

# Fungal contamination of poultres litter: A public health problem

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A vertical strip on the left side of the slide shows a microscopic view of a fungus, likely a mold, with a prominent circular structure and branching filaments.

# INTRODUCTION

Exposure to certain fungi can cause human illness. Fungi cause adverse human health effects through three specific mechanisms:

- generation of a harmful immune response (eg, allergy or hypersensitivity pneumonitis);
- direct infection by the fungal organism;
- by toxic-irritant effects from mold byproducts, such as mycotoxins.

# INTRODUCTION

In Portugal there is an increasingly industry of large facilities that produce whole chickens for domestic consumption and only few investigations have reported on fungal contamination of the poultry litter.

(Ambu et al. 2004, Kotimaa et al. 1991)



# INTRODUCTION

The material used for poultry litter is varied but normally can be constitute by:

- pine shavings;
- sawdust of eucalyptus;
- other types of wood;
- peanut;
- coffee;
- sugar cane;
- straw;
- hay;
- grass;
- paper processed.

# INTRODUCTION

Litter is one of the most contributive factors to fungal contamination in poultries.

(HSE, 2008; Just et al. 2009; Williams, 2009)

Spreading litter is one of the tasks that normally involve higher exposure of the poultry workers to dust, fungi and their metabolites, such as VOC's and mycotoxins.

(White, 2010; Milner, 2009; Tsapko et al., 2011)





# INTRODUCTION

After being used and removed from poultries, litter is ploughed into agricultural soils, being this practice potentially dangerous for the soil environment, as well for both humans and animals.

(Anbu et al. 2004)

**The goal of this study was to characterize litter's fungal contamination and also to report the incidence of keratinophilic and toxigenic fungi.**

# MATERIALS AND METHODS

## Poultry farms

Selected farms were dedicated to broiler chicken production, where birds are bred to reach slaughter weight as rapidly as possible.



# MATERIALS AND METHODS

## Samples collection, preparation and analyses

- Each litter sample was diluted in 100 mL of sterilized distilled water, agitated and 0.2 mL of this suspension was spread onto triplicate Petri dishes containing malt extract agar (2%) with cloramphenicol (0.05 g/L) and incubated during 5–7 days at 27.5 °C.
- Results were reported as the average count of the three replicas, in colony forming unit per gram of litter (CFU/g). Isolated fungi were identified to the species level.



# MATERIALS AND METHODS

Table 1 – Litter samples collected

Litter type	New	Used
Pine shavings	2	4
Straw	2	2
Wood shavings with rice hulls	2	6
Wood shavings	1	2
Total	7	14

