

Review

Should the Cat Stay Home? A Guide to Managing Cat Allergies

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Abstract: Worldwide, cat allergies affect 15% of the population. Cat allergens are ubiquitous and challenging to eliminate from homes, making it difficult to implement effective allergen reduction strategies. Developing strategies to reduce cat allergens in homes could alleviate the burden of allergic diseases, enhance symptom management, lower healthcare expenses, and improve patients' quality of life. Studies have produced varied results concerning the effectiveness of specific environmental control measures in lowering cat allergen levels and improving clinical outcomes for allergic diseases. This review evaluates the existing evidence on the effectiveness of environmental control measures in reducing cat allergens and their potential clinical impact.

Keywords: cat allergy; allergen avoidance; cat allergen reduction; allergic rhinitis; Fel d 1; atopy; aeroallergen reduction

1. Introduction

Allergic rhinitis and asthma are very common disorders, impacting nearly 10–40% of the United States (US) population [1]. Cats are the leading cause of mammalian-based allergies and are becoming increasingly prevalent in the US [2]. One in every three households in the US has one or more cats [3]. Cat allergen exposure has been shown to contribute to symptoms of allergic rhinitis and asthma [4–6]. Cat allergens are 2–10 microns in size and are readily airborne [7,8]. Exposure to even small quantities of cat dander, urine, or saliva, whether from pets at home or in environments like schools or workplaces, can provoke symptoms in individuals who are sensitized to cats [8,9]. Allergic rhinitis and asthma can be burdensome for patients and families, affecting patients' quality of life [10]. Some patients have an insufficient response to conventional treatments for allergic diseases [11]. Identifying effective allergen reduction strategies could alleviate the burden of allergic diseases, lower healthcare expenses, and enhance quality of life.

The expert panel of the National Asthma Education and Prevention Program (NAEPP) recommends a multi-component, allergen-specific mitigation strategy for patients with asthma linked to specific indoor allergen exposures, as confirmed through a medical history and allergy testing using established skin prick test methodologies [12–14].

This review assesses the evidence on environmental control strategies for reducing cat allergen exposure and their clinical impact. Additionally, we assess pharmacological interventions aimed at improving the clinical status of allergic rhinitis and asthma in patients with cat allergies. We conducted a comprehensive literature search on PubMed using the following keywords: allergen avoidance, aeroallergen reduction, cat allergens, asthma, allergic rhinitis, and cat allergen.



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1.1. Cat Allergen

Allergic sensitization to cats has become increasingly common [2,5,15], with pet allergen exposure being a significant contributor to allergic asthma symptoms [2]. The primary protein linked to cat allergies is *Felis domesticus* 1 (Fel d1), responsible for >95% of human allergic sensitization [16,17]. Although its function in cats remains unknown, it is the primary trigger for IgE-mediated allergic response in sensitive individuals [16,17]. Additional cat allergens which have been shown to contribute to asthma include Fel d2 and Fel d4 [15]. These allergens are found in cat dander, saliva, and urine, and can readily transfer to surfaces and remain airborne [7,8,16,17].

Fel d 1 is widespread and detected in high quantities in indoor settings [15,18]. Reducing cat allergen exposure in homes may not result in clinical improvement unless efforts are made to minimize exposure to high levels of cat allergens in other public or occupational settings [2,5,15,19]. Certain breeds are often considered “hypoallergenic” due to anecdotal claims that they produce lower levels of Fel d 1 [20]. However, analysis has revealed significant variability even among cats of the same breed, and no breed is entirely free of allergens [20].

One study obtained data from 831 US homes, measuring Can f 1 and Fel d 1 concentrations from dust samples collected via the vacuuming of bedroom and living room furniture and floors [18]. Although only 49.1% of homes had a dog or cat, Can f 1 and Fel d 1 were found in 100% and 99.9% of homes, respectively [18]. This indicates that even most pet-free homes contain detectable levels of Can f 1 and Fel d 1, highlighting the widespread dispersal and transportability of these allergens [18]. Given the ubiquity of this allergen, implementing effective reduction strategies is challenging.

