

## A Tragic Case Study in Hazardous Chemicals in Consumer Products

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The humidifier disinfectant tragedy in the Republic of Korea represents the largest number of deaths known to be caused by a home consumer product.<sup>1)</sup> The tragedy has been described as being “born of corporate complacency and institutional paralysis” and serves as a graphic case study on the harms of hazardous chemicals in products. The humidifier disinfectant tragedy provides important lessons on the need for greater industry responsibility and precautionary-based regulatory policies.<sup>2)</sup> If this tragedy could occur in the Republic of Korea, it could easily happen elsewhere, particularly in countries with weak regulatory infrastructure.

Humidifier disinfectants prevent and impede microbial growth in humidifiers. They are aerosolized during humidifier operation and inhaled, resulting in direct human exposure. In the Republic of Korea, sale of toxic products began in 2001 and subsequently killed more than 1000 people, mostly infants and their mothers.<sup>3)</sup> In 2017, the Ministry of Environment estimated that 3.5-4.0 million people were exposed to toxic humidifier disinfectants at home and that 490,000-560,000 people experienced health damage including pulmonary fibrosis, interstitial lung disease, and others.<sup>4-9)</sup> Investigations revealed the toxic chemical agents to include polyhexamethylene guanidine (PHMG), oligo(2-[2-ethoxy]ethoxyethyl) guanidinium chloride (PGH), methylisothiazolinone (MIT), and chloromethylisothiazolinone (CMIT).<sup>10)</sup>

The private sector has a responsibility to protect

the safety of consumers by eliminating hazardous chemicals and extending the most rigorous national regulatory standard to all countries globally. In contrast, Oxy Reckitt Benckiser exploited a double standard by legally selling toxic PHMG- and PGH-containing humidifier disinfectant products in the Republic of Korea even though they could not be sold for health and safety reasons in the UK, the location of the company’s headquarters. Scientific fraud compounded the problem as Korean prosecutors noted that the company rejected commissioned test results showing that the products were toxic and even bribed two researchers to exonerate the products.<sup>11)</sup> The company falsely marketed their toxic products as essential to hygiene and occupied about half of the humidifier disinfectant market.

A key chemical safety principle is that health and safety information should not be considered confidential business information but none of the humidifier disinfectant products were labeled to show their toxic chemical content.<sup>12)</sup> SK Chemicals (now known as SK Discovery) manufactured toxic chemicals for the products and in April 2019, the Ministry of Environment filed a complaint against the company for allegedly hiding evidence of the toxicity of CMIT and MIT in a study commissioned by the company and performed at Seoul National University.<sup>13)</sup>

While the internal decision-making processes at Reckitt Benckiser and SK Chemicals are not clear, the corporate decision-making surrounding the

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Received: 1 August 2019, Revised: 10 August 2019, Accepted: 13 August 2019

decisions to manufacture toxic chemicals has been studied using internal company documents for a case study involving US company, DuPont.<sup>14</sup> Researchers found that the company was aware of the toxicity of its product but decided to continue manufacturing it anyway counting on a low probability of getting caught and a very low probability of regulatory intervention.

The DuPont case study provides four recommendations that should be applied to humidifier disinfectant producers and other manufacturers that use hazardous chemicals in products: 1) establish government policies that protect and promote whistleblowing by company employees; 2) penalize gag settlements that keep matters confidential; 3) penalize delays in action so that penalties are more consistent with the economic benefits the company has gained from sales of its toxic product; and 4) allocate responsibility by prosecuting high-level managers and executives. Note that in the Republic of Korea consumers cannot request punitive damages from companies in lawsuits 0 a practice that functions as a financial deterrent on corporate irresponsibility and should be implemented in the country.<sup>15</sup>

At the time the toxic humidifier disinfectants entered the market, there was no regulatory requirement to provide toxicity data, despite its likelihood of inhalation exposure.<sup>16</sup> The regulatory response to the humidifier disinfectant tragedy in the Republic of Korea has been to enact K-REACH in 2015 with revisions in 2017 and 2018 (Act on the Registration and Evaluation of Chemical Substances or ARECS)<sup>17</sup> and the Consumer Chemical Products and Biocides Safety Act (K-BPR) in 2018.<sup>18</sup> The ability of these regulations to prevent another humidifier disinfectant tragedy has not been fully evaluated, however they did not prevent another dangerous consumer product from entering the market.

