



Personal protective equipment used as sampling
methods to assess exposure to bioburden.

An added value to be considered?

Carla Viegas

Marta Dias, Beatriz Almeida and Elisabete Carolino



Outline

1. Background

2. Materials and methods

3. Results

4. Main findings discussion

5. Preliminary results from different assays



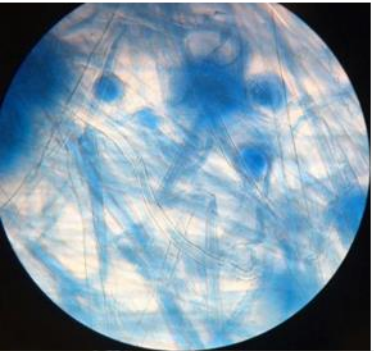
1. Background

- Waste from non-biodegradable materials is sorted in waste sorting units to produce dry recyclables raw materials, leading to direct access and exposure of workers to waste and its contaminants.

(Park et al. 2011)

- The organic residues present in waste serve as a substrate for **numerous microorganisms**, **increasing workers' exposure to microbial contaminants**, with previous studies associating **health risks** with these environments.

(Heldal et al. 2003; Hambach et al. 2012; Černá et al. 2017).

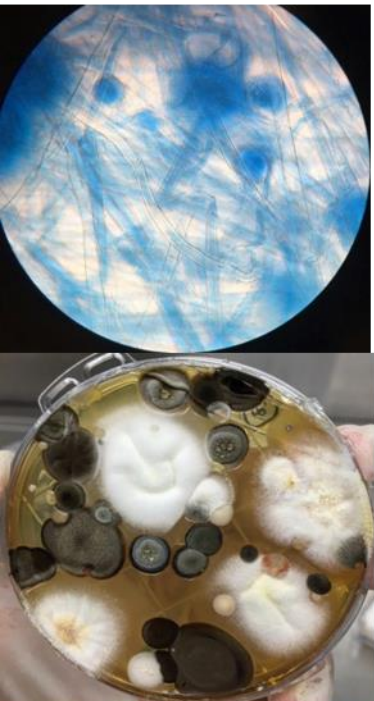


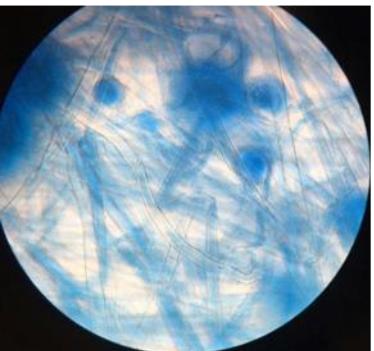


In Portugal, mechanical protection gloves (MPG) are of mandatory use.

During their use, sweat is released and, consequently, the humidity of the material increases. Additionally, the temperature inside the glove leads to conditions favorable to the growth of microorganisms.

(Majchrzycka et al. 2016)





2. Materials and methods

67 MPG

Passive Sampling



Workstations



Tasks



MPG number

FMW	Feeding machines with waste	9
SW	Sorting waste	40
MI	Machines inspection	10
MSVO	Machines and special vehicles operator	8
Total	-----	67