Oral and intranasal allergy treatments may have limited effectiveness. More advanced treatment such as allergen immunotherapy (AIT) is often effective but generally more time-intensive and may not be appropriate for all patients [21]. Developing strategies to minimize cat allergens in homes may help reduce the burden of allergic diseases, alleviate symptoms, lower healthcare costs, and enhance patients’ quality of life.

1.2. Cat Exclusion from the Household

Removing cats from the home is considered the most clinically effective strategy [22]. However, pet ownership offers health benefits, including positive effects on mental well-being [2,15]. As a result, removing pets to reduce allergen exposure is often undesirable and impractical [19]. Additionally, many patients struggle to adhere to removing animals from the home [19]. Furthermore, Fel d 1 is a “diligent” and longer-lasting allergen, taking months to decrease in quantity once the cat is removed from the home. A study found that after the removal of a cat, it may take up to 20 weeks for Fel d 1 levels to decrease to levels found in homes without cats [23]. Symptoms may take even longer to improve after removal from the home, especially in homes with carpeting [22,23]. Cat exclusion from the household may not eliminate Fel d 1 exposure given the ubiquity and transportability of this allergen.

1.3. Air Cleaners

Air cleaners are effective at reducing airborne Fel d 1 in individuals with asthma who are allergic to cats, but the impact on clinical outcomes varies. One double-blind, placebo-controlled crossover study found that using air cleaners in bedrooms and living rooms reduced peak flow amplitude and improved airway hyper-responsiveness [24]. In contrast, a randomized controlled trial involving 36 children with asthma (sensitized to cats and heavily exposed to cat allergens) demonstrated that the use of HEPA cleaners

effectively lowered cat allergens in ambient air. In this study, allergic symptoms remained unchanged [25].

A double-blind, placebo-controlled trial involving 35 adults with cat allergies living with cats assessed the impact of a HEPA cleaner. There were no observed differences in allergen levels in settled dust, nasal or chest symptoms, sleep disturbances, peak flow rates (morning or afternoon), or the use of rescue medications [26]. Moreover, the use of a HEPA room air cleaner, mattress and pillow covers, and cat exclusion from the bedroom reduced airborne cat allergen levels; however, it had no impact on clinical symptoms [26]. One randomized, crossover, double-blind, placebo-controlled study showed that air cleaners decreased asthmatic responses in cat-allergic patients with asthma while they were exposed to cat allergens [27].

A systematic review conducted by an expert panel from the American Academy of Allergy, Asthma, and Immunology (AAAAI) concluded that air filters can provide benefits for patients with allergic airway disease [28]. However, the magnitude of the effect and the most effective techniques remain unclear. In most studies demonstrating positive outcomes, clinical benefits were observed only after prolonged use, typically a minimum of one year [28]. The panel recommended room air cleaners equipped with high-efficiency particulate air (HEPA) filters and whole-house filtration systems for homes with forced-air heating, using disposable HEPA filters that are regularly replaced [28]. Although effective, this option is relatively costly due to the higher airflow resistance of HEPA filters, which necessitates more powerful and expensive air pumps [28].

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) guidelines recommend air filters with a MERV (Minimum Efficiency Reporting Value) rating of 10 or higher as the most effective for removing pet dander [29].

A modeling analysis conducted in one study evaluated the efficacy of filtration-based methods in reducing airborne allergens [30]. The findings indicated that air filters with a MERV12 rating or greater significantly lowered indoor cat allergens [30]. Filters with an efficiency greater than 70% for Fel d 1 were able to reduce allergen concentrations by more than 50% [30]. Filters with exceptionally high removal efficiency (rated MERV 16) were only marginally more effective than those rated MERV12 or MERV13 [30].

Overall, evidence suggests that air filtration lowers Fel d 1, and air cleaners with advanced HEPA filters are effective in filtering Fel d 1 and reducing allergen levels in homes, although the impact on symptoms is variable.

