

Evaluation of methylprednisolone and triamcinolone for the induction and maintenance treatment of pruritus in allergic cats: a double-blinded, randomized, prospective study

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Background – Oral triamcinolone (T) and methylprednisolone (M) have been recommended at various dosages for the control of pruritus associated with feline allergic dermatitis.

Objectives – The first objective was to determine effective dosages of methylprednisolone (Pfizer, New York, NY, USA) and triamcinolone (Boehringer Ingelheim Vetmedica, Inc., St Joseph, MO, USA) required to induce remission from pruritus associated with feline allergic dermatitis. The second objective was to compare efficacy of several different alternate day maintenance dosages. The third objective was to determine whether laboratory abnormalities occurred at effective dosages.

Animals – Thirty-two client-owned allergic cats were randomly assigned to the M or T groups.

Methods – Owners reported weekly on pruritus score and behavioural changes. Remission was defined as a pruritus score of $\leq 2/10$, with 0 as the least and 10 as the most pruritic. Serum chemistry, complete blood count, fructosamine and urinalysis were assessed on day 0, at the end of the 7–14 day induction phase and at study completion.

Results – Mean once daily doses required for induction were 1.41 mg/kg for M and 0.18 mg/kg for T. Mean alternate day maintenance doses were 0.54 mg/kg for M and 0.08 mg/kg for T. There was a statistically significant decrease in eosinophils and increase in fructosamine for both groups from baseline to study completion. Fructosamine levels did not exceed the reference range in any case.

Conclusions – These results suggest that triamcinolone is approximately seven times as potent as methylprednisolone, and that these dosages are efficacious and well tolerated for the control of pruritus in allergic cats.

Introduction

Oral glucocorticoids are commonly prescribed by veterinarians for the treatment of allergic pruritus in cats. Published dosage ranges are quite variable for these drugs and range from 1 to 2 mg/kg/day for prednisolone, from 0.3 to 1.6 mg/kg/day for methylprednisolone and from 0.1 to 0.5 mg/kg/day for triamcinolone.^{1–4} Although these dosages are purported to be effective, there are no controlled studies demonstrating efficacy or comparing efficacy at recommended dosages. One blinded study showed 1 mg/kg/day of prednisolone to be relatively ineffective,⁵ although it is in the published range of supposed effective dosages. It is also typically recommended to taper oral steroid medications to lower every other day (EOD) maintenance doses in order to minimize adverse effects.^{2,3} A variety of methods for tapering glucocorticoids are

discussed and practised. In general, the induction dosage ends within a week and then tapering occurs at 1–2 week intervals. The final dosage is generally the lowest EOD dosage that maintains remission. No studies have shown an effective way to taper glucocorticoids or reported an average EOD maintenance dosage that can be achieved. In addition to wide ranges in recommended dosages, there are also marked differences in published dosage equivalency between prednisolone and methylprednisolone compared with triamcinolone. The range varies from almost equipotent to a 1 to 10 equivalency.^{1–6} There are no studies comparing the different glucocorticoids and evaluating the relative equivalent dosages of triamcinolone and methylprednisolone for treating allergic cats. There are studies that have compared dexamethasone with prednisolone and prednisone with prednisolone, but not in allergic cats or using an induction schedule followed by tapering.^{7,8}

Although it is commonly believed that cats are tolerant to adverse effects of glucocorticoids, adverse effects can occur.^{4,6} These include marked cutaneous atrophy,^{4,6} congestive heart failure,^{9,10} iatrogenic hyperadrenocorticism^{11–13} and increased risk of diabetes mellitus.^{4,6,8} As these effects can be dosage dependent, establishment

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of mean effective dosages should limit adverse effects secondary to excessive dosages.

The overall objective of this study was to compare two oral glucocorticoids, methylprednisolone and triamcinolone, for control of feline allergic dermatitis. The first comparison was to determine the efficacy of the published dosage range in inducing remission of pruritus in allergic cats. The second objective was to determine the ability to decrease to lower EOD maintenance dosages. The third objective was to determine whether complete blood count (CBC), serum chemistry, fructosamine or urine abnormalities occurred with the efficacious induction dosage and/or with the effective EOD maintenance dosage. Client-observed behavioural changes, including hunger, thirst, urination, aggression and affection, were also evaluated.

