, safe and nutritious food” (emphasis added) has also found protection under the Food Assistance Convention.<sup>54</sup>



Phthalates have been broadly used in food packaging, and thus diet can be an important way of exposure. Because of the ubiquitous nature of phthalate contamination, it is complicated to accurately determine their levels in food by a laboratory.<sup>55</sup>

The metabolites of di-ethyl phthalate (DEP) were associated with tomato and potato consumption, while DEHP and MBP were respectively associated with poultry and meat related food<sup>56</sup> and with seafood in China.<sup>57</sup> DEHP can be detected in several foods products (highest levels were found in milk [31.4 mg/liter, fat basis] and cheese [35 mg/kg, fat basis] but also fish and cheese, and other packaged foods).<sup>58</sup>

Young people are often large packaged food consumers, and DEHP can contribute to cause them obesity and insulin resistance.<sup>59</sup>

Phthalates can also leach in water (rainwater, rivers, surface water near industrial areas) and were detected also in bottled water (*"bottled stored at 4°C contained higher levels of DMP, DEP, BBP and DEHP than those stored at room temperature and outdoors"*).<sup>60</sup>

Considering that there is no safe exposure level to phthalates<sup>61</sup>, the presence of these toxic contaminants in water and food, even at what could be considered low doses for other chemicals, constitutes a serious violation of the right to healthy food and water.

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