1.4. Excluding the Cat from the Bedroom

Data from the Bureau of Labor Statistics and American Time Use Survey reveal that the average American spends approximately 9–10 h per day in their bedroom, primarily for sleeping [31]. Americans are now spending significantly more time at home. While the trend of increased time at home predates the COVID-19 pandemic, it accelerated sharply during the pandemic and continues to rise (approximately a 10% increase in daily time spent at home from 2003 to 2022) [31]. This increase in time spent at home, along with the rise in cat allergy prevalence, poses a major healthcare challenge. Excluding cats from the bedroom (where we spend the most time) may be beneficial. Although excluding cats from the bedroom may decrease allergen load in the location where individuals spend most of their time, this intervention alone is not supported by evidence. There may be some potential benefit when this approach is combined with others such as a MERV 13 HEPA filter. Restricting cats to one location in the living space is often challenging and, in many cases, ineffective since Fel d 1 is easily transportable and, due to its small size, can remain airborne for extended periods of time [2–9].

1.5. Vacuuming

The regular use of high-efficiency or central vacuum cleaners is linked to reduced exposure to cat allergens in homes with cats. However, this does not result in clinical benefits [32]. The efficacy of vacuum systems in reducing cat allergen loads or allergic diseases varies based on the system used; for example, in one study, high-efficiency, central, and microfilter systems were used. However, none of the three vacuum systems reduced Fel d 1 [33]. As noted previously, cat dander is a small and rather buoyant allergen that may be propagated in the air to some extent with the use of vacuums and other devices with fans.

Nonetheless, after a period of time, high-efficiency vacuums may begin to reduce the allergen burden to some degree. A reduction in Fel d 1 levels was observed in dust samples from homes after 12 months of using high-efficiency cleaners. Patients from the high-efficiency vacuum group demonstrated improvements in lung function and had a reduced need for bronchodilator usage after 12 months. When standard cleaners were used, only the mattress sample showed a reduction [33].

One study of 30 cat-sensitized adults with asthma living in homes with cats demonstrated that the use of both free-standing HEPA filters and frequent vacuuming led to clinical improvement in asthma when compared to the use of vacuum cleaners alone [34]. However, no differences were observed in objective lung function and reservoir or airborne pet allergens [34].

1.6. Bathing Cats

Washing cats by immersion removes allergens and can reduce the quantity of Fel d 1 that becomes airborne [35]. One study demonstrated that this decrease is brief and is not maintained at 1 week [35]. Cats secrete sufficient Fel d 1 to replace protein removed by washing days after the wash [35]. Some studies have found that cat allergens in the air can return to pre-bath levels within just one to three days of bathing [36]. Therefore, washing cats weekly does not provide a durable benefit as a sole measure and is not considered effective. It is unclear if bathing or wiping down the cat daily would yield clinical benefits, but this may otherwise be an impractical approach and unpleasant for the cat.

1.7. Elimination or Covering of Fabric-Upholstered Furniture

Studies evaluating Fel d 1 variation within homes found that sofas consistently had the highest level of Fel d 1 [37]. Cloth-upholstered furniture is generally more difficult to clean than floors or bedding, and cats move around frequently, reintroducing allergens to areas like sofas [38].

Minimizing Fel d 1 on upholstered furnishings may be an effective way to reduce the amount of allergens in the home. In one study, the removal of all carpets and furniture from the home led to a more rapid decline in Fel d 1 when compared to routine cleaning (including vacuuming and steam cleaning) [23]. The covering of upholstered furniture can reduce the load of cat allergens in the home [39]. One study revealed that tightly woven fabrics and nonwoven synthetic fabrics can block Fel d 1 but still allow airflow [40]. This would provide patients with a more cost-effective strategy to decrease allergen exposure rather than removing upholstered furniture completely from the home.

Although these strategies have been shown to lower cat allergen levels, there is insufficient evidence to conclude that these strategies lead to clinical improvements in alleviating respiratory allergies. Furthermore, the removal or covering of cloth-upholstered furniture demands substantial resources, incurs high costs, and can be difficult to sustain over time.