In 2018, Daijin Bed was found to be selling mattresses emitting carcinogenic radon at nine times the safety limit, but claiming alleged health benefits from “negative ions”.<sup>19</sup> The problem was discovered

by a mother who was monitoring home air quality because her son had been born with weak lungs.<sup>20</sup> Daijin later recalled over 40,000 toxic mattresses. In 2019, Sealy, an international mattress manufacturer, recalled 500 radon-emitting mattresses which apparently were only made in the Republic of Korea - not at the company’s US headquarters.<sup>21</sup> Daijin also followed the script established previously by Reckitt Benckiser by refusing to compensate consumers that had purchased its radon-containing mattresses.<sup>22</sup>

Preventive regulatory mechanisms require comprehensive toxicity information on product ingredients before permitting entry to the market; a mandate for full ingredient disclosure to the public; standards that protect the most vulnerable populations; placing the burden of demonstrating product safety on the private sector, not the government; and use of stiff, enforced financial and criminal penalties for non-compliance.<sup>23</sup>

Sixty-two percent of industrial substances are estimated to be toxic but only a fraction has been thoroughly evaluated to determine their impacts on human health and the environment.<sup>12</sup> Companies have a clear responsibility to know about the chemicals in their products and to actively engage in implementing safer substitutes. A corporate strategy for active disclosure and substitution provides advantages to companies in the form of reducing hidden liabilities, avoiding chemical-by-chemical crisis management, and enhancing brand reputation and generating long-term value.<sup>24</sup>

The externalized human cost of the humidifier disinfectant tragedy is severe and ongoing. Only 3 diseases have been accepted as damages related to humidifier disinfectants: lung injury, fetal damage and asthma. As of 26 July 2019, only 835 cases have been recognized as victims officially by the South Korean government.<sup>3</sup> These include 484 cases of lung injury, 27 cases of fetal damage, and 341 cases of asthma (17 cases duplicated).<sup>3</sup> The vast majority of victims are still “undecided” or

decided as “not victims” by the government for compensation, including over 1,000 people that have already died.<sup>3)</sup>

The humidifier disinfectant tragedy stands as an icon of industry irresponsibility and a warning to all countries about the importance of accountability and precautionary action.

