

Equine atopic skin disease and response to allergen-specific immunotherapy: a retrospective study at the University of California-Davis (1991–2008)

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Abstract

This retrospective study reports on the clinical presentation of equine atopic skin disease and evaluates response to treatment with allergen-specific immunotherapy (ASIT) based on intradermal testing and/or serum testing. Computerized medical records from January 1991 to December 2008 yielded 54 horses included in the study. Presenting clinical signs (CS) included urticaria ($n = 28$), pruritus ($n = 8$) or both ($n = 18$). Forty-one of 54 horses received ASIT, and response to ASIT ($n = 32$) was evaluated via telephone survey. Eighty-four per cent ($n = 27$) of owners reported that ASIT reduced their horse's CS; 59% ($n = 19$) were able to manage CS by ASIT alone. Three horses (9%) were managed with ASIT in combination with doxepin and discontinued use of corticosteroids. There was no statistical significance between type of test performed and reported success of ASIT (χ^2 analysis, $P = 0.53$). Ninety-three per cent ($n = 30$) of owners reported use of antipruritic medications prior to starting ASIT; 57% ($n = 17$) of these owners reported discontinuing those medications due to success of ASIT. Adverse effects were limited to swelling at the injection site, seen in 16% ($n = 5$). Seventy-five per cent ($n = 24$) of owners elected to discontinue ASIT after 6 months to 8 years (mean 2.2 years): 15 due to resolution of CS, six due to persistent CS, two because the horse was sold, and one due to cost. Ten owners reported no recurrence of CS after discontinuing ASIT; five had recurrence within a median of 2 years of discontinuing ASIT (range 1–12 years). Allergen-specific immunotherapy is a safe and effective way to manage equine atopic skin disease.

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Introduction

Atopic skin disease in people and dogs is a heritable condition characterized by pruritus, with affected individuals genetically predisposed to develop IgE-mediated allergy to environmental allergens.¹ Atopic skin disease in horses is not as well characterized as in other species, despite sharing some similarities.

While pruritus is considered the primary clinical sign of atopic skin disease in all species,^{2–5} it is reported that equine patients may experience urticaria with or without concurrent pruritus as a manifestation of their atopic skin disease.^{6,7} Clinical signs may occur seasonally or year round.^{2,8} The diagnosis of equine atopic skin disease is primarily based on history, clinical presentation and exclusion of other pruritic and/or urticarial skin diseases.^{3,6,9}

Equine atopic skin disease is typically considered a lifelong disease that requires chronic management.^{2,3} Management strategies include systemic medications, such as antihistamines, glucocorticoids, tricyclic antidepressants or a combination of these, along with topical therapy and allergen avoidance.⁶ The undesirable adverse effects and limitations on usage in competition sport of some of these systemic medications along with the impracticality of being able to avoid the offending allergens often make allergen-specific immunotherapy (ASIT) the preferred treatment choice.^{2,3} Allergen-specific immunotherapy has been used successfully in the management of atopic skin disease in horses.^{2,3,7} Intradermal testing and serum tests have both been utilized for identification of allergens to be used in immunotherapy formulated for horses.^{5,6}

Reports on the compatible history, clinical signs and treatment of these horses have been limited to descriptions in textbooks and limited isolated case reports. The purpose of this retrospective study was to report in detail a larger population of horses examined at the Veterinary Medical Teaching Hospital, University of California at Davis (VMTH-UCD), describe their clinical presentation of atopic skin disease and evaluate their response to treatment with ASIT.

Materials and methods

The computerized medical records of the VMTH-UCD from January 1991 to December 2008 were searched using the key words 'atopic dermatitis', 'allergy test', 'intradermal skin testing', 'urticaria' and 'equine'. Horses were excluded if their history was not compatible with atopic skin disease and if there were no cutaneous lesions described in the medical record. Urticaria was included if other aetiologies for the urticaria had been eliminated and other criteria for inclusion in the study were met. Within the scope of the retrospective

nature of this paper, pruritic dermatitis and/or urticaria due to ectoparasites, bacteria, dermatophytes and pemphigus foliaceus¹⁰ were ruled out by institution of fly control, skin scraping, skin cytology, fungal culture and/or biopsy, as indicated and noted in the records. In addition, records kept by the VMTH-UCD dermatology service were searched for horses that had ASIT prescribed by that service. Only horses that had positive results obtained by intradermal test (IDT), or the serological tests, enzyme-linked immunosorbent assay (ELISA) or radioallergosorbent test (RAST), were included in the study. The medical record of each horse included in the study was evaluated for data regarding breed, sex, history, presenting clinical signs (urticaria, pruritus or both) and physical examination findings.