1.8. Vaccinations

A potential method for lowering Fel d 1 production in cats involves vaccinating them against their own Fel d 1 protein [41]. A vaccine, which included Fel d 1, was combined with a tetanus toxoid-derived peptide [41]. This led to the production of high-affinity antibodies capable of neutralizing Fel d 1, thereby reducing allergen levels in their secretions [41]. Early clinical trials have demonstrated that the vaccine is well tolerated [42]. Comprehensive bloodwork, as well as kidney and liver function tests, indicated no notable side effects, and vaccinated cats maintained normal activity levels [42]. Short-term studies suggest a favorable safety profile, with mild injection-site reactions, such as redness or swelling, being the only reported side effects in isolated cases [42]. However, limited data are available on the vaccine's use in pregnant or lactating cats, and long-term effects are still being evaluated. Importantly, trials have shown that the vaccine can reduce Fel d 1 levels by up to 50–60%, significantly decreasing allergen levels in the home environment without negatively impacting the cat's health [42]. Although the vaccine's safety and efficacy appear promising, ongoing evaluation is essential to confirm its long-term safety.

It also remains unclear whether the reduction in allergen levels is enough to improve clinical outcomes [41].

1.9. Hormonal Variation

The connection between hormones and sebum production is well established [43]. Hormones play a role in regulating Fel d 1 production, which originates from the salivary and sebaceous glands [43]. Older, male cats produce more Fel d 1 than smaller, younger, female specimens [43]. Cats that have undergone castration, resulting in reduced testosterone levels, exhibit lower levels of Fel d 1 [43]. However, when testosterone was administered to these castrated cats, a marked increase in both sebum and Fel d 1 production was observed [43]. These findings highlight the influence of hormonal activity on the production of Fel d 1 [43].

1.10. Dietary Strategies to Reduce Cat Allergens

New approaches to reduce Fel d 1 production in cats have been examined [25–27,30,34,44,45]. Evidence indicates that certain dietary modifications may impact Fel d 1 production; however, the clinical effectiveness of these dietary changes has not been extensively studied [45]. The addition of a specific neutralizing antibody (anti-Fel d 1 IgY) to cat food has shown potential in reducing the levels of Fel d 1, which could lower exposure and mitigate allergic reactions [42]. However, its effectiveness in individuals with cat allergies has not yet been evaluated in properly designed randomized clinical trials [42].

1.11. Therapeutic Options

In addition to allergen avoidance, pharmacotherapy is utilized to reduce allergic disease. Several pharmacotherapy options have been evaluated in managing allergies, including antihistamines, corticosteroids, leukotriene receptor antagonists, biologics, allergen immunotherapy, and combination therapies [46–55].

Allergen immunotherapy (AIT) is the only treatment that may modify the course of IgE-mediated allergic diseases [51]. AIT consists of administering repeated, gradually increasing doses of the identified allergen at designated intervals [51]. This approach aims to alter the immune response, enhancing symptom control and reducing the need for rescue medications [51]. Two methods for AIT include subcutaneous immunotherapy (SCIT) and sublingual immunotherapy (SLIT) [52].

Numerous SCIT studies have produced promising findings regarding the effectiveness of immunotherapy in patients sensitized to cats [53,54]. A double-blind, randomized, placebo-controlled, parallel-group trial examined the impact of a recombinant Fel d1 peptide on patients with allergic rhinitis triggered by cat allergies [53]. The trial demonstrated significant improvements in both ocular and nasal symptoms among participants receiving cat allergen immunotherapy (AIT), with benefits persisting for up to a year after treatment ended [53].

A double-blind, placebo-controlled study involving 50 participants was conducted to assess the effectiveness of sublingual immunotherapy (SLIT) over the course of one year. After one year of treatment, the group receiving SLIT showed significant improvements in peak expiratory flow (PEF) and a 62% reduction in symptoms during a natural challenge test (in a cat allergen challenge room) [55].

The EAACI guidelines suggest that allergen immunotherapy (AIT) should be considered for individuals with symptoms that strongly indicate allergic rhinitis/rhinoconjunctivitis or asthma, particularly when there is evidence of IgE-mediated sensitization to relevant allergens, or when patients experience moderate to severe symptoms despite implementing avoidance measures and pharmacotherapy [56]. Additionally, due to the long-term benefits of AIT in rhinitis, AIT may also be beneficial for some individuals with less severe symptoms [56].

AIT does have some important limitations and contraindications [57]. It requires long-term commitment, and benefits take months to years to manifest [57]. Compliance can be challenging due to frequent dosing and potential adverse reactions, including anaphylaxis [57]. Furthermore, there are several contraindications to consider, including severe uncontrolled asthma and the use of beta-blockers [57]. Other contraindications are severe cardiovascular disease, immune deficiencies, pregnancy (for initiation), and acute infections [57]. Careful patient selection and risk assessment are essential for safe and effective AIT use.