Materials and methods

Eligibility criteria

Indoor cats with pruritus attributed to environmental and/or food-associated allergic dermatitis were eligible for the study. Prior to enrolment, infectious and parasitic conditions were ruled out by skin scrape, dermatophyte culture and faecal flotation. To be included, fleas and visible flea dirt must have been absent on physical examination. All cats were required to have been on veterinary prescribed flea control for a period of no less than 30 days prior to the start of the study. Bacterial pyoderma and yeast dermatitis as causes of pruritus were ruled out prior to enrolment by skin cytology and physical examination. Cats with clinical signs of eosinophilic granuloma complex at day 0 were not eligible for enrolment in an effort to avoid infected lesions that might hinder the response to glucocorticoid therapy.¹⁴ To be eligible, cats must have had an owner-reported pruritus score of 4/10 or greater. The pruritus score was adapted for feline patients from that described by Hill *et al.*¹⁵ (Figure 1).

Cats with concurrent disease or receiving medications that were contraindicated with steroid use were not eligible. Cats that could not be maintained on the same diet during the trial were excluded from enrolment. Concurrent therapies, including antihistamines, fatty acids, ciclosporin or other topical or systemic glucocorticoids, were not allowed during the study period. Withdrawal periods prior to the start of the study were 14 days for antihistamines, 30 days for oral glucocorticoids, 30 days for ciclosporin and 60 days for injectable glucocorticoids. Cats that had been receiving allergen-specific immunotherapy (ASIT) for over 1 year yet remained pruritic were eligible as long as no changes were made to the ASIT protocol during the study period. Normal grooming and bathing practices were allowed to continue during the study period as long as they were not changed during the course of the study. Cats with body condition score >7/9 and cats allowed outdoors during the study period were not eligible. Cats that could not be given pills due to fractious temperament were also not included.

Initial examination (day 0)

All clients signed an informed consent form prior to enrolling their pets on day 0. On day 0, each case had an initial consultation by a primary investigator, including a thorough history, physical and dermatological examination. Each cat received examinations by the same primary investigator throughout the study. Lesions of self-induced alopecia were measured and photographed. The average hair length at sites of self-induced alopecia was measured by plucking several hairs with a haemostat and measuring the total length of those hairs (in centimetres). If hairs were too short to be plucked, the skin was folded perpendicular to the body surface so that hairs were more easily visualized, and the length of the hair from the skin surface was measured. In such cases, the same technique was repeated at all visits.

How itchy is your cat?

This scale is designed to measure the severity of itching in cats. Itching can include scratching, biting, licking, grooming, chewing, nibbling or rubbing. Read all the descriptions below so that you may use this scale to report the itchiness you are observing at home.

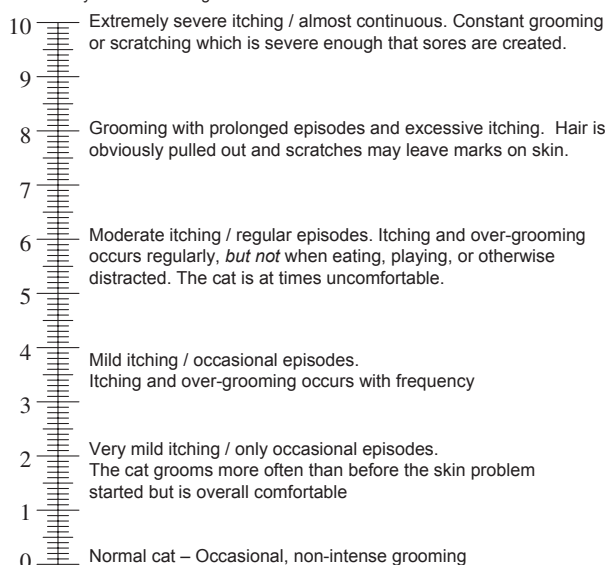


Figure 1. Pruritus scale used by owners to evaluate and report itch level.

Lesions were also evaluated by the primary investigator using a modification of the canine atopic dermatitis extent and severity index score (CADESI-03 score) as described by Olivry *et al.*¹⁶ Scoring in the categories of erythema, excoriation and self-induced alopecia was performed exactly as described for each body area. However, lichenification was omitted from evaluation in all body areas because it is rarely observed in pruritic cats. The adapted CADESI-03 is therefore referred to as the feline erythema, excoriation and alopecia score (FE-EAS) for the purposes of this study.