If glucocorticoids or antihistamines were being administered, testing was not performed until administration of short-term glucocorticoids was discontinued for a minimum of 2 weeks and antihistamines were discontinued for a minimum of 7 days. This has been reported as acceptable time periods for discontinuation of these systemic medications prior to testing.¹¹

All the allergens for IDT performed at the VMTH-UCD were obtained from Greer Laboratories (Lenoir, NC, USA). All allergens were purchased as concentrates, stored in the original glass vials in a standard refrigerator at temperatures of 2–4°C, and rediluted every 2–3 weeks. Saline was used as the negative control and histamine (1:100,000 w/v) as the positive control. Sixty-four allergens regionalized to northern California were administered to each horse.

All allergens were tested at 1000 protein nitrogen units per millilitre (pnu/mL) except for the following: sheep epithelia, box elder, house dust mix and horsefly, which were tested at 500 pnu/mL; corn was tested at 250 pnu/mL; flea, *Culicoides*, *Dermatophagoides farinae*, *D. pteronyssinus*, Arizona cypress, red cedar and black ant were tested at 1:1000 w/v; and grain mill dust and grain smut were tested at 1:5000 w/v. Approximately 0.1 mL of each allergen and the controls were injected intradermally into an area from which the hair had been clipped on the lateral neck. Intradermal testing results were interpreted 15 min after injection and were subjectively graded on a scale of 0–4 according to the approximate diameter, height, firmness and erythema of the wheal. The negative control, saline, was graded as '0' and the positive control, histamine, was graded as '4'. Depending on the number of positive results and the patient's history, '3' and '4' results were considered clinically relevant.¹² Evaluation of IDT at 24 h rarely has been shown to provide additional information;¹³ however, owners were provided with a late phase reaction recording sheet and instructed to call 24 h later if any late phase reactions were noted.

The ELISA tests were performed by Greer Laboratories utilizing approximately 6 mL serum specimens. Results were interpreted according to the established grading methods of the laboratory. Scores of >40 modified absorbance units (MAUs) were considered clinically relevant, depending upon the patient's history. One ELISA test was sent to Bio-Medical Services (Austin, TX, USA), and results were interpreted according to the established grading methods of the laboratory. Scores that were positive (P) or high positive (HP) were considered clinically relevant, depending upon the patient's history.

The RAST and modified ELISA tests were performed by Spectrum Laboratories (The Spectrum Group, Mesa, AZ, USA), utilizing 3–5 mL serum specimens. Results were interpreted according to the established grading methods of the laboratory. Scores that were positive (P) or high positive (HP) were considered clinically relevant, depending on the patient's history.

The solutions of aqueous allergens prepared for ASIT included allergens that were positive on the various tests when consistent with the patient's history. These were injected subcutaneously by the owners. The injections were administered on an every-other-day basis for 1 month, with increasing concentrations and volumes being injected according to the previously published canine protocol.⁹ After the maintenance dose of 1 mL of 20,000 pnu/mL was reached, the injection frequency decreased to once weekly. Owners were instructed to continue these injections on a weekly basis for at least 1 year, unless otherwise directed. If clinical signs of urticaria or pruritus decreased, the owner was then instructed to decrease the frequency of the injections. This was done on an individual basis.

Follow-up telephone contact was attempted with owners whose horses had been administered ASIT. All owners were asked the same series of questions (Table 1). This telephone survey was used as the basis for determining response to ASIT.

Statistical analysis

The sex and breed distribution of horses with atopic skin disease was compared with the same distributions for all equines presented to the VMTH-UCD from 1 January 1991 to 31 December 2008 using chi-square tests of homogeneity. This test was also used to compare the success proportions of ASIT between skin tests, serum tests and both. When the overall chi-square test was significant ($P < 0.05$), components of the test were further evaluated for significance using a Bonferroni adjustment for multiple comparisons. The ages of affected horses are summarized as mean age and its 95% confidence interval, and contrasted with the average age in the entire hospital population in the same period.

Results

Sixty-three tests were performed in 57 horses between the years of 1991 and 2008. Three tests belonging to three different horses were excluded because the medical record was not consistent with atopic skin disease. Fifty-four horses and 60 tests were included in the study for data analysis. All of the following data, except the owner survey results, were obtained from the medical records.

Signalment and clinical signs

Age of onset of atopic skin disease ranged from 1 year (two horses) to 22 years (one horse) with a mean of 9.6 years (95% confidence interval of the mean = 8.2–11.0 years). The age that horses were presented for testing ranged from 2 years (two horses) to 24 years (one horse) with a mean of 9.4 years. The average age for the overall VMTH equine population was lower than for horses with atopic skin disease and outside the interval range at 8.1 years.

Table 1. Survey questions

1. What were the clinical signs of atopic skin disease that your horse exhibited?
2. Did allergen-specific immunotherapy help your horse?
If yes, did it decrease pruritus, urticaria or both?
Did it allow you to discontinue the use of other medications in the management of atopic skin disease in your horse?
3. Were other medications used to manage atopic skin disease in your horse prior to beginning allergy injections?
If so, what were they?
Do you recall the doses or how often you gave them?
Were these medications effective?
Were these medications given simultaneously with the allergy injections?
4. How long were allergy injections administered?
If allergy injections were discontinued, why were they discontinued?
If allergy injections were discontinued, did the clinical signs recur after discontinuing the injections?
If so, were the injections started again?
Did clinical signs resolve when the injections were restarted?
5. Were there any adverse effects from the allergy injections?
If so, what were they?
How were they treated?
6. If allergy injections are still being administered, how often are the injections being given and what amount is being administered?
How long have you been administering the injections?