1.12. CATNIP Trial (Tezepelumab: Anti-Thymic Stromal Lymphopoietin (TSLP))

Tezepelumab is a monoclonal antibody that works by blocking thymic stromal lymphopoietin (TSLP), a protein released by cells lining the skin, intestines, nose, and lungs in response to potential threats [58–60]. Adding tezepelumab to cat allergy shots was investigated to determine if this combination would provide better symptom relief than allergen immunotherapy alone for individuals with allergic rhinitis triggered by cat allergens [61].

The Phase 1/2 trial, named CATNIP, was a double-blind parallel-design trial in 121 adult patients with cat allergies at nine medical centers across eight U.S. cities [61]. Participants were randomly assigned to one of four groups: tezepelumab plus AIT, tezepelumab plus placebo injections, placebo plus AIT, or double placebo for 52 weeks, followed by 52 weeks of observation [61]. As the primary outcome measure, participants received nasal challenges via six nasal sprays containing cat allergen extract, one spray per nostril per session [61]. Researchers measured nasal symptoms and airflow at intervals ranging from 5 min to several hours after exposure [61]. Results showed that the group receiving tezepelumab with AIT experienced an overall 80% reduction in their worst nasal symptoms by the end of treatment, which represented a 36% reduction compared to those receiving AIT alone [61]. This reduction in symptoms persisted in the long term (24% improvement over standard AIT a year later) [61]. This study is the first to demonstrate that adding a cytokine inhibitor to AIT can provide long-lasting clinical benefits for allergic rhinitis symptoms compared to AIT alone [61].

2. Conclusions

Despite decades of research on environmental interventions for managing cat allergies, a definitive solution for mitigating cat allergens has yet to be identified. Studies on interventions to reduce cat allergen exposure have shown mixed outcomes regarding the effectiveness of environmental control measures in lowering Fel d 1 and improving allergic symptoms. Cat allergens are pervasive, commonly found in public spaces, and challenging to eliminate from households, making sustainable reduction strategies challenging to implement. Several strategies have been effective in reducing cat allergen levels and improving symptoms for allergic rhinitis and asthma (Table 1).

