

# PET GROOMERS' OCCUPATIONAL EXPOSURES: AN UNDER-RESEARCHED GROUP OF WORKERS IN A GROWING PET-CARE INDUSTRY

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### ABSTRACT

The increase in global pet ownership has led to the pet-care industry's growth, making pet grooming an occupation that has seen considerable growth. Yet, little is known about their occupational environment, exposures and the associated health effects. Veterinary workers may be the most closely comparable group, owing to their similar occupational exposures. This review explores both the comparable biological, chemical and other hazards identified in veterinary practices and their impact on the health of veterinary workers; it also considers how research findings among these workers may help to determine the direction in which studies among pet groomers must focus. Studies reported on the following: veterinary workers have a high prevalence of sensitisation to animal allergens and latex, which lead to both respiratory and skin effects such as asthma and contact dermatitis. Zoonotic infections among veterinary workers are also common. Research on respirable dust and bioaerosol exposure among veterinary workers is still limited, but current evidence from veterinary and pet-grooming establishments shows the need for further investigation. Other physical, ergonomic and noise hazards need to be investigated further in pet-grooming settings. Inadequate training on health and safety aspects and poor personal protective equipment use was observed in veterinary workers and pet groomers. The need for more research among pet groomers is necessary, as there seems to be little to no information on a variety of occupational exposures and their health effects. Future studies need to focus on the environmental conditions, hazards and also on workers' health and prevention strategies.

Keywords: pet groomers, pet allergy, biological hazards, infectious disease, allergens

### INTRODUCTION

**P**ets (also known as 'companion animals') have become an integral part of many families globally, leading to an increase in pet ownership.<sup>1,2</sup> It is estimated that 50% of households worldwide own a cat or a dog.<sup>3</sup> According to an American Pet Products Association (APPPA) survey in 2019, 67% of United States (US) households own a pet, an 11% increase from when the survey was initially conducted in 1988.<sup>4</sup> Currently, New Zealand is reported to have the most pets per household in the world, at 68%.<sup>1</sup> High pet ownership in households can be seen in many other countries worldwide, including South Africa, which ranks ninth in the world for the most dogs in households.<sup>5</sup> The reasons for pet ownership include the owners' enjoyment, companionship, security and having them as working animals.<sup>6</sup>

As with human beings, pets require health and nutritional care. The pet-care industry is a notable occupational sector, with occupations in retail (eg sales representatives, product

specialists), veterinary services and other services (eg groomers, walkers, animal-care workers).<sup>7</sup> The global statistics on the number of people who work in this industry are unknown, but in 2019 it was estimated that 350 900 people were employed in this industry in the United States.<sup>8</sup>

Animal grooming has grown significantly over the past few years due to the rise in pet ownership.<sup>9</sup> However, this occupation has been around for centuries, with a description of its existence dating back to the 1800s.<sup>10</sup> Grooming is essential to maintaining an animal's health and improving its appearance.<sup>11</sup> A variety of animals can be groomed, including companion animals (eg cats, dogs, horses, rabbits), farm animals (eg cattle) and wildlife (eg big cats).<sup>12</sup> Of these animals, dog and cat grooming are the most popular. Pet-grooming establishments offer a number of services, including bathing, cutting, de-matting, cleaning of the pets (brushing teeth, clipping nails, cleaning ears), massaging

and pet flea treatments, to name a few.<sup>13</sup> This review focuses on pet groomers (PGs) who service only cats and dogs.

The pet-grooming market has grown significantly over the years and future projections show even more growth. Reuters projects that the pet-grooming market will grow to US\$358 million by 2025 from US\$213 million in 2018 (a 68% increase).<sup>14</sup> Despite the growth in the industry, pet grooming is still not a formal occupation in some parts of the world. Currently, there is no requirement for formal training in this field; most people learn the skill under the guidance of an experienced groomer. However, various entities in different parts of the world offer training, and the learners are awarded certifications at the end of the training period. One such entity is the International Professional Groomers (IPG), which offers certifications from beginner level to advanced level.<sup>15</sup> Other entities include associations and training schools, which offer similar training and certifications. In South Africa, pet-grooming training schools are available, but a qualification in this field is still optional.