Table 2. Breed distribution of affected equine patients

Breed	Number of equine patients presented with atopic skin disease (<i>n</i> = 54)	Percentage of total affected horses	Percentage of hospital population during same time period
Quarter horses	12	22	24
Thoroughbreds	8	15	24
Arabians	6	11	10
Dutch warmbloods	5	9	1.4
Morgans	4	7	1.8
Hanoverians	3	5	2.2
American paint horses	3	5	5.3
Swedish warmbloods	2	4	0.4
Oldenburgs	2	4	0.8
Hackney horses	2	4	0.04
Quarter horse/ thoroughbred cross	1	2	0.7
Arabian/saddlebred cross	1	2	0.07
Friesian	1	2	0.97
Andalusian	1	2	0.4
Trakehner	1	2	0.4
Paso fino	1	2	0.15
Polish Arabian	1	2	0.07

The 54 horses in this study comprised 17 breeds or cross-breeds of horses (Table 2). For statistical evaluation, there were 18 breed groups analysed: the 17 listed and a category for all others. The initial chi-square analysis showed a significant difference in breed distribution between the overall VMTH population and the affected horses ($P < 0.0001$). The breeds of horses contributing to this significance, with a higher than expected number of horses affected with atopic skin disease (based on the VMTH population distribution), were Dutch warmbloods, Morgans, Swedish warmbloods, Oldenburgs, Hackney horses, paso finos, Polish Arabians and Arabian/saddlebred cross. After using a Bonferroni adjustment for multiple comparisons, the only breed that was shown to have a significantly higher than expected number of cases of atopic skin disease was the Hackney horse; however, this was based on only two horses of this breed.

There were 31 geldings (58%), four stallions (7%) and 19 mares (36%) included in the study. The hospital population for equine patients seen at the VMTH during the same time period was 38% geldings, 12% stallions and 49% mares. There were four sex groups analysed: mares, stallions, geldings and unclassified in the record. An initial chi-square analysis showed a significant difference in sex distribution between the overall VMTH population and the affected horses ($P = 0.034$). The significance was attributable to more geldings ($n = 31$) than expected, with an observed to expected ratio of 1.5. However, this was not significant after Bonferroni adjustment for multiple comparisons.

Twenty-eight (52%) horses presented with urticaria as the primary complaint. Eighteen (33%) horses were presented due to pruritus and urticaria, and eight (15%) horses presented with only pruritus. The average length of time horses were reported to have clinical signs prior

to presenting to the VMTH-UCD was 24.9 months (range 4 months to 5 years) for pruritus, 16 months (range 1 month to 10 years) for pruritus and urticaria, and 14.7 months (range 1 month to 5 years) for urticaria. Twelve of the 54 horses were reported to experience their clinical signs seasonally [urticaria ($n = 4$), pruritus ($n = 2$), both ($n = 6$)].

Thirteen horses presented to the VMTH-UCD during the winter months of December ($n = 1$), January ($n = 7$) and February ($n = 5$). Fourteen horses presented during the spring months of March ($n = 8$), April ($n = 4$) and May ($n = 2$). Sixteen horses presented during the summer months of June ($n = 6$), July ($n = 6$) and August ($n = 4$). Eleven horses presented during the autumn months of September ($n = 5$), October ($n = 2$) and November ($n = 4$).

Prior to presenting to the VMTH-UCD, 27 owners reported having changed the horse's diet, 16 had changed the bedding, 10 had changed or strengthened their fly control programme, and eight had changed the horse's environment. Additionally, eight horses had skin biopsies performed by their referring veterinarians prior to presentation; five skin biopsies were reported to be consistent with allergic dermatitis, one was reported as alopecia areata, one was reported to be normal, and one was reported to be consistent with an immune-mediated disease.

Serum testing had been performed in 14 horses prior to referral, and four of these horses were reported to have received ASIT based on these results. Three of four received ASIT for 1 year, and the fourth horse received ASIT for <1 year. One horse's ASIT was discontinued 3 months prior to presentation to the VMTH-UCD; for the other three horses it was unclear from the medical records whether they were receiving ASIT at the time of their presentation to the VMTH-UCD.

Forty-six of the 54 horses had previously received corticosteroids to manage their clinical signs, 29 had received antihistamines, and two had received the tricyclic antidepressant, doxepin. Shampoos had been used in four horses and antibiotics in two horses. Corticosteroids improved the clinical signs in 36 of the 46 horses that had received them. In eight horses, there was no change, and in two horses the response was not reported. Thirteen of the 29 horses that had received antihistamines were reported to be responsive, with 16 reported as unresponsive. The two horses that had received doxepin were reported to be responsive to the medication. No response was recorded in respect to the shampoos and antibiotics that were used.

