Exposure to particles in veterinary clinical practice – Exploratory study

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ABSTRACT
Several papers have reported that livestock workers have an increased risk of developing respiratory diseases as a result of chronic inhalation exposure to organic dust in farm animal production facilities. However, for veterinarians most of the published studies are related with zoonoses and only a few papers have been dedicated to occupational health in small-animal veterinary practices. An exploratory study was developed aiming to perform a first assessment in the particles contamination and to identify the presence of other risk factors that should be tackled in future studies. Results showed that 0.3 µm particles have higher counts with statistically significant differences when compared with the other sizes and 10.0 µm particles obtained the lowest counts. The location in the clinic with higher contamination was the treatment, preparation and recover room. Important to consider that smaller particles presented the higher counts and this can imply local and systemic health effects in workers due to the capacity of these particles to reach alveoli. Moreover, particles may act as a carrier and a source of nutrients for fungi and bacteria and their metabolites such as endotoxins and mycotoxins. This exploratory study allowed to conclude that additional studies focused on several contaminants are needed in this occupational environment. Additionally, the number of animals and tasks performed seems to influence particles contamination and, probably, the presence of others risk factors.

KEYWORDS: veterinary clinical practice, occupational health, particles exposure

1. INTRODUCTION

Several papers already reported that livestock workers have an increased risk of developing respiratory diseases, such as asthma-like syndrome, rhinosinusitis, hypersensitivity pneumonitis, organic dust toxic syndrome, chronic obstructive pulmonary disease (COPD) and chronic bronchitis, as a result of chronic inhalation exposure to organic dust in farm animal production facilities (Faria et al., 2006; Viegas et al., 2013a; Viegas et al., 2013b; McClendon et al., 2015). However, for veterinarians most of the published studies are related with zoonoses and mostly describing the risk in animal farms when veterinarians are handling livestock.

On the contrary, few papers have been dedicated to occupational health in small-animal veterinary practices (D'Souza et al., 2009; Epp & Waldner, 2012; Chen et al. 2016). All papers mentioned that even when working with small animals there are several risks that should be considered namely, physical (X-rays), chemicals (use of gas or injectable anesthetics, and administer cytotoxic drugs) and, of course, biological agents (fungi, bacteria and virus). However, there are no data reporting exposure to the mixture of these risk factors and identification of the workplace conditions that can enhance exposure.

This exploratory study intended to give a first assessment in the particles contamination in a veterinary clinical practice. Additionally, the study also aimed to recognize what variables can influence contamination and to identify the presence of other risk factors that should be tackled in future studies.

2. MATERIALS AND METHODS

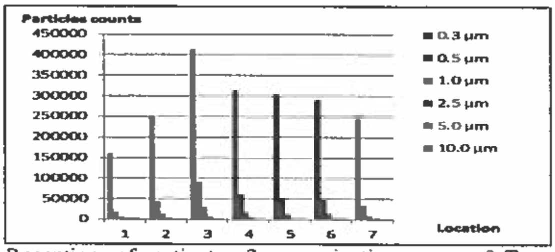
One veterinary clinic located in Lisbon, Portugal, accepted to participate in this exploratory study after the aim of the study was explained by the researchers involved.

Particles measurements were performed using a portable direct-reading equipment (Lighthouse, model 3016 IAQ) that gives information regarding particle number concentration (PNC) by each diameter size. Particles results are given in 6 different diameter sizes, namely: 0.3 µm, 0.5 µm, 1 µm, 2.5 µm, 5 µm and 10 µm. The measurements were conducted near the respiratory system of the workers involved on the tasks being performed. One measurement with the duration of 5 min was done in each location. The measurements were performed with the typical conditions regarding ventilation, number of workers and tasks being developed in each location. The locations were selected based on the time the workers spend in each location. The considered locations for measurements were selected according to the places where workers spend more time and included: reception of patients (1), examination room (2), treatment, preparation and recover room (3), imaging diagnostic room (4), chemotherapy administration room (5), equipment washing room (6) and, workers canteen area (7).

The data were analyzed in statistical software SPSS version 24.0 for Windows. The results are considered significant at the 5% significance level. To test the normality of the data, the Shapiro-Wilk test was used. To compare particles counts of different sizes, the Friedman test was used. When statistically significant differences were detected, the Friedman multiple comparison test was used.

3. RESULTS

Results showed that the smaller particles (0.3 μm) have higher counts in all the locations and with statistically significant differences when compared with the other sizes. In opposite result, 10.0 μm particles obtained the lowest counts in all the locations. The location with higher contamination was the treatment, preparation and recover room (Figure 1).



1 - Reception of patients; 2- examination room; 3-Treatment, preparation and recover room; 4 - Imaging diagnostic room; 5 - Chemotherapy administration room; 6 - Equipment washing room; 7 - Workers canteen area.

Figure 1. Particles counts distribution in each location

4. DISCUSSION

It is important to bear in mind that particles may act as a carrier and a source of nutrients for fungi and bacteria, already stated in several published work (Pedersen et al., 2000; Becker et al., 2002; Taylor, 2002; Milner, 2009; Tsapko et al., 2011; Viegas et al., 2016). Particles can also be rich in endotoxins from the cell wall of gram-negative bacteria and are also associated with mycotoxins produced by several fungi (Zock et al., 1995; Allermann and Poulsen, 2000; Viegas et al., 2013). Thus, exposure to particles can promote exposure to other contaminants such as biological agents and other chemicals.

The fact that the smaller particles presented the higher counts can result in local and systemic health effects since these particles can reach alveoli and consequently could be disseminated and act in all the organism, depending of their chemical and biological composition (Brown et al., 2013).

The higher results obtained in the treatment, preparation and recover room is probably due to the fact that this location has normally the higher number of workers performing different tasks and also has the higher number of animals in cages waiting for treatment or recovering from the treatment. The three areas with lower contamination are the ones where there are no animals (reception of patients, examination room and canteen area) or animal's interventions are not performed.

5. CONCLUSIONS

This exploratory study allowed to conclude that additional studies focused on several contaminants are needed in this occupational environment. Therefore, in future studies attention should be given to what can be the organic dust composition, namely its chemical and microbiological content. This will facilitate a more precise risk assessment.

Additionally, the number of animals and tasks performed seems to influence particles contamination and, probably, others risk factors.

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