The number of PGs globally is unknown, and this may be due to the lack of recognition in some countries (informal work) and the lack of a proper registry. Although there are representative associations in many countries, an affiliation with an association is not compulsory, and often only the business owner is affiliated, and so the exact number of PGs may not be obtained from the affiliate association. In many countries, this therefore makes determining the number of people working in this profession challenging. Nonetheless, some countries do have data on the number of PGs. New Zealand reported 714 PGs in 2018, Sweden reported a doubling of dog groomers from 200 in 2011 to 550 in 2018 and, according to Pets Australia, Australia has approximately 4 000 PGs.<sup>16–18</sup> Currently, the number of PGs in South Africa is not known. Nonetheless, as the number of PGs increases due to the increase in pet ownership, it is important to understand these workers' occupational exposures.

## WORK ENVIRONMENT

The pet-grooming environment is often wet, covered with animal matter (hair/fur, dander and nails), and these are emitted into the air during the blow-drying process, making the environment dusty. A study by Stanevich and Romani-Ruby (1997) gave a glance into the PGs' work environment. The study was conducted on seven grooming establishments based in different settings. These places were often small, grooming spaces often had limited ventilation, lacked respiratory or skin protective equipment for grooming activities, and the employees had little knowledge of the health safety hazards of their occupation. Furthermore, some of the chemicals used for bathing and flea treatment had toxic or other adverse health effects.<sup>19</sup> No other report looking at a PGs' work environment has been published since 1997. Some of these findings are comparable to those reported in some veterinary practices. Macedo et al (2017) observed poor hygiene practices and poor knowledge of health and safety.<sup>20</sup> Poor ventilation in some areas of companion animal veterinary clinics have also been described by Adidin et al (2017).<sup>21</sup>

## OCCUPATIONAL EXPOSURES

Workers in the animal-care industry experience more significant

occupational health risks and hazards than those in human healthcare.<sup>22,23</sup> These include biological, chemical, physical and ergonomic risks, which can be caused by matter or objects in the work environment or the animals themselves.<sup>22–24</sup> Currently, most studies looking at the occupational health risks and hazards among pet-care workers have focused on veterinary workers. Few studies have been done on PGs; therefore, an enormous literature gap remains. Veterinary workers' and PGs' work environments are similar, and PGs can also be employed in veterinary practices. Therefore, a comparison of the occupational risks and hazards and the inclusion of currently available data from studies done in PGs' workplaces, may give insight into where future occupational health studies on PGs' need to focus.

## BIOLOGICAL HAZARDS

Veterinary practices attend to animals with different needs, from general check-ups to the treatment of various illnesses. These animals may carry biological contaminants such as bacteria, viruses, fungi and parasites, which can be found in contaminated animal secretions, wounds or animal skin. These pathogens can be transmitted through direct contact or aerosol transmission (bioaerosols – organic dust composed of plant, animal or microbial matter),<sup>25</sup> and the contaminants may cause health effects such as respiratory diseases, allergies, infections, cancer (due to aflatoxins) and other diseases.<sup>26</sup> Workers in veterinary practices are exposed to biological contaminants in indoor air for prolonged periods and are considered to have one of the most high-risk occupations for bioaerosol exposure and occupational infectious diseases.<sup>27</sup> PGs may be comparably exposed to such biological hazards.

## ALLERGIC DISEASE

Veterinary workers and PGs are exposed to various allergens in the workplace. These allergens may be derived from pets and/or other substances used in the workplace (eg animal hair), which can lead to allergic conditions of the skin and/or the respiratory system.

## SKIN ALLERGENS

Skin allergies are elicited by allergens that come into contact with the skin, triggering various immune responses, which can result in a skin reaction in a sensitised person. Conditions include allergic contact dermatitis (ACD), protein contact dermatitis (PCD), and contact urticaria (CU). ACD is a localised skin reaction caused by an immune response to contact with an allergen in a sensitised individual. It is also known as a Type-IV delayed hypersensitivity reaction, as the cell-mediated allergic response activates the reaction. Studies among healthcare workers have identified agents such as disinfectants (eg formaldehyde and glutaraldehyde), rubber chemicals (eg thiuram mix), drugs (eg antibiotics) and nickel sulphate to be the most common triggers.<sup>23,28–32</sup> Among veterinarians, animal allergens, drugs and latex are the most commonly reported allergens.<sup>23,28,29</sup> A study by Nienhaus et al (2005) found that allergic skin conditions contributed to 32.5% of all the work-related skin diseases.