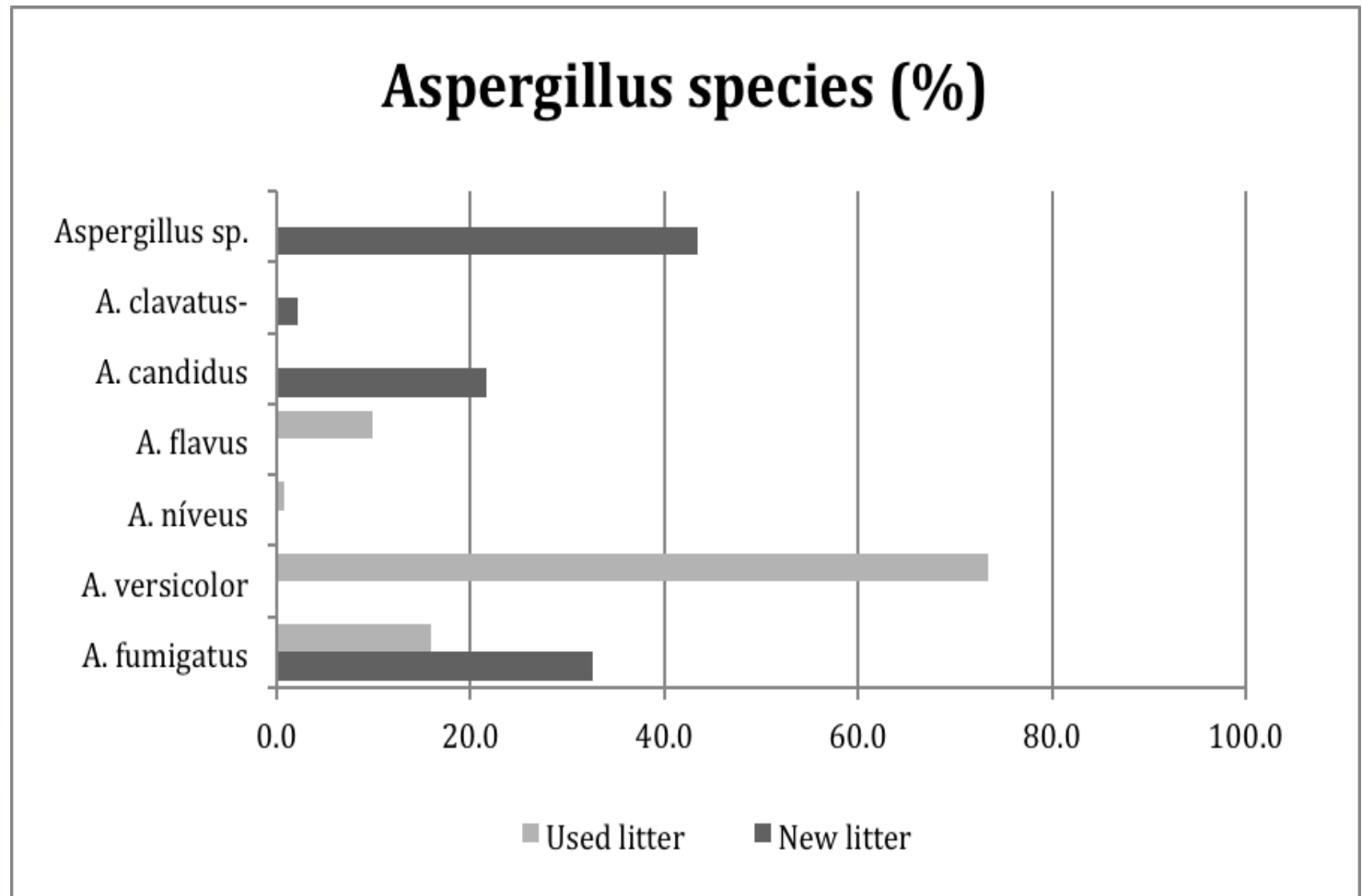
# RESULTS

Table 2 – Most frequent fungi genus isolated in new and used poultries litter

<b>Fungi - New litter</b>	<b>Frequency (N; %)</b>
<i>Penicillium</i> sp.	482500; 59.9
<i>Alternaria</i> sp.	73000; 17.8
<i>Cladosporium</i> sp.	57000; 7.1
<i>Aspergillus</i> sp.	20000; 5.7
Others	173000; 9.5
<b>Fungi - Used litter</b>	<b>Frequency (N; %)</b>
<i>Penicillium</i> sp.	962500; 42.3
<i>Scopulariopsis</i> sp.	871000; 38.3
<i>Trichosporon</i> sp.	200000; 8.8
<i>Aspergillus</i> sp.	126000; 5.5
Others	117000; 5.1