Physical examination findings for the 54 horses included generalized urticaria in 19 horses, urticaria localized to the neck and trunk in two horses, and urticaria localized to the trunk in three horses. Six horses had generalized urticaria and concurrent pitting oedema [limb/sheath oedema ($n = 2$), ventral abdominal oedema ($n = 2$) and facial oedema ($n = 2$)]. Six horses were reported to have no cutaneous lesions at the time of physical examination. Four horses had generalized urticaria with focal areas of alopecia. Three horses had focal areas of alopecia as their only physical examination findings. Three horses had alopecia with concurrent exco-

riations. Three horses had generalized scaling, one also with pustules, and another with focal areas of alopecia. Two horses had alopecia along with broken tail hair. One horse was noted to have broken tail hair, and one had generalized oedema, involving the sheath, limbs and ventral abdomen. No physical examination findings were recorded for one horse.

Eleven horses [urticaria ($n = 6$), pruritus ($n = 2$) and both ($n = 3$)] had a skin biopsy performed at the VMTH-UCD. Six horses were diagnosed with eosinophilic dermatitis consistent with urticaria, two horses were diagnosed with vasculitis, one horse was diagnosed with perivascular dermatitis consistent with hypersensitivity, one horse was diagnosed with eosinophilic, histiocytic, lymphoplasmacytic dermatitis consistent with hypersensitivity, and one horse was diagnosed with pyotraumatic dermatitis. Three horses had fungal cultures and were reported to be fungal culture negative.

All 54 horses received a diagnosis of atopic skin disease at the VMTH-UCD. Eighteen horses had concurrent diagnoses: 10 horses were diagnosed with concurrent insect bite hypersensitivity, four with concurrent pyoderma, two with vasculitis, one with *Malassezia* dermatitis and superficial pyoderma, and one with alopecia areata.

Test results

A total of 60 tests were performed in 54 horses; six horses were tested twice. All 60 tests were included in the study. Thirty-six were intradermal tests and 24 were serum tests. All tests were based upon allergens regionalized to northern California at the time of testing; there were differences in the allergens tested for over the 17 year period, and not all horses were tested for the same allergens. All horses in the study were living in northern California at the time of testing.

Thirty horses were tested by IDT only, nine horses by ELISA only, and nine horses by RAST/modified ELISA only. Four horses were tested by both IDT and ELISA, and two horses by both IDT and RAST/modified ELISA. A complete list of allergens used and the number of positive-reacting horses for each one is available from the primary author.

Of 44 horses tested for house dust mites, 21 horses were positive to both *D. farinae* and *D. pteronyssinus*, 13 were positive to *D. farinae* alone, and two were positive to *D. pteronyssinus* alone. The most common positive reaction among tree pollens was to olive tree ($n = 19$ horses); 18 horses tested positive to orange tree, red cedar tree and/or white alder tree. The most common positive reaction of grass allergens was to Bermuda grass ($n = 24$ horses). The most common weed pollen was sage mix, with 25 horses testing positive. There were 24 horses testing positive to *Penicillium notatum*, which was the most common positive within the fungi and smuts. Of the insect allergens tested for, the most common positive was to deer fly or *Chrysops* spp. ($n = 29$ horses). Using these positive reactions, the number of allergens utilized in the allergen solution based on a history of exposure ranged from 12 to 17.

Of the 54 horses that were tested, 41 received ASIT. Of these 41 horses, 32 horses were able to be evaluated for response to ASIT via telephone survey of their own-

ers. Within this group of 32 horses, 15 horses initially presented with a history of urticaria and pruritus, 13 horses were presented for nonpruritic urticaria, and four presented with pruritus. Seventeen horses were tested by IDT, 10 horses were serum tested, and five were tested by both IDT and serum test.

Nine of the horses treated with ASIT were lost to follow up. One of the 13 owners that declined ASIT purchased the first set of allergens and then elected to discontinue the treatment because the horse's behaviour prevented the owner from administering injections.

Results of owner surveys

Twenty-seven (84%) of the 32 owners surveyed reported that ASIT reduced the clinical signs of atopic skin disease that their horse was exhibiting; within these 27, 14 horses initially presented with urticaria and pruritus, nine horses presented with urticaria, and four horses presented with pruritus. Five (16%) of 32 owners reported that ASIT was not effective in managing their horse's atopic skin disease because their horse's clinical signs [urticaria ($n = 4$), both ($n = 1$)] persisted while it was receiving ASIT.

Of the 27 horses that were reported to benefit from ASIT, 13 horses had their ASIT formulated based on the results of IDT, nine had their ASIT based on a serum test, and five had both an IDT and a serum test. A chi-square analysis used to compare the success proportions of ASIT between skin tests, serum tests and both showed no statistical difference between the three groups ($P = 0.53$).