Animal allergens and latex are high molecular-weight molecules which are not commonly associated with ACD. They often

induce a skin condition known as PCD.<sup>33–35</sup> PCD is a Type-I hypersensitivity (immediate hypersensitivity) reaction and its clinical presentation resembles that of chronic dermatitis.<sup>33–35</sup> Nienhaus et al (2005) found that allergic skin reactions caused by animal allergens accounted for 15% of the compensation claims<sup>23</sup> and studies reporting on latex-induced allergic skin conditions among veterinarians reported prevalence rates of between 5% and 12%.<sup>23,36–41</sup>

Another IgE-mediated allergic dermatitis reported among veterinary workers is CU, which is characterised by a wheal and flare, consisting of an oedema of the dermal tissue, erythema and an intense itch upon contact with the allergen.<sup>42</sup> A survey done in Belgium on occupational dermatoses among veterinarians found that 31% had CU.<sup>43</sup> Furthermore, a Finnish registry of occupational diseases showed that veterinary surgeons were one of the top occupations reporting occupational CU between 1990 and 1994.<sup>44</sup> The leading causes of CU are animal fluids, dander and latex.<sup>45</sup>

Skin allergies among PGs have not been determined and warrant investigation, because these workers are regularly exposed to animal allergens and other chemical allergens that may be present in pet-cleaning products (eg shampoos).

#### RESPIRATORY ALLERGENS

Respiratory allergies are an immune response to airborne substances, which, when inhaled, trigger airway inflammation. Sources of respiratory allergies among animal-care workers such as veterinary workers include pet allergens, drugs and rubber latex.<sup>23,39–41</sup> The PGs' work environment contains both animal and chemical allergens. However, a literature search on studies in this work environment yielded limited information.

Allergic sensitisation has been well studied among veterinary workers, and some studies have focused on workers entering the work environment. Epp and Waldner (2012) found that 39% of veterinarian graduates with no prior allergies had reported developing allergies after starting work.<sup>36</sup> Common respiratory allergic diseases include asthma, allergic alveolitis, wheezing, rhinitis, conjunctivitis and coughing.<sup>46</sup> For the general population, avoiding pets if sensitised is more likely than for pet-care workers; moreover, continuous exposure of sensitised pet-care workers to pet allergens can lead to worsening symptoms.<sup>47</sup> Nienhaus et al (2005) found that allergies to animals accounted for 54.2% of all lung-disease claims made by veterinarians and their staff.<sup>23</sup> Studies among veterinarians have reported prevalence rates of 15–26% for cats and 7.4–25% for dogs.<sup>31,32,48,49</sup> The most common pet allergen sources include saliva, dander, urine and serum.<sup>50,51</sup>

Allergic respiratory symptoms due to latex are reportedly the second most common allergen among veterinarians.<sup>23</sup> Previous survey studies reported the prevalence among veterinarians to be between 5% and 20.5%.<sup>23,38,39,41,52</sup> Latex exposure among PGs is currently unknown.

Furthermore, a study by Pu et al (2016) described a lung disease termed 'pet-groomers' lung' (a work-related hypersensitivity pneumonitis) in a 61-year-old male PG who had symptoms due

to continuous exposure to a pesticide (pyrethrin) used to kill fleas on dogs.<sup>53</sup> This study was the first published description of allergic sensitisation in a PG. The study by Pu et al (2016) provides a glimpse into sensitisation among PGs, and their findings emphasise the need for further research among this group of workers. With the frequent use of flea treatments in pet grooming, the need for further investigation as indicated by Pu et al (2016) in this occupational group is to be supported.