# RESULTS

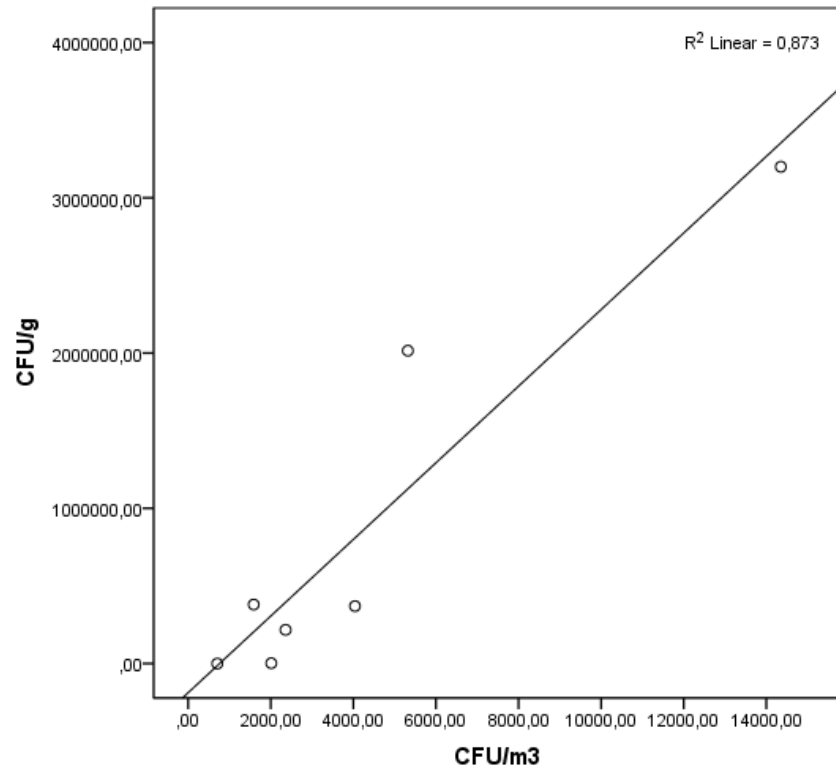
Figure 1 - *Aspergillus* species incidences in new and used litter



# RESULTS

Correlation of litter fungal contamination (CFU/g) and air fungal contamination (CFU/m<sup>3</sup>) shows a strong positive correlation and statistically significant. **Litter fungal contamination contributes 87.3% to the explanation of the air fungal contamination.**

Figure 3 - Scatterplot for air fungal contamination (CFU/m<sup>3</sup>) and litter fungal contamination (CFU/g)





# DISCUSSION

- Surfaces sampling, in addition to air sampling, is essential to achieve the fungal contamination characterization and evaluation, and can be used to identify contamination sources.

(Stetzenbach et al. 2004; Klánová and Hollerová, 2003)

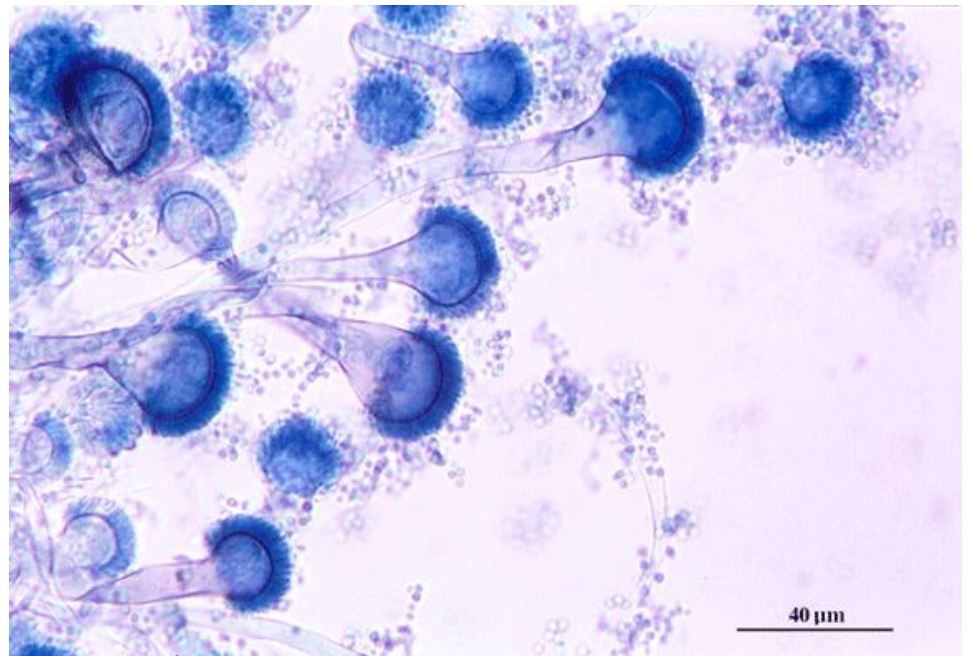
- Litter is one of the most contributive factors to fungal contamination in poultries and its analysis is crucial to evaluate occupational and public health risks.