Based on evaluations of both the medical record and the owner survey responses, 30 of 32 horses had received oral and/or injectable antipruritic medications prior to beginning ASIT. Twenty-four of these 30 horses had received corticosteroids, 19 had received the antihistamine hydroxyzine, and 10 had received the tricyclic antidepressant, doxepin. Two horses had received no oral medications prior to starting ASIT. One horse was shampooed with a medicated shampoo, Etiderm® (Virbac Animal Health, Fort Worth, TX, USA), for a secondary pyoderma.

Of the 30 owners who reported using antipruritic medications prior to beginning ASIT, 57% (17 of 30) reported being able to discontinue those medications with the addition of ASIT. Forty-three per cent (13 of 30) of owners reported needing to use antipruritic medications concurrent with the ASIT. Six horses received doxepin, three horses received corticosteroids, two horses received hydroxyzine, and one horse received corticosteroids, hydroxyzine and doxepin, intermittently and at different times, during the time period that ASIT was administered. Three owners reported that although they were not able to discontinue oral medications, they were able to discontinue the use of corticosteroids, which they attributed to the use of ASIT. All three described this as a benefit in the management of their horse's atopic skin disease. All three horses initially presented with pruritus and urticaria, and all three were eventually managed with doxepin concurrently with their ASIT.

To provide a more objective evaluation of the success of ASIT, horses were categorized as responders, partial

responders, undetermined responders and nonresponders. The responder category was defined as the use of ASIT as the sole therapy and was noted in 19 (59%) of 32 horses. The addition of ASIT allowed three additional horses to discontinue corticosteroids and, as noted above, these horses were managed with ASIT in combination with doxepin, giving a percentage of success for partial responders of 9%. In five horses (16%), none of the concurrent medications could be discontinued with the addition of ASIT, thus the true response to ASIT could not be determined. The remaining five horses (16%) were reported to have no change in their clinical signs with the addition of ASIT and were deemed nonresponders. Using this stricter definition of success, there was still no statistical correlation ($P = 0.26$) between successful management of the atopic skin disease and on which test (serum or IDT) the ASIT was based.

The 32 owners surveyed reported the duration of administration of ASIT as follows: two (6.25%) horses received ASIT for <1 year, 10 (31%) for 1 year, two (6.25%) for 1.5 years, six (19%) for 2 years, four (13%) for 3 years, three (9%) for 4 years, two (6.25%) for 5 years, two (6.25%) for 8 years, and one (3%) horse received ASIT for 12 years. The mean duration of administration of ASIT in these horses was 2 years.

Eighty-four per cent (27 of 32) of owners reported no adverse effects associated with the administration of ASIT, while 16% (5 of 32) reported an occasional swelling at the injection site. All five owners reported resolution of the injection site swelling within 24–48 h, with no medical care needed.

Ninety per cent (29 of 32) of owners were no longer administering ASIT at the time of the survey. Seventy-five per cent (24 of 32) had elected to discontinue ASIT, while 16% (5 of 32) reported that ASIT had been discontinued because the horse had died due to unrelated causes. These five horses were still receiving ASIT at the time of their deaths.

Of the 24 owners who had elected to discontinue ASIT, 62% (15 of 24) reported that they discontinued ASIT due to resolution of clinical signs [urticaria ($n = 7$), both ($n = 7$), pruritus ($n = 1$)]. Twenty-five per cent (6 of 24) of owners reported persistence of clinical signs and lack of clinical benefit as the reason for discontinuing ASIT [urticaria ($n = 4$), both ($n = 2$)]. Eight per cent (2 of 24) reported that the horse was sold and ASIT was discontinued at that time. Four per cent (1 of 24) reported cost of therapy as the reason for discontinuing ASIT.

Of the 15 horses whose owners had discontinued ASIT due to resolution of clinical signs, 33% (5 of 15) experienced a recurrence of their clinical signs. Three horses with both urticaria and pruritus relapsed 1, 3 and 12 years after discontinuing ASIT. Two horses with urticaria relapsed within 2 years of stopping ASIT. Three of the five horses that experienced a recurrence of their clinical signs were restarted on ASIT and were reported to again have resolution of their clinical signs. Of the two horses that were not restarted on ASIT, one owner reported the horse's urticaria to be manageable with antihistamines alone and thus the owner elected not to restart ASIT; the other horse was reported to have intermittent, localized urticaria that did not require medical management. The

two horses that were sold and the horse that had ASIT discontinued due to cost of treatment were reported by the owners not to have any recurrences of their clinical signs after discontinuing ASIT.