#### INFECTIOUS DISEASES

Exposure to zoonotic pathogens is one of the inherent risks of working with animals. Zoonotic diseases have been reported among animal-care workers such as veterinary workers, and the prevalence is notably high, with survey studies and diagnostic studies indicating prevalence rates of between 4% and 90%.<sup>23,36,39–41,48,54–58</sup> Langley et al (1995) found that 27% of veterinary workers had acquired at least one zoonotic infection during their career.<sup>41</sup> Zoonotic infections can be caused by viruses, bacteria, parasites or fungi.<sup>23,36,41,45,48,59</sup> Baker and Gray (2009) determined that veterinarians were at increased risk of acquiring specific zoonotic pathogens, including:

- *Brucella* species;
- *Coxiella burnetii*;
- avian and feline *Chlamydia psittaci*;
- swine and avian influenza A-virus;
- methicillin-resistant *Staphylococcus aureus* (MRSA); and
- swine hepatitis E-virus.<sup>60</sup>

PGs have similar exposures to those of veterinary workers who work with companion animals. Yet, a current search on the prevalence of zoonotic diseases among PGs yielded no publications relating to PG infection. Pets are often taken to grooming establishments when they require cleaning and therefore PGs may even be at greater risk of acquiring a zoonotic infection, as the pet-grooming process (ie washing, drying and cutting) may lead to greater dispersal of the pathogens into the environment. Gould et al (2020) investigated the identification of methicillin-resistant *Staphylococcus* species in pet-grooming salons. They isolated methicillin-resistant coagulase-positive staphylococci in 12 of the 19 salons (63.2%). The most common source of the methicillin-resistant *Staphylococcus* species were clipper handles, clipper blades and grooming leads and leashes.<sup>61</sup> Although their study focused on the spread of the infections among the pet population, this study gives insight into the possible spread of these pathogens to the grooming staff and pet owners.<sup>61</sup> Studies investigating zoonotic infection prevalence among PGs need to be established.

#### TOXINS

Some organisms present in the work environment produce harmful toxins that may lead to specific health effects. These include endotoxins and  $\beta(1-3)$ -Glucans. Endotoxins are released during bacterial cell growth and after cell lysis.<sup>27,62,63</sup> A major component of the gram-negative bacteria cell wall, endotoxin is a biologically active material with strong pro-inflammatory properties, affecting numerous human organ systems and disrupting both the humoral and the cellular mediation systems. Occupational exposure to endotoxin as a bioaerosol has been linked to airway disease; exposure to very high levels of endotoxin has been shown to cause organic dust

toxic syndrome (ODTS – a non-allergic inflammatory reaction associated with flu-like symptoms).<sup>58,64,65</sup> Endotoxin is a well-known cause of occupational disease: studies done in different occupational settings (eg farming, animal-feed industry, abattoirs, the fibreglass industry, the waste and compost industry) have shown an association between endotoxin exposure and certain health effects, including chronic airway obstruction, reversible asthma, increased airway responsiveness and other respiratory symptoms (eg bronchitis).<sup>64</sup> Exposure to endotoxins has also been reported in laboratory animal workers and veterinary workers. A study by Pacheco et al (2003) looking at endotoxin exposure among laboratory animal workers found endotoxin to be significantly associated with chest, nasal and skin symptoms among non-mouse-sensitised workers working with mice.<sup>66</sup> Samadi et al (2010) found endotoxin levels to be low; however, its effect on the companion animal-hospital workers was not investigated further.<sup>58,67</sup> Our literature search did not yield any publications reporting on endotoxin exposure among PGs.

Another common bioaerosol reported in certain work environments is (1–3)- $\beta$ -D-Glucans. These are glucose polymers that form part of the cell wall of moulds, yeast, certain bacteria, some plants and algae.<sup>64,68</sup> (1–3)- $\beta$ -D-Glucans are released into the air after cellular decomposition, at which time they can induce adverse health effects similar to those seen with endotoxin exposure. These include inflammatory responses, immunosuppressive effects and respiratory symptoms.<sup>27,68</sup> A study by Samadi et al (2011) on the exposure of caretakers, veterinarians and veterinary students to dust, endotoxins and (1–3)- $\beta$ -D-Glucans ruminant found the levels of endotoxin and (1–3)- $\beta$ -D-Glucans to be substantial, particularly in poultry clinics.<sup>69</sup> To our knowledge, (1–3)- $\beta$ -D-Glucan exposure has not been investigated among veterinary workers and PGs who work with companion animals.

