Policy Brief: Improving Indoor Air Quality through Mitigating Cleaning Product Impacts

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1 - InChildHealth

The InChildHealth project highlights the importance of prioritizing the health of children within indoor environments, aligning with current policy efforts to improve indoor air quality. Children are particularly susceptible to the effects of poor air quality due to their developing respiratory systems and higher exposure levels in school settings. By integrating insights from InChildHealth, this policy brief highlights the critical need to mitigate the impact of cleaning products in educational and public spaces. The project advocates for safer indoor environments, promoting strategies that limit exposure to harmful chemicals known to exacerbate respiratory conditions in children. By bridging scientific research and policy recommendations, InChildHealth's contributions ensure that measures to optimize cleaning practices and improve air quality are informed by comprehensive health assessments and evidence-based strategies tailored to the needs of vulnerable populations.

2 - Problem Statement

The extensive use of cleaning agents and chemicals, particularly heightened during the COVID-19 pandemic, has raised serious concerns about their adverse impacts on indoor air quality and human exposure. Cleaning agents can contain harmful components such as surfactants, acids, bases, carcinogens, and endocrine disruptors. They contribute significantly to indoor pollution through volatile and semi-volatile organic compounds ((S)VOCs), particulate matter (PM), and other contaminants. These pollutants increase exposure risks, potentially leading to respiratory symptoms and diseases like asthma and rhinitis and aggravating existing health conditions. Vulnerable groups, including professional cleaners and children who spend significant time indoors, are especially at risk. Addressing these toxicological effects is vital for healthier indoor environments and safeguarding these populations from negative health outcomes.

Project funded by

Funded by the European Union

UK Research and Innovation

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

Australian Government
National Health and Medical Research Council

NHMRC

Funded by the European Union (grant agreement 101056883). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Health and Digital Executive Agency (HaDEA). Neither the European Union nor the granting authority can be held responsible for them. InChildHealth is also receiving funding from the Swiss State Secretariat for Education, Research and Innovation (SERI grant agreement 22.00324), from the United Kingdom Research and Innovation (UKRI grant agreement 10040524), and from the Australian National Health & Medical Research Council (NHMRC grant agreements APP2017786 and APP2008813).

For example, the practice of floor mopping using diverse commercial cleaning products, including those infused with fragrances, influences indoor VOC and particle levels heavily. Strong oxidants in these products can initiate the formation of secondary organic aerosols (SOA) and sharply increase nanoparticle concentrations. Rigorous validation of cleaning products and processes remains crucial for effectively providing clean and health-promoting indoor spaces without compromising indoor air quality. Additionally, commonly held views such as 'the cleaner the healthier' have led to antimicrobial cleaning approaches focusing on eliminating microbes. However, research suggests that microbes persist, adapt, and re-establish post-cleaning, indicating the potential for probiotic cleaning systems that curate indoor microbiomes for health promotion rather than aiming at eliminating them.

3 - Current situation of knowledge and measures implemented

Cleaning products contain a complex mix of chemicals, including carbonyls, glycol ethers, hydrocarbons, detergents, fragrances, pH stabilizers, and solvents, classified as hazardous by the European Union. Their usage surged during the COVID-19 pandemic globally, leading to increased exposure concerns. Disinfectants with active ingredients such as quaternary ammonium compounds, hydrogen peroxide, bleach, and alcohols were extensively used against the spread of SARS-CoV-2, raising alarm over indoor air quality due to emissions of primary and secondary pollutants. These pollutants are associated with health risks like respiratory damage, asthma, and chronic obstructive pulmonary disease (COPD), particularly affecting children due to their higher breathing rates and exposure-prone behaviors. To tackle these issues, efforts have focused on optimizing cleaning practices, improving ventilation, and enhancing the safety of cleaning products through better labeling and consumer education. Despite these efforts, continuous monitoring and rigorous validation are essential to mitigate adverse impacts on indoor air quality and to protect human health.

4 – Policy recommendations

To reduce exposure to harmful chemicals from cleaning products, the following measures are proposed:

- Minimize the use of harmful chemicals by selecting ready-to-use cleaning products that prioritize safer alternatives, such as peroxides rather than bleach. Explore non-chemical disinfection methods to reduce the release of volatile organic compounds and particulates into the indoor environment. Limit the use of harmful disinfectants to essential situations, applying appropriate caution to prevent unnecessary exposure to potentially toxic chemicals and safeguard indoor air quality.
- Schedule cleaning activities when spaces are unoccupied to minimize exposure risks. Ensure enhanced ventilation during and after cleaning to effectively reduce emitted pollutants and maintain indoor air quality.
- Ensure that cleaning equipment is promptly removed from occupied areas post-use and properly stored and maintained, to maintain their efficacy and reduce potential exposure to residual chemicals.
- Provide and use appropriate protective equipment, including gloves, protective clothing, and respiratory masks, to safeguard cleaning personnel and occupants.
- Conduct educational campaigns targeted at cleaners, healthcare workers, and consumers to raise awareness about the health risks associated with chemical exposure and promote safer cleaning practices.
- Improve the accuracy of safety data sheets and product labels, providing users with clearer information to make informed choices regarding the safe use of cleaning and disinfecting products.

- Encourage partnerships between the scientific community and health organizations to develop and improve guidelines and regulations, ensuring that cleaning practices align with the latest research and safety standards.
- Adhere to manufacturers' instructions regarding the dilution and use of cleaning agents to maintain their effectiveness while minimizing health risks.

5 - Future Research Directions

- The emission behavior of cleaning chemicals.
- Health impact mechanisms, especially for sprayed products.
- The effects of greener cleaning alternatives on cleaning efficiency, exposure, and health.
- The use of probiotic cleaning and hygiene systems to control indoor microbiomes and reduce chemical loads.
- The application of water-only cleaning for routine maintenance of surface cleanliness, as an effective and environmentally friendly alternative to using detergents.

6 – Conclusion

By implementing optimized cleaning practices and raising awareness of chemical hazards, we can significantly mitigate the negative impacts of cleaning on indoor air quality and public health, while at the same time addressing sustainability concerns. Collaborative efforts and improved product labelling will support healthier environments in both residential and public buildings. Use of validated products and procedures, combined with education for cleaning staff and building users and proper commissioning, ensures safe building operation and maintenance.

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Acknowledgement

This document has been created for the InChildHealth project. Funded by the European Union (grant agreement 101056883). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Health and Digital Executive Agency (HaDEA). Neither the European Union nor the granting authority can be held responsible for them. InChildHealth is also receiving funding from the Swiss State Secretariat for Education, Research and Innovation (SERI grant agreement 22.00324), from the United Kingdom Research and Innovation (UKRI grant agreement 10040524), and from the Australian National Health & Medical Research Council (NHMRC grant agreements APP2017786 and APP2008813).