Discussion

Age, breed and sex predilections for atopic skin disease in the equine patient have not been extensively reported. In this study, quarter horses and thoroughbred horses were the most common breeds presented with atopic skin disease. However, these two breeds were also the most common breeds to present to the VMTH-UCD during this same time period. Although some of the less common breeds (e.g. Hackney horse) appeared to be over-represented in the atopic group based on the hospital's breed distribution, there were only a relatively small number of these horses affected. This potential breed predilection warrants further investigation. Although males (mostly geldings) were more prevalent than females, with a 35 to 19 ratio, this finding was not considered statistically significant, which is similar to previous reports.¹³

Unlike the canine patient, clinical signs specific for horses with atopic skin disease are not well defined. Pruritus is reported to be the main clinical feature of atopic skin disease in all species.^{2–5} Although urticaria is often cited as a clinical presentation associated with atopic skin disease in the equine patient, to the authors' knowledge this is the first report of 28 horses presenting with nonpruritic urticaria as the only clinical sign of atopic skin disease. In our study, we chose to include horses with urticaria that had all other aetiologies for urticaria eliminated and had positive results on either serum testing or IDT. It has been previously reported that urticaria in horses may be caused by inhalant (airborne) allergens (pollens, molds and dust) and possibly aerosol insecticides.¹⁴ The urticaria associated with atopic skin disease in the horse has been reported to be quite severe yet nonpruritic.^{3,6} There may be a familial predisposition for equine urticaria associated with atopic skin disease,¹⁵ which may correlate with our finding of possible breed predisposition.

Included in this study were 60 tests. Forty-four horses were tested for *D. farinae*, with 34 horses (77%) testing positive. This is similar to tests done in other species. House dust mites were the most common allergen to cause positive reactions in canine testing in northern California, with 71% of dogs testing positive.¹⁶ While *D. farinae* is classically considered a 'house' dust mite, it may be present in an outdoor or barn environment, or the test may cross-react with other arthropods commonly seen in an outdoor environment, or both. A recent study demonstrated the presence of house dust mites in horse rugs.¹⁷ Positive reactions to house dust mites in horses in IDT have been reported previously,¹⁸ as has cross-reactivity of this mite with other arthropods.^{19–21} Interestingly, a camel kept in an outside environment in northern California also had positive reactions on IDT to both *D. farinae* and *D. pteronyssinus*, and was subsequently successfully hyposensitized to these and other environmental allergens.²²

Allergen-specific immunotherapy was offered to the owners of 54 horses over the 17 year time period. Seventy-six per cent of these horses were treated with ASIT. According to the owners surveyed, the overall response rate to ASIT was 84%. Although a previous report noted a response rate of 92% in the management of equine urticaria,⁷ the percentage rate reported here may be overestimated, as this is higher than what has previously been reported for other species. It is possible that owner assessment may be skewed by placebo effect or that concurrent medications administered were controlling clinical signs. Owing to the retrospective nature of the study, a telephone survey of horse owners was utilized as a way to ascertain success of ASIT. However, if interpretation of success of ASIT in managing clinical signs of equine atopic skin disease is determined by it being the sole therapy used, then a stricter evaluation of success in the present study would be 59%, with a further small percentage (9%) of horses being considered partial responders (i.e. concurrent medications administered with ASIT but allowed discontinuation of corticosteroids). This would give a total response rate of 69% (22 of 32 horses), which is similar to the 72% response rate previously reported in the canine patient.⁹ In the present study, there was no apparent correlation between type of test performed and success of ASIT.

Although all owners were instructed to continue ASIT for at least 1 year to fully assess response, in our study, two patients had their ASIT discontinued prior to 1 year of treatment. Both horses [pruritus ($n = 1$) and both ($n = 1$)] were reported by the owners to have a decrease in their clinical signs while receiving ASIT. Despite having attempted to rule out other causes of urticaria and pruritus, it is possible that atopic skin disease was not responsible for these clinical signs; however, in a previous report, most owners noted a decrease in their horse's clinical signs within the first 6 months of administering ASIT.⁷ It has also been reported that horses being treated with ASIT for urticaria may show a clinical response as early as 2 months into treatment.^{6,15}

In our study, it is noteworthy that 57% (17 of 30) of owners reported being able to discontinue oral medications by utilizing ASIT. Horses affected with atopic skin disease are typically treated with antihistamines and corticosteroids, both of which have potential adverse effects.^{6,7} Corticosteroids in horses may cause steroid hepatopathy, laminitis and iatrogenic hyperglucocorticoidism.⁶ Antihistamines have fewer adverse effects, but may still cause drowsiness or nervousness, and some breed associations do not allow their use when performing in the show ring or competition sports.⁶

Only five owners reported an adverse effect of the ASIT (swelling at the injection site), which is consistent with a previous report.⁷ No oral or topical medications were utilized to treat the localized swelling. No owners of horses receiving ASIT reported anaphylaxis, which is a rare but potential adverse effect of ASIT.⁷

Of the 41 horses that began ASIT, nine horses were lost to follow up. Client communication is a key feature in the success of ASIT.⁹ It is often recommended in the management of canine atopic dermatitis that recheck evaluations occur within 6 months of starting ASIT.⁹

While this recommendation can be applied to the equine patient, owners may be reluctant to transport their horse for a follow-up evaluation. Therefore, follow-up evaluation should be attempted through collaborative work with the primary care veterinarian and/or through telephone and/or e-mail communication with the owner.