There is still a knowledge gap regarding the effects of respirable dust among both companion animal workers and PGs. This is due mainly to limited research among these groups of workers. In addition, in the available studies, the measurements of respirable dust and the respective contaminants are compared to the limits set in the regulation and/or the recommended limits set by the relevant country or certain organisations. Some of these limits are based on indoor office environment conditions and not on occupations that may be exposed to elevated levels of indoor respirable dust.<sup>70</sup> A case study by Stanevich and Romani-Ruby (1997) assessed PGs' exposure to respirable dust. They found that dog groomers had a higher exposure to respirable dust when compared to office workers. The authors also found no difference between respirable dust measurements based on the tasks, with clipping having a mean of 0.13 mg/m<sup>3</sup> versus bathing, drying and brushing with a mean of 0.14 mg/m<sup>3</sup>.<sup>19</sup> Since then, no other study has been done looking at respirable dust and its components among PGs – but the findings in this study indicate the importance of research among these workers. Future studies need to assess PGs' exposure to bioaerosols and measure the concentration of the different contaminants in the environment and their effects on their health.

## CHEMICAL HAZARDS

Chemicals used widely in veterinary practices for treatment,

cleaning and disinfection purposes include drugs, anaesthetics, pesticides, soaps, shampoos, detergents and disinfectants (eg glutaraldehyde).<sup>28,39,71</sup> This section focuses solely on chemicals that are common to both PGs and veterinary workers: soaps, detergents, shampoos, pesticides and disinfectants.

Soaps and detergents are used to remove dirt from surfaces, textiles, solids and skin. These chemicals have been associated mainly with irritant contact dermatitis (ICD)<sup>72</sup> – soaps and detergents being a common cause of ICD among veterinarians.<sup>73</sup> However, ACD to perfumes, colouring agents and preservatives in soaps and detergents has been reported. Compounds in soaps and detergents associated with ACD include surface-active compounds (eg lauryl ether sulphates and sodium lauryl sulphate, cocamidopropyl betaine) and preservative agents (isothiazolinone derivatives, quaternium 15 and formaldehyde).<sup>74</sup>

Veterinary practices use disinfectants regularly in order to prevent the spread of infectious diseases. These chemicals are used to kill microorganisms and they are often applied to non-visibly soiled surfaces. Those commonly used in veterinary practices include aldehyde compounds, alcohols, chlorine-based compounds, quaternary ammonium compounds, phenols, iodine compounds, biguanides and oxidising agents. Some of these chemicals are known to cause ICD and irritation to the eyes of those exposed; these include aldehydes, chlorine-based compounds, phenols and quaternary ammonium compounds.<sup>75</sup> A study by Jeyaretnam et al (2000) reported that 20% of respondents reported that disinfectants such as iodine, quaternary ammonium compounds, glutaraldehyde (aldehyde compound) and chlorhexidine (antimicrobial) caused dermatitis, headaches and dyspnoea. In addition, formalin and glutaraldehyde were associated with nose irritation, watery eyes and respiratory problems in 10% of the respondents.<sup>40</sup>

Currently, there are no studies describing the use and effects of soaps, detergents and disinfectants on PGs. However, the use of cleaning and disinfecting products in their workspaces has been described.<sup>19</sup> Research into the effects of these chemicals among PGs needs to be undertaken.

Pesticides are another commonly used chemical in veterinary practices and pet-grooming establishments. Pesticides are crucial in controlling insects (eg fleas), parasites and other pests that may cause disease and discomfort to animals.<sup>76</sup> In dogs, the most commonly used include organophosphates and carbamates, pyrethrins and pyrethroids, insect development inhibitors, amitraz, avermectins and chlorinated hydrocarbons. Of these, pyrethrins and pyrethroids are considered safer due to their low toxicity and selective action. For this reason, these agents are available in many dog-cleaning products, including shampoos, but not in cat products, as pyrethrins and pyrethroids are toxic to cats.<sup>76,77</sup> Jeyaretnam et al (2000) showed that 22% of the veterinary respondents reported that pesticides or organophosphates (eg asuntol and fenthion) and flea sprays and rinses caused nausea, skin allergy and headaches.<sup>40</sup> Stanevich and Romani-Ruby (1997) found that PGs used a wide variety of tick and flea dips, and shampoos, to control fleas in dogs.

