WHOSE JURISDICTION IS HOME CONTAMINATION? PARA-OCCUPATIONAL ‘TAKE-HOME’ HERBICIDE RESIDUE EXPOSURE RISKS AMONGST FORESTRY WORKER’S FAMILIES IN SOUTH AFRICA
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Introduction

- Herbicides are used to eradicate and manage invasive alien plant species
- Unintentional exposure to residues may be harmful to other non-target organisms (e.g., humans who work with or come into contact with residues)
- Worker’s families, in particular, may be exposed to herbicide residues through the para-occupational ‘take-home’ exposure pathway
  - Para-occupational ‘take-home’ exposure has been defined as indirect exposure that occurs when workers unintentionally transport pesticide residues on their skin, hair, clothing, shoes and vehicles from the workplace into their homes.
- This is concerning as research is increasingly showing the association between herbicide exposure, including low dose exposure, and the development of adverse health effects.

Research Aim & Objectives

- To aim of the study was to determine whether the families of workers in the Working for Water programme are at risk of exposure to ‘take-home’ herbicide residues transported from the workplace to the home on worker’s Personal Protective Equipment (PPE).
- The study objectives were as follows:
  o To assess the extent of ‘take-home’ herbicide residue exposure risks in the homes of Workers for Water workers
  o To document the different types of workers’ practices, related to their care of Personal Protective Equipment (PPE) that may be risk factors for ‘take-home’ exposure
  o To identify the determinants of exposure to residues for workers’ families and household members at risk of exposure
  o To provide recommendations for the prevention and management of ‘take-home’ exposures.

Methods

- Study design: Qualitative research design
- Participant recruitment: Recruited Working for Water (WfW) programme forestry workers from four worksites (See Table 1)

Table 1: Study participant demographics by research site

<table>
<thead>
<tr>
<th>Research Site</th>
<th>Participates (N=37)</th>
<th>Sex</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrusdal</td>
<td>11</td>
<td>Males = 5</td>
<td>females = 6</td>
</tr>
<tr>
<td>Grootfontein (de Hoek estate)</td>
<td>10</td>
<td>Males = 4</td>
<td>females = 6</td>
</tr>
<tr>
<td>Laapies River</td>
<td>8</td>
<td>Males = 1</td>
<td>females = 7</td>
</tr>
<tr>
<td>Westlake</td>
<td>8</td>
<td>Males = 3</td>
<td>females = 5</td>
</tr>
</tbody>
</table>

- Data collection: Photovoice methods; participants photographed their families ‘take-home’ exposure risks using disposal cameras composed of 27 exposures. Conducted documentary review of existing WfW programme policies and regulations.
- Data analysis: Participatory analysis of selected photographs depicting ‘take-home’ exposures during Focus Group Discussions. Thematic analysis was used to analyse emerging data; data was coded, organised and sorted into themes in Nivo 11.

Results

- The main finding of the documentary review was the lack of comprehensive workplace policies; WfW programme documents were specifically aimed at reducing occupational exposure risks and none encompassed practices related to the reduction of ‘take-home’ herbicide exposure risks.
- The emerging themes through Photovoice methods were:
  - Working Conditions
    - Forest and residential areas
    - Transient nature of work
    - Absence of hygiene facilities (e.g., showers) at worksites
  - Working conditions impacted on their ability to carry out hygiene practices at work.

- Workplace Practices
  - The majority of female workers wore full PPE compared to male workers.
  - Dermal exposure to herbicides; residues transported to worker’s homes on their skin.
  - Respiratory route of exposure; none of the workers wore respirators.

- After Work Behaviours
  - Workers wore PPE (e.g., boots) inside the home.
  - This resulted in surfaces in the home being contaminated.
  - Some workers did not change or shower immediately after work.
  - “Some days it is too hot to wash your body right after work because one is just sweating too much.”

- Living Conditions
  - Informal homes, made of corrugated iron sheets and cardboard.
  - Space constraints in worker’s homes (e.g., washed laundry outside). “We do not have drains or flush toilets so dirty water from washing PPE is thrown in refuse piles or holes around the home.”
  - Poor quality of washing facilities.

- Home Hygiene Practices
  - Laundry practices
    - All workers washed their PPE, including contaminated PPE, at home.
    - Some workers mixed PPE with household laundry. “Washing PPE separately means many trips to fetch water and this is tedious as the water point is very far away.”
  - Drying practices
    - Participants held the view that drying or storing PPE with household laundry did not pose a risk; they were not aware that residues may remain on washed PPE.
  - Storage practices
    - PPE is placed in the cupboard after washing because the assumption is that it has been cleaned and free of residue.

Discussion

- Lack of policy support
  - Noted the absence of provisions related to the control and regulation ‘take-home’ exposure risks in the existing South African legislation (See Table 2). This may have resulted in the omission of information related to ‘take-home’ exposure risks in WfW policies and regulations.

Table 2: Comparison of international (i.e., United States) and national legislative provisions for occupational and non-occupational exposure

<table>
<thead>
<tr>
<th>Key Legislative Provisions</th>
<th>United States</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Exposure (Protection of worker)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-occupational Exposure (Protection of worker’s families)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Worker’s Families Protection Act (1962)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Environmental Protection Agency, Agricultural Worker Protection Standard</td>
<td>(2015)</td>
<td></td>
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</tbody>
</table>

- Residues bearing practices
  - Observed a direct link between worker’s practices at work and the risk ‘take-home’ herbicide residue exposure amongst their families.
  - Over and above training, contextual and structural factors (e.g., absence of hygiene facilities) influenced worker’s practices.
  - Complexities involved in changing worker’s after work behaviours and home hygiene practices.

- Unfavorable living conditions
  - Worker’s living conditions limited their ability to effectively carry out practices that may have contributed to reducing ‘take-home’ exposure risks.

Conclusions & Recommendations

- This study demonstrated evidence related to workers’ ‘taking-home’ herbicide residues and exposing their families to potential health risks from low-dose exposures.
- Study findings also suggest that the toxicity of herbicides remains an issue which needs to be assessed when registering herbicides, especially in light of the evidence of ‘take-home’ herbicide exposure risks in this study.
- Recommend that interventions aimed at reducing ‘take-home’ exposure be primarily targeted at the workplace, especially in low-and-middle income countries. Secondly, that integrated approaches be employed in order to prevent and reduce ‘take-home’ exposure risks.

Acknowledgments

- WfW forestry workers for their valuable contributions in this study.
- Fieldworkers who assisted during briefing sessions and photovoice focus group discussions with study participants.