All owners of horses that receive ASIT through the VMTH-UCD dermatology service are provided with an instruction sheet, a tutorial on how to administer subcutaneous injections (if needed) and contact information for the veterinarian and the dermatology service as a whole. Owners are encouraged to call with any questions or concerns. Despite these attempts at facilitating communication, two owners reported that the first time they received any contact regarding their horse and ASIT was from the investigator involved with this study. One owner stated that she would have been more likely to continue ASIT had she been contacted regarding expectations and questions that had arisen. Thus, it should be the standard of care that despite any written or verbal instructions provided to the owner, the veterinarian or a designated technician should take the initiative to follow up with the owners of horses with atopic skin disease.

While the success rate, based on owner assessment, with ASIT in this study is 84%, if success is interpreted as the ability to utilize ASIT as a sole or concurrent therapy that allows the discontinuation of corticosteroids then the success rate was 69%. Owners should be made aware that while they may see decreased clinical signs of atopic skin disease within 6 months of administering ASIT, they should anticipate giving the injections for at least 1 year. Owners and veterinarians should also be aware that, unlike other species, ASIT may not need to be given for the lifetime of the horse. As shown in this study, 72% did not have recurrence of their clinical signs after discontinuing ASIT. Based on our findings, ASIT appears to be a safe and effective way to manage equine atopic skin disease.

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Résumé Cette étude rétrospective décrit la présentation clinique de la dermatite atopique équine et évalue la réponse au traitement avec l'immunothérapie spécifique d'allergène (ASIT) basée sur des tests intradermiques et/ou des tests sériques. Des données médicales informatisées enregistrées de janvier 1991 à décembre 2008 ont permis d'inclure 54 chevaux dans l'étude. Les signes cliniques présentés (CS) comprenaient urticaire ($n = 28$), prurit ($n = 8$) ou les deux ($n = 18$). Quarante et un des 54 chevaux ont reçu une ASIT et la réponse à l'ASIT a été évaluée par surveillance téléphonique. Quarante quatre pourcent ($n = 27$) des propriétaires ont rapporté que l'ASIT diminuait les CS de leur cheval; 59% ($n = 19$) étaient capables de gérer les CS par l'ASIT seule. Trois chevaux (9%) étaient gérés avec l'ASIT associé à la doxépine et à l'administration irrégulière de corticostéroïdes. Il n'y avait pas de différence significative entre le type de test allergique effectué et le succès rapporté de l'ASIT (analyse chi-deux, $P = 0.53$). Quarante trois pourcents ($n = 30$) des propriétaires ont rapporté l'utilisation d'antiprurigineux avant le début de l'ASIT; 57% ($n = 17$) de ces propriétaires ont rapporté un arrêt de ces traitements lié à l'efficacité de l'ASIT. Les effets secondaires étaient limités à un gonflement au site d'injection dans 16% des cas ($n = 5$). Soixante-quinze pourcents ($n = 24$) des propriétaires ont arrêté l'ASIT après 6 mois à 8 ans (moyenne 2.2 ans): 15 en raison de la résolution des CS, six en raison de la persistance des CS, deux parce que le cheval a été vendu et un, à cause du coût. Dix propriétaires n'ont rapporté aucune récurrence des CS après l'arrêt de l'ASIT; cinq ont récidivé en moyenne deux ans après l'arrêt de l'ASIT (écart : 1–12 ans). L'ASIT est un moyen sûr et efficace de gérer la dermatite atopique équine.

Resumen Este estudio retrospectivo trata sobre la presentación clínica de la atopia equina en la piel y evalúa la respuesta al tratamiento con la inmunoterapia específica de alérgeno (ASIT) basada en la prueba intradérmica y/o la prueba del suero. Las historias clínicas entre enero de 1991 y diciembre de 2008 aportaron 54 caballos incluidos en el estudio. Los signos clínicos (CS) incluyeron urticaria ($n = 28$), prurito ($n = 8$) o ambos ($n = 18$). Cuarenta y uno de 54 recibieron ASIT y la respuesta a ASIT ($n = 32$) fue evaluada vía encuesta telefónica. Ochenta y cuatro por ciento ($n = 27$) de dueños indicaron que ASIT redujo los CS de su caballo; un 59% ($n = 19$) pudieron manejar los signos clínicos con ASIT solamente. Tres caballos (9%) fueron manejados con ASIT conjuntamente con doxepin y uso continuado de corticoesteroides. No hubo significación estadística entre el tipo de prueba alérgica realizada y el éxito de la ASIT (análisis de chi-cuadrado, $P = 0.53$). Noventa y tres por ciento ($n = 30$) de dueños indicaron uso de medicaciones antipruriginosas antes de comenzar ASIT; un 57% ($n = 17$) de estos dueños decidieron no continuar esas medicaciones debido al éxito de ASIT. Los efectos adversos se limitaron a hinchazón en la zona de inyección en un 16% de animales ($n = 5$). Setenta y cinco por ciento ($n = 24$) de dueños decidieron terminar la ASIT después de 6 meses a 8 años (media 2.2 años): 15 debido a la resolución de los CS, seis debido a CS persistentes, dos porque el caballo fue vendido, y uno debido al coste. Diez dueños indicaron ausencia de recidiva de los CS después interrumpir ASIT; cinco manifestaron recidiva con una media de dos años tras discontinuar ASIT (rango de 1–12 años). ASIT es una forma segura y eficaz de manejar la atopia cutánea equina.