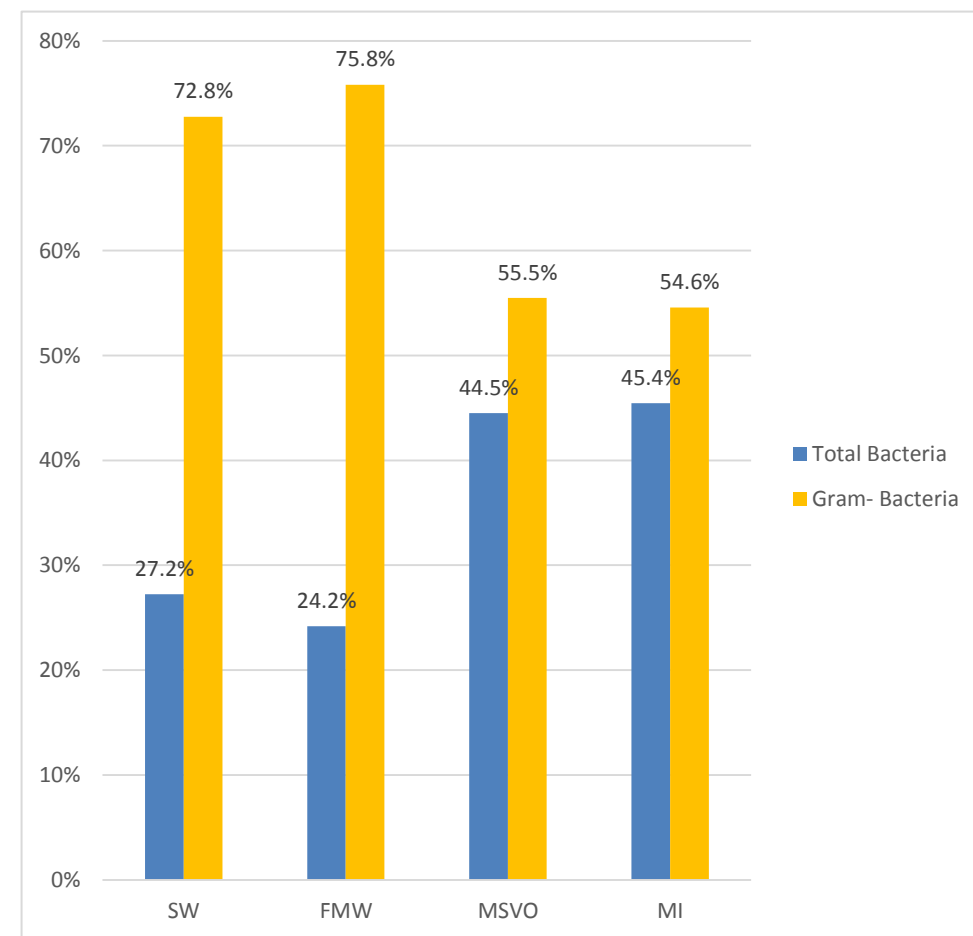


- Azole resistance screening
- Toxigenic fungal strains (*Aspergillus* sections *Flavi* , *Versicolores*, *Circumdati* and *Fumigati*)
- Cell viability was determined in swine kidney (SK) monolayer and hepatocellular carcinoma (Hep G2) cell lines
- Mycotoxins



3. Results - Bacterial contamination

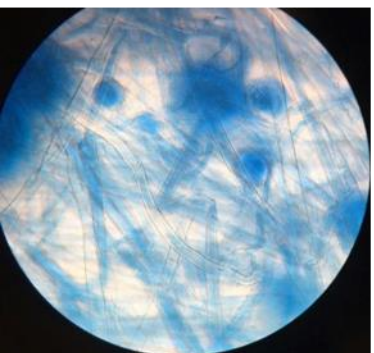
- All MPG samples presented bacterial contamination.
- Total bacteria: only two samples presented no contamination (97.02%); Range (0 to 4.15×10^5 CFU.m⁻²)
- Gram-: all samples showed contamination (100%); Range (2.00×10^3 to 5.04×10^6 CFU.m⁻²)
- SW and FMW higher prevalence of Gram-bacteria.



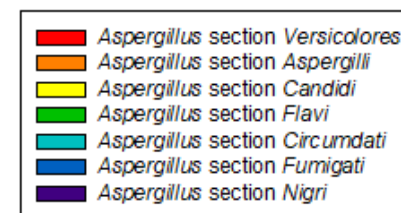
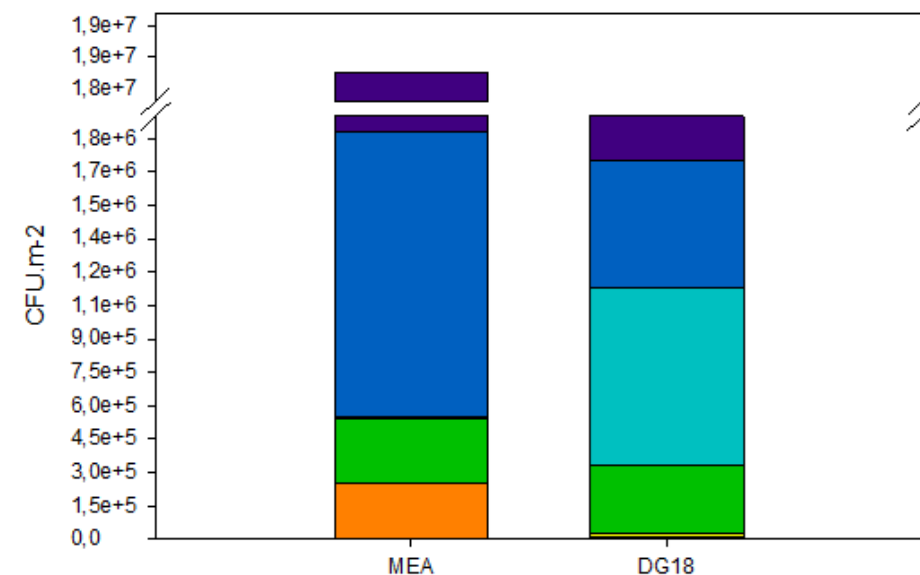


3. Results - Fungal contamination

- The fungal contamination in the MPG samples ranged from 0 in both MEA and DG18, to 5.09×10^6 and 2.75×10^6 CFU.m⁻², respectively.
- Seven different fungal species were found in the MPG samples in MEA.
- The most commonly found was *Aspergillus* spp. (50.46%), followed by *Mucor* spp. (37.88%) and *Penicillium* spp. (9.43%).
- Wearing time influence fungal counts on MEA



Aspergillus sections observed in each media (submitted elsewhere)





The results highlight the occupational concern regarding the exposure to microbiologic agents.