These ranged from non-toxic herbal products to highly toxic pesticides such as petroleum-based chemicals, malathion and other cholinesterase-inhibiting products.<sup>19</sup> In addition, in both veterinary workers and PGs, it has been observed that some workers would use pesticides without using personal protective equipment (PPE).<sup>19,41</sup>

## OTHER HAZARDS

Animal-care workers experience other hazards in the workplace, including physical, ergonomic and noise hazards. Animal-care workers are at high risk of being physically injured at work. One of the most common causes of physical injury is an animal-related injury (eg animal bites, scratches and strikes). Previous studies estimate that 50–67% of veterinarians and 98% of veterinary technicians had experienced an animal-related injury at some point in their careers.<sup>22,23</sup> The prevalence of animal-related injuries reported in the literature ranges from 8% to 78%, with cats and dogs being the most reported cause of the injuries.<sup>22–24,40,41,71</sup> In a study by Fowler et al (2016), 30.8% of accepted animal-related injury claims were filed by the grooming and other services workers and 69.2% were filed by veterinary clinic workers. Among these, dogs were the common source of injury among the grooming and other services workers, with 57.6% of claims, while cats were the common source of injury among veterinary clinic workers, accounting for 63.1% of their claims.<sup>22–24,40,41,71</sup> However, the exact number of PGs affected cannot be determined, as they were grouped with other workers.

Ergonomic hazards are also important because often animal-care workers lift and move heavy animals.<sup>20</sup> Stanevich and Romani-Ruby (1997) reported on ergonomic problems among dog groomers. They noted that the groomers applied stress to different parts of their bodies throughout the day. Groomers would bend and stretch over dogs during the various grooming processes and the constantly use their hands when operating the various grooming tools.<sup>19</sup> Since then, no other study has reported on ergonomic hazards among PGs. A study by Macedo et al (2018) on the occupational risks faced by small animal veterinary clinics found that ergonomic-related risks were the second (33%) most reported risk behind biological-related risks (49%). Other causes of ergonomic injuries were awkward posture while performing certain tasks such as surgery and ultrasound.

Several studies have reported noise levels in pet-grooming establishments. Stanevich and Romani-Ruby (1997) reported on higher noise levels (65–88 dB(A)) among the dog-grooming establishments due to blow dryers. However, they were lower than the recommended limit of 90 dB(A) set by the Occupational Safety and Health Administration (OSHA) standard for an eight-hour workday for occupational noise exposure.<sup>19,78</sup> In South Africa, the noise exposure limit is 85 dB(A).<sup>79</sup> Among veterinarians loud vocalisation by animals and the banging of cages by animals have also been reported to lead to hearing impairment.<sup>39</sup> Monitoring noise levels is important, as long-term exposure to high noise affects hearing.<sup>78</sup>

**TABLE I: CAUSATIVE AGENTS OF OCCUPATIONAL DISEASES AND INJURIES REPORTED AMONG VETERINARY WORKERS OR PGs IN THE LITERATURE**

| OCCUPATIONAL DISEASES AND INJURIES                                  | CAUSATIVE AGENTS REPORTED                                                                                                   | REPORTS ON PGs                      | REPORTS ON VETERINARY WORKERS |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------|
| <b>Infectious diseases</b>                                          |                                                                                                                             |                                     |                               |
| Zoonotic diseases <sup>23,36,41,45,48,59,60</sup>                   | Bacteria, viruses, parasites and fungi                                                                                      | NPD*                                | Yes                           |
| <b>Skin diseases</b>                                                |                                                                                                                             |                                     |                               |
| Irritant contact dermatitis (ICD) <sup>48,80,81</sup>               | Chemicals, drugs, disinfectants (formaldehyde), detergents and animal secretions (urine, amniotic fluid)                    | NPD                                 | Yes                           |
| Allergic contact dermatitis (ACD) <sup>23,28,29</sup>               | Disinfectant components (eg glutaraldehyde), animal allergens (eg dander and saliva), drugs, rubber chemicals (eg thiurams) | NPD                                 | Yes                           |
| Protein contact dermatitis (PCD) <sup>23,36,38–42</sup>             | Animal allergens and latex                                                                                                  | NPD                                 | Yes                           |
| Contact urticaria (CU) <sup>43–45</sup>                             | Animal allergens and latex                                                                                                  | NPD                                 | Yes                           |
| <b>Respiratory diseases</b>                                         |                                                                                                                             |                                     |                               |
| Asthma <sup>23,47,52,82,83</sup>                                    | Animal allergens, animal dander, disinfectants, latex                                                                       | NPD                                 | Yes                           |
| Allergies <sup>23,31,32,38–41,48,49</sup>                           | Antibiotics, animal allergens, disinfectants, latex                                                                         | NPD                                 | Yes                           |
| Hypersensitivity pneumonitis (HP) 'pet-groomers' lung <sup>53</sup> | Pesticide (pyrethrin), dander, shampoos                                                                                     | Yes (journal article and web pages) | NPD                           |
| <b>Other</b>                                                        |                                                                                                                             |                                     |                               |
| Physical hazards <sup>22–24,40,41,71</sup>                          | Bites, scratches and kicks from animals                                                                                     | Yes                                 | Yes                           |
| Ergonomic hazards <sup>19,20</sup>                                  | Awkward posture, bending                                                                                                    | Yes                                 | Yes                           |
| Noise hazards <sup>19,78</sup>                                      | Blow dryers, animal vocalisation, loud sounds                                                                               | Yes                                 | Yes                           |