## References

- Kim P, Leem JH. The humidifier disinfectant scandal: the need for vigorous government oversight of chemicals and household chemicals and household products to secure public safety. *Environmental Health and Toxicology*. 2016; 31. Available: <https://www.e-eh.org/journal/view.php?number=764>
- Ahn JJ. The humidifier disinfectant incident and the self-examination of environmental toxicology and public health experts. *Environmental Health and Toxicology*. 2015; 30.
- Korea Environmental Industry & Technology Institute. Comprehensive portal for humidifier disinfectant damage support: Statistics. Available: <https://www.healthrelief.or.kr/home/content/stats01/view.do>
- Republic of Korea. Establishing disease identification and standards criteria to expand the range of health hazards caused by the humidifier sterilizer. *Ministry of Environment*. 2017. NIER-SP2016-429. Available: <http://library.me.go.kr/search/DetailView.ax?cid=5638910>
- Nemery B, Hoet PH. Humidifier disinfectant-associated interstitial lung disease and the ardstyl syndrome. *American Journal of Respiratory and Critical Care Medicine*. 2015; 191: 116-117.
- Deterding RR, White CW. Humidifier and environmental “chILD” risks. *American Journal of Respiratory and Critical Care Medicine*. 2014; 189: 10-12.
- Choi Y, Park D. Humidifier disinfectants, unfinished stories. *Environmental Health and Toxicology*. 2016; 31.
- Kim S, Paek D. Humidifier disinfectant disaster: what is known and what needs to be clarified. *Environmental Health and Toxicology*. 2016; 31.
- Park K. An analysis of a humidifier disinfectant case from a toxicological perspective. *Environmental Health and Toxicology*. 2016; 31.
- Leem HJ, Lee JH. Humidifier disinfectant-associated specific diseases should be called together as “humidifier disinfectant syndrome”. *Environmental Health and Toxicology*. 2017; 32. Available: <https://www.e-eh.org/journal/view.php?number=796>
- Chaudhuri S. Reckitt Benckiser apologizes for disinfectant deaths. *Wall Street Journal*. September 21, 2016. Available: <https://www.wsj.com/articles/reckitt-benckiser-struggles-to-move-past-disinfectant-deaths-1474480171>
- Human Rights Council. Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes. Başkut Tuncak. *Human Rights Council*. 2015. A\_HRC\_30\_40\_ENG
- Bahk EJ. SK Chemicals accused of hiding evidence on toxicity of humidifier disinfectant. *Korea Times*. 19 April 2019. Available: [https://www.koreatimes.co.kr/www/nation/2019/04/251\\_267412.html](https://www.koreatimes.co.kr/www/nation/2019/04/251_267412.html)
- Shapira R, Zingales L. Is pollution value maximizing? The DuPont Case. Working paper series No. 13. Stigler Center for the Study of the Economy and the State. *University of Chicago Booth School of Business*. 2017.
- Choe SH. South Korea targets executives, pressed by an angry public. *New York Times*. July 4, 2016. Available: <https://www.nytimes.com/2016/07/05/business/dealbook/south-korea-targets-executives-pressed-by-an-angry-public.html>
- Lee JH. What must be done to prevent another humidifier disinfectant disaster? *Environmental Health and Toxicology*. 2016; 31.
- Korea Law Translation Center. Act on Registration, Evaluation, etc. of Chemicals. Available: [https://elaw.klri.re.kr/kor\\_mobile/viewer.do?hseq=48870&type=sogan&key=16](https://elaw.klri.re.kr/kor_mobile/viewer.do?hseq=48870&type=sogan&key=16) [accessed 28 July 2019].
- Korea Ministry of Government Legislation. National Law Information Center. Safety of Household Chemical Products and Biocidal Products Act. Available: <http://www.law.go.kr/lsInfoP.do?lsiSeq=202779&efYd=20190101#0000> [accessed 28 July 2019].
- Lee SY. Household products in South Korea under scrutiny for radioactive emissions. *Korea Times*. May 25, 2018. Available: [http://www.koreatimes.co.kr/www/news/nation/2018/05/119\\_249554.html](http://www.koreatimes.co.kr/www/news/nation/2018/05/119_249554.html)
- Seo JE, Song KS, Bulley J. Radioactive mattresses. *Korea Joongang Daily*. July 9, 2018. Available: <http://koreajoongangdaily.joins.com/news/article/article.aspx?aid=3050350>
- Yang YH, Choi M. Sealy Korea recalls 500 radon-emitting mattresses. *Pulse News*. February 15, 2019. Available: <https://pulsenews.co.kr/view.php?year=>

- 2019&no=94173
22. Yonhap News. Maker of radon-emitting mattresses refuses state arbitration decision. *Yonhap News*. December 9, 2018. Available: <http://www.koreaherald.com/view.php?ud=20181209000131>
  23. Kim S, Im S, Choi Y, Park S, Hyun J, Lee KS, Lee S, Lee SL, Seo J, Kim JH, Na H, Kim M. A call for action from workers, local residents, and consumers: a safe society from toxic chemicals. *Environmental Health and Toxicology*. 2016; 31.
  24. UN Environment. The business case for knowing chemicals in products and supply chains. *UN Environment*. 2014. Available: [https://www.cleanproduction.org/images/ee\\_images/uploads/resources/UNEP\\_BusinessCaseForChemicalsInProducts\\_English\\_final.pdf](https://www.cleanproduction.org/images/ee_images/uploads/resources/UNEP_BusinessCaseForChemicalsInProducts_English_final.pdf)