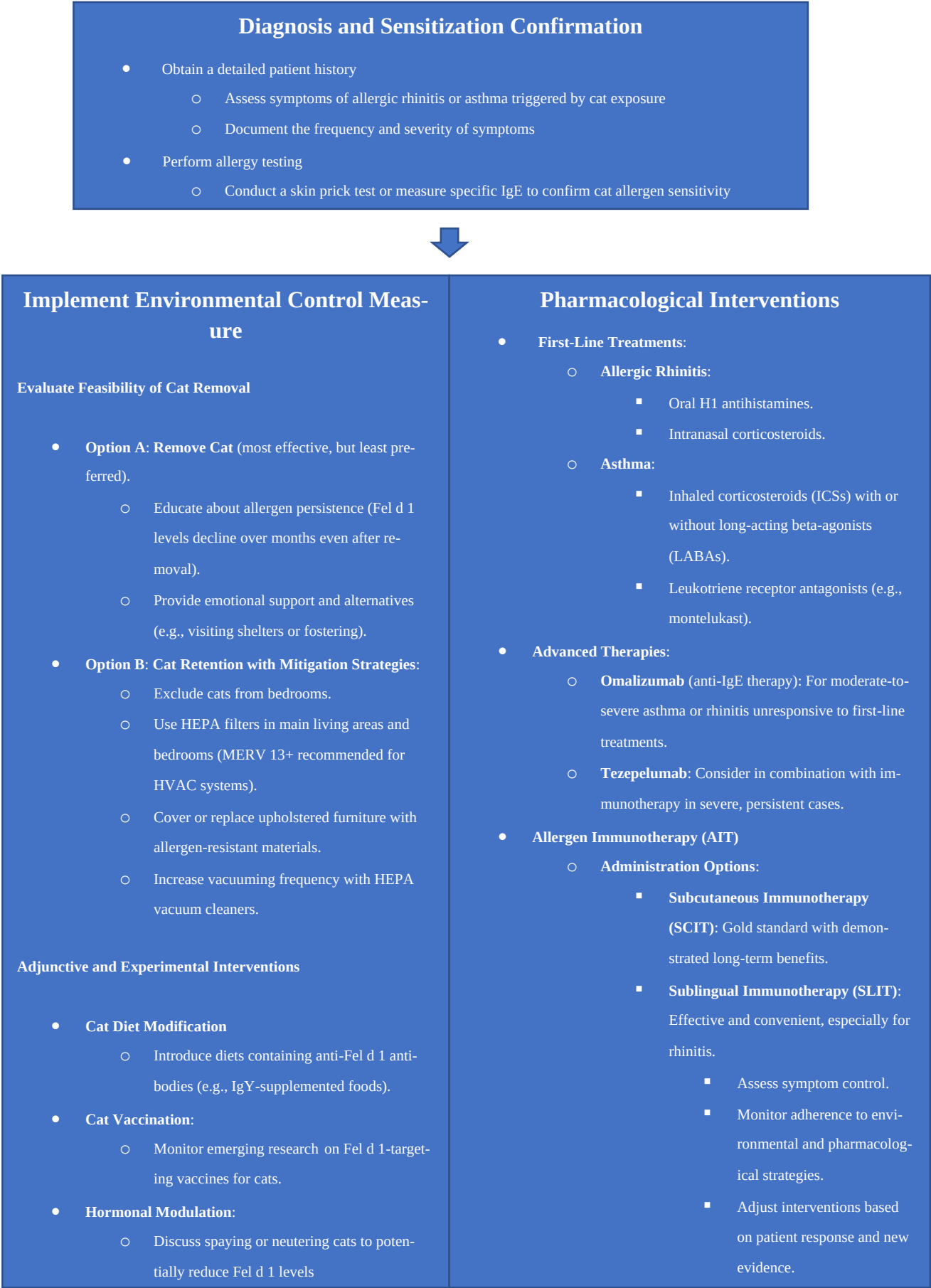
Table 1. Summary of the approximate risk reduction or allergen level reduction for each intervention.

Intervention	Risk Reduction for Allergic Rhinitis (AR) (%)	Risk Reduction for Asthma (%)	Allergen Reduction (%)	Notes
Removing Cat	50–80%	40–60%	90–100% (over months)	High efficacy for allergen exposure; delayed symptom improvement due to lingering allergens.
Bathing Cat	10–30%	5–20%	25–50% (temporary)	Requires frequent washing; effects diminish within 1–2 days.
MERV 12 HEPA filters	20–40%	15–30%	50–80% (airborne allergens)	Most effective when combined with other interventions.
Vacuuming	5–15%	5–10%	10–30%	Effective with HEPA vacuums; limited effect on airborne allergens alone.
Allergen Immunotherapy (AIT)	60–80%	50–80%	N/A	Builds tolerance over time; highly effective for many patients.
Nasal Steroids	30–70%	N/A	N/A	Reduces inflammation; effective for managing AR symptoms.

Currently, the most effective measure for controlling cat allergens is the removal of the cat from the home. However, this approach could have substantial social and emotional impacts and is generally recommended only in severe cases. High-efficiency particulate air (HEPA) filters have proven effective in reducing exposure to cat allergens. However, using standalone HEPA filters in combination with regular vacuuming has demonstrated better asthma control compared to either of these methods alone.

Removing cats from the bedroom, covering or removing fabric-upholstered furniture, vacuuming, and bathing cats have demonstrated mixed outcomes. These methods are also somewhat labor-intensive, are often expensive, and may be challenging to maintain for sustained effectiveness, especially considering the widespread and persistent nature of these allergens. Data remain inconclusive in confirming clinical improvements with these environmental control measures. More well-designed randomized controlled clinical trials are necessary to evaluate whether these interventions effectively reduce symptoms of allergic diseases.

In summary, managing patients with allergic disease necessitates close attention to potential environmental triggers, including exposure to cats. The process begins with a thorough environmental history and allergy testing. Based on this information, patients should receive personalized recommendations informed by the best available scientific evidence (Figure 1).



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