- Employers are obliged to assess and control the risks due to biological agent's exposure.
- Among the measures that can minimize exposure is the use of appropriate personal protective equipment, such as MPG.

(Directive 2000/54/EC)

- The workstations where the workers contact more with waste (FMW and SW) were the ones with increased microbial contamination found on MPG.

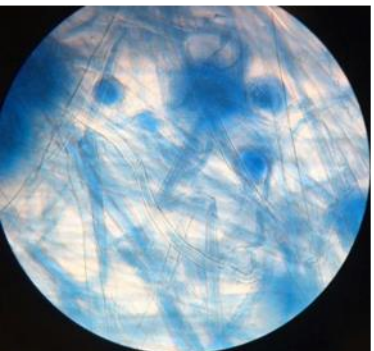


- (Institute of Medicine 2004; Viegas et al. 2019; 2020)

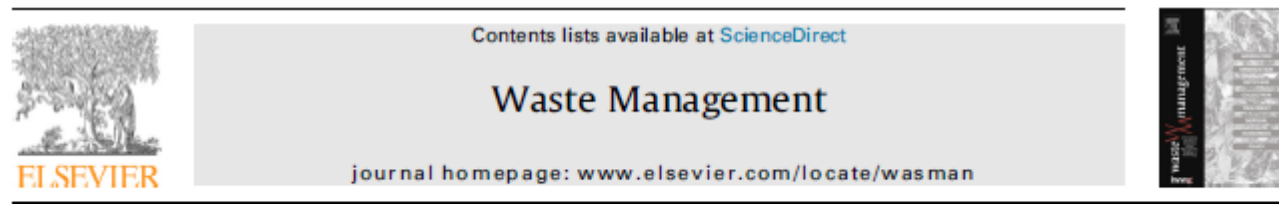
MPG can be used as:



- passive methods to assess occupational exposure to bioburden
- screening method to decide what workstations we should start performing personal exposure assessments.



MPG bioburden contamination is mimicking the environment contamination



Are workers from waste sorting industry really protected by wearing Filtering Respiratory Protective Devices? The gap between the myth and reality



Carla Viegas^{a,b,*}, Marta Dias^a, Beatriz Almeida^a, Liliana Aranha Caetano^{a,c}, Elisabete Carolino^a, Anita Quintal Gomes^{a,d}, Magdalena Twarużek^e, Robert Kosicki^e, Jan Grajewski^e, Geneviève Marchand^f, Susana Viegas^{a,b}



The results allowed to:

- Occupational Health services to prioritize the workstations where the protection equipment replace frequency should be increased.
- Inform workers about the results to easier behavior changes for hygienic measures compliance.

(Viegas et al. 2020)

Ann. Occup. Hyg., 2016, Vol. 60, No. 7, 812–824
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BOHS
The Chartered Society for
Worker Health Protection

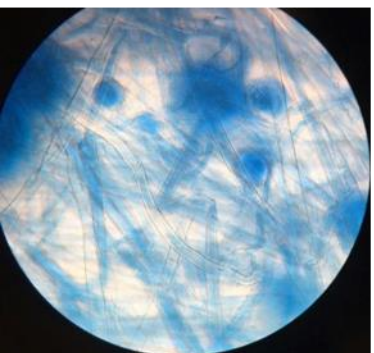


Feedback on Measured Dust Concentrations Reduces Exposure Levels Among Farmers

Ioannis Basinas^{1*}, Torben Sigsgaard¹, Jakob Hjort Bønløkke¹,
Nils Testrup Andersen¹, Øyvind Omland^{2,3}, Hans Kromhout⁴⁺ and
Vivi Schlünssen^{1,5+}



- *Aspergillus* sections with toxigenic and azole resistance potential were observed.
- Mycotoxins exposure through ingestion route by hand-mouth contact is possible.
- Cytotoxic potential affecting hepatic cells more than renal cells was observed.
- Workers can have health effects due to the contamination found on MPG.



Thanks for your attention!

Acknowledgments

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