\* NPD: No published data

Although some of these hazards have been described among PGs, the data remain limited and the information currently available in pet-grooming establishments warrants further investigation. Table I summarises the occupational diseases and injuries covered in this review and their reporting among PGs and veterinary workers.

## HEALTH EFFECTS

### RESPIRATORY DISEASES

Respiratory diseases have been described among veterinary workers. A study by Langley et al (1995) found that 20.6% of veterinarians had reported having experienced respiratory symptoms when exposed to chemicals such as formalin, disinfectants, pesticides and drugs.<sup>41</sup> These findings have been corroborated by other studies.<sup>39,71</sup> Other reported causes of respiratory problems among veterinarians are animal substances such as saliva, dander, urine and fur. These animal substances are reported to cause several different respiratory symptoms.<sup>71</sup> Reported respiratory disorders include asthma, rhinitis, sinusitis and hypersensitivity pneumonitis (HP).

Asthma has been reported among veterinarians. Blair and Hayes (1980) reported that veterinarians' mortality rates due to asthma were higher than that of the US general population.<sup>47,82</sup> The high asthma incidence among veterinarians was also corroborated by Lutsky et al (1985), who found the prevalence of asthma in veterinarians to be three times higher than that of the controls (16% versus 6%).<sup>47,83</sup> Animal allergens are the most commonly reported causative agents of asthma among veterinarians.<sup>23,47,52</sup> In addition, disinfectants and latex have also been reported to cause asthma among veterinarians and veterinary workers.<sup>23</sup>

A study by Lee et al (2020), determining the incidence of occupational diseases among 95 veterinary clinic workers (including PGs), found that PGs and veterinary nurses or assistants had the highest prevalence of rhinitis at 33.3% (5/23), respectively. Groomers had reported the third highest (26.7%; 4/19) prevalence of reported conjunctivitis, after veterinary nurses or assistants (40.0%) and other workers (27.3%). In addition, asthma was more prevalent among veterinary doctors (20.0%), than the other veterinary workers.<sup>46</sup> Furthermore, 82.6% (19/25) of participants with work-related rhinitis reported cats worsening their symptoms and 56.5% reported that dogs caused the same effect. However, sensitisation to animal allergens was not confirmed by testing.

### SKIN DISEASES

Skin conditions are common among animal-care workers, as they are often exposed to various agents that can affect skin. These include animal allergens, chemicals, drugs, detergents, disinfectants, pathogens and water.<sup>43,84</sup> Occupational skin diseases such as ICD, ACD and infective diseases have been reported among veterinary workers.<sup>43,81,84</sup> The cause of CD is broad and includes chemical, biological and physical agents. The most common type of CD is ICD. Research of ICD among pet-care workers remains limited, but current data obtained from studies done among veterinary workers indicate that ICD may be notable and requires further investigation. In these studies, chemicals, drugs, detergents and animal secretions

were the common causes of ICD.<sup>48,80,81</sup> PGs work with water for extended periods and, currently, the irritant effect of water has not been described among these workers. Excessive exposure of skin to water has a damaging effect, which often leads to the development of ICD.<sup>85</sup>

## HAZARD CONTROL MEASURES

Animal-care workers in general are exposed to an array of occupational hazards and, among these workers, the challenges faced by veterinarians attending to different animals (ie pets, farm animals and wild animals, etc) have been described.<sup>75,86</sup> As with hazards from any other occupation, measures have to be in place to prevent and protect workers against them. To our knowledge, there has not been an in-depth study into the occupational hazards encountered by PGs and the measures to control them. However, as PGs and companion animal veterinary workers share similar exposures, some of the control measures that are well established in veterinary practices may be adapted to a PG's work environment.