Zusammenfassung Diese retrospektive Studie berichtet über die klinische Präsentation der atopischen Hauterkrankung des Pferdes und evaluiert den Erfolg einer Behandlung mit Allergen spezifischer Immuntherapie (ASIT), welche auf einem Intradermaltest und/oder Serologie basierte. Computerisierte

Krankengeschichten von Jänner 1991 bis Dezember 2008 ergaben 54 Pferde, die in die Studie aufgenommen wurden. Die klinischen Zeichen (CS), mit denen die Pferde präsentiert wurden bestanden aus Urtikaria ($n = 28$), Juckreiz ($n = 8$) oder beidem ($n = 18$). Einundvierzig von 58 Pferden erhielten eine ASIT und die Reaktion darauf ($n = 32$) wurde mit Hilfe eines Telefonrundrufs ermittelt. Achtundvierzig Prozent ($n = 27$) der BesitzerInnen berichteten, dass die ASIT die CS ihrer Pferde reduzierte; bei 59% ($n = 19$) konnten die CS zu Hause allein mit ASIT kontrolliert werden. Drei Pferde (9%) wurden mit einer ASIT in Kombination mit Doxepin, sowie intermittierend mit Kortikosteroiden, kontrolliert. Es bestand kein signifikanter Unterschied zwischen dem durchgeführten Allergietest und dem beschriebenen Erfolg der ASIT (chi-square Analyse, $P = 0,53$). Dreiundneunzig Prozent ($n = 30$) der BesitzerInnen berichteten von der Verwendung von Medikamenten gegen den Juckreiz bevor sie die ASIT begannen; 57% ($n = 17$) dieser BesitzerInnen berichteten diese Medikamente aufgrund der erfolgreichen ASIT nicht mehr zu verwenden. Nebenwirkungen beschränkten sich auf eine Schwellung an der Injektionsstelle, welche bei 16% ($n = 5$) gesehen wurde. Fünfundsiebzig Prozent ($n = 24$) der BesitzerInnen beschlossen die ASIT nach einem Zeitraum von 6 Monaten bis zu 8 Jahren (Durchschnitt 2,2 Jahre) zu beenden: 15 aufgrund des Verschwindens der klinischen Symptome, sechs aufgrund persistierender Symptome, zwei aufgrund des Verkaufs des Pferdes und einer aufgrund der Kosten. Zehn BesitzerInnen berichteten, dass nach Beendigung der ASIT die klinischen Symptome nicht zurückkehrten; fünf Pferde zeigten ein Wiederauftreten innerhalb eines Medianwertes von zwei Jahren, nachdem die ASIT beendet worden war (Bereich von 1–12 Jahren). Die ASIT ist eine sichere und effektive Möglichkeit die atopische Hauterkrankung des Pferdes zu managen.

要約 この回顧的研究では馬のアトピー性皮膚疾患の臨床症状ならびに皮内試験および／あるいは血清検査に基づいたアレルゲン特異的免疫療法 (ASIT) に対する反応を評価した。1991 年 1 月から 2008 年 12 月の間に診察した、54 頭のコンピュータ化された診療記録を用いた。認められた臨床症状 (CS) には蕁麻疹 ($n = 28$)、そう痒 ($n = 8$)、または両方 ($n = 18$) が含まれていた。54 頭中 41 頭が ASIT を受けており、ASIT への反応は電話での聞き取りによって評価した。84% ($n = 27$) の飼主は ASIT が馬の CS を減少させたと報告し；59% ($n = 19$) は ASIT 単独で症状の管理が可能であった。3 頭 (9%) は ASIT とドキシセピンの併用療法で管理可能であり、コルチコステロイドの使用を中止した。実施したアレルギー検査の種類と ASIT の有効性の間には統計学的な有意差は認められなかった (カイ二乗分析、 $P = 0.53$)。93% ($n = 30$) の飼主が抗そう痒剤を ASIT の開始以前に使用していた：ASIT の効果により飼主の 57% ($n = 17$) それらの薬剤を中止したと報告した。副作用は注射部位の腫脹のみが 16% ($n = 5$) にみられた。75% ($n = 24$) の飼主が 6 ヶ月から 8 年後に ASIT の中止を選んだ (平均 2.2 年)：15 頭は CS の解消により、6 頭は持続する CS により、2 頭は馬が売却されたため、1 頭は費用の為であった。10 人の飼主は ASIT を中止しても再発がなかったと報告した：5 頭は ASIT 中止後、中央値で 2 年以内 (1–12 歳の範囲) に再発がみられた。ASIT は馬のアトピー性皮膚疾患の維持管理方法として安全で効果がある。