(HSE, 2008; Just et al. 2009; Williams, 2009)

# DISCUSSION

- Some of the fungal species found in our study are potential agents of infection in human beings and animals, such as *Scopulariopsis* sp., *Fusarium* sp. and *Aspergillus* sp..

(Ponikau et al. 1999; Tosti et al. 1996; Ghannoum et al. 2000; Araújo et al. 2003)





## DISCUSSION

- *Penicillium sp.*, *Aspergillus sp.*, and also *Scopulariopsis sp.* genus were the most common fungi in air and also in the analyzed litter.
- This situation maybe be due to the litter spreading, normally involving high dust aerosolization, and consequently, also high spreading of fungi and their metabolites, such as VOC's and mycotoxins .

(White, 2010; Milner, 2009; Tsapko et al. 2011)

# DISCUSSION

- Regarding the *Aspergillus* genus, different species were isolated in both new and used litter.
- Confirmed presence of the species *Aspergillus flavus* and *Aspergillus fumigatus*, requires implementation of corrective measures. Both species were identified in litter, which shows the relevance of this study.

(AIHA, 1996)





## DISCUSSION

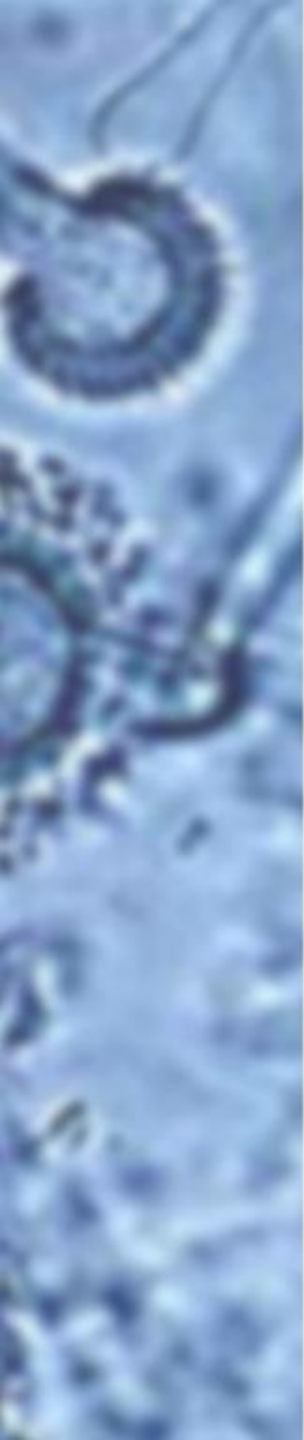
- Corroborating the indoor aerosolization of the fungi isolated in litter, we found a correlation of litter fungal contamination (CFU/g) and air fungal contamination (CFU/m<sup>3</sup>)

**Proving that litter from analyzed poultries is a source of indoor fungal contamination.**



## CONCLUSIONS

Spreading of poultry litter in agricultural fields is a potential public health concern, since keratinophilic (*Scopulariopsis* and *Fusarium* genus) as well as toxigenic fungi (*Aspergillus*, *Fusarium* and *Penicillium* genus) were isolated.



**Thank you for your attention**