Once hazards in a workplace have been identified, it is necessary that the exposure is controlled and reduced. This involves applying the hierarchy of controls, which range from the most effective to the least effective method of reducing the health risk to workers: elimination of the hazard > substitution for the hazard > engineering controls > administrative controls > use of PPE.<sup>75,86</sup>

### BIOLOGICAL CONTROL MEASURES

Biological agents causing zoonotic infections and allergic reactions are the most frequent cause of occupational disease among veterinary workers.<sup>23,86</sup> Control strategies for zoonotic infections include vaccinations (elimination), where possible; having non-porous surfaces which can effectively be disinfected; designating areas for work and appropriate waste disposal, as possible engineering controls. Administrative controls can include written health-and-safety procedures and PPE (eg gloves, face protection, footwear and respirators) when all other control measures are inadequate.<sup>75,86</sup>

Allergic disease prevention in the workplace can be challenging, particularly if the worker is allergic to the very animals they serve. Therefore, the elimination of the allergen and working with different species may not be possible. Prevention measures may then include working in safety hoods, performing aerosolisation procedures, having work clothes (that can be removed when going home), and using PPE such as respirators, gloves and gowns.<sup>75,86</sup>

Most of the prevention measures used in veterinary practices can be adaptable to PGs' work environment, with some specific adaptations (eg all pets to be groomed must have valid vaccination records).

### CHEMICAL HAZARD CONTROL

A number of chemicals used in veterinary medicine such as pesticides, antibiotics and disinfectants are known to have effects on the workers' health, including carcinogenic, toxic, allergenic and irritative effects.<sup>86</sup> The material safety data sheets (MSDS) of these chemicals need to be followed to ensure that

they are handled as used appropriately. Alternatively, some of these chemicals can be substituted for less toxic compounds (eg disinfectants, pesticides and anaesthetic gases), otherwise personnel need to be trained in the appropriate use of the chemicals and PPE (eg respirators and gloves).<sup>19,75,86</sup>

#### PHYSICAL HAZARD CONTROL

Trauma is reportedly the most significant cause of physical injury among veterinarians and their staff. This can be in the form of scratches, bites from the animals and injuries from the instruments used. Lifting heavy animals and equipment can lead to back injuries and strains. Loud sounds from animals (barking, screaming) and instruments used can lead to hearing loss. Furthermore, slips and falls, particularly in areas with water and soaps on the floor (eg the grooming environment) can also lead to serious injuries.<sup>86</sup> Prevention measures should include having suitable harnesses and rooms to handle aggressive animals (with adequate exit points) and training personnel in handling dangerous or large animals. The floor of the work environment should not enable either veterinarians or groomers to slip; in addition, suitable footwear should be provided for performing certain tasks. Noise control may include substituting noisy machines, installing noise barriers, training personnel in the use of hearing protection and limiting the time spent in noisy

areas. Ear PPE should also be provided if high noise levels are unavoidable. Unlike veterinary workers, PGs work constantly in wet and noisy environments, and often do not receive adequate training in dealing with dangerous animals. Therefore, proper control strategies and procedures need to be implemented to ensure workers' safety (eg dangerous/aggressive animals cannot be groomed).

#### CONCLUSION

The rise in pet ownership has led to the pet-care industry's growth and as a result the pet-grooming business is expanding. Yet, it is evident that more research needs to be focused on PGs' occupational health and safety, as an extensive knowledge gap remains. It is evident that PGs are the least researched of pet-care workers. Studies performed in veterinary settings seem to provide insight into possible study directions, as these workers have similar exposures. Such studies must focus on the environmental conditions and hazards inherent in the pet-grooming environment, their effects on workers' health, and on preventive measures.

#### DECLARATIONS OF CONFLICT OF INTEREST

The authors declare no conflict of interest.

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