Laboratory analyses, including a CBC, serum chemistry panel, fructosamine blood level, urinalysis and faecal flotation with Giardia test by ELISA, were submitted on day 0. Cats were randomly and evenly assigned to the methylprednisolone (M) or the triamcinolone (T) group using standard randomization software.¹⁷ An unblinded veterinary technician dispensed prescription vials of 4 mg tablets of methylprednisolone to patients in the M group and 0.5 mg tablets of triamcinolone to patients in the T group as determined by the randomization chart. The study medications were dispensed in identical prescription vials labelled as follows: 'Steroid medication. Give only as directed by veterinarian.'. The labels included the client and patient's name, but not the name of the drug. The primary investigator did not see the pills or the prescription vials distributed to the owners. All cats stayed with their owners in their own environments, were kept indoors and remained on the same diet for the duration of the study.

Phase I: induction

The starting dosage for cats ≤5 kg in the M group was 4 mg (one tablet) *per os* (p.o.) once daily, while starting dosage for the T group in this weight class was 0.5 mg (one tablet) p.o. once daily. For cats >5 kg in the M group, the starting dosage was 6 mg (1.5 tablets) p.o. once daily. The starting dosage for cats in this weight class in the T group was 0.75 mg (1.5 tablets) p.o. once daily. These initial doses investigated a comparison, assuming triamcinolone to be approximately eight times as potent as methylprednisolone.

On day 0, owners were instructed by a trained veterinary technician to administer the tablets to their cat at home. Owners were contacted via telephone by the primary investigator on day 7. During this conversation, the owner reported the current pruritus score (0–10) as well as whether there was an increase, decrease or no change in hunger, thirst, urination, aggression or affection since starting the

medication. They were also asked to report any other changes in behaviour. Remission was defined as ≤ 2 on the pruritus scale.^{15,18} Cats in remission were presented on day 7 for their end phase I evaluation. This included a physical and dermatological examination, FEEAS, photographs of remaining lesions and measurement of average hair length at sites of self-induced alopecia. Samples for CBC, serum chemistry, fructosamine level and urinalysis were collected for each cat. These cats then began phase II of the study.

Cats that did not achieve remission by day 7 had their once daily induction dose doubled for the next 7 day period. At the end of this second 7 day period, all cats were presented for examinations and sampling as described above. Cats in remission with a pruritus level of $\leq 2/10$ proceeded to phase II of the study. Cats that were not in remission at the doubled induction dose were considered induction failures and did not proceed further in the study. Data for these induction failures were used to analyse the percentage of the total study population and percentage within each group that achieved remission. Laboratory parameters, behavioural changes and lesion scores of these animals were not grouped together for analysis with those cases that did achieve remission.

Phase II: tapering

During phase II, the effective induction dosage was tapered in order to establish how many cats in remission could have their dosage reduced to as low as 25% of the daily induction dose given EOD. During week 1 of phase II, cats in both groups had their induction dosage reduced from once daily to EOD for a period of 7 days. At the end of 7 days, owners were contacted via telephone. Owners were again asked to evaluate their cat's pruritus on a scale of 0–10 at the new EOD dosage, as well as to report any changes in hunger, thirst, urination, aggression or affection since starting the study.

Cats that remained in remission with a pruritus score of $\leq 2/10$ had further tapering according to the schedule displayed in Table 1. Cats that did not remain in remission with an EOD dosage were considered failures following induction and did proceed in the study. Data for these cases were therefore collected and analysed only for day 0 and the end of phase I. Owners of cats that remained in remission continued to be contacted via telephone at 7 day intervals and asked to report on their cat's pruritus score, as well as any changes in hunger, thirst, urination, aggression or affection. If at any point a cat came out of remission with an owner-reported pruritus score of $>2/10$, that cat was administered a 3 day, once daily course of the current dose and then returned to EOD dosing. If this was not effective at reducing the pruritus level to $\leq 2/10$ by the end of the 7 day period, that cat had its dosage raised back to the last effective EOD dosage. Once a cat reached 25% of the effective induction dosage and stayed in remission, or was maintained at any EOD dosage for 4 weeks total, that cat completed phase II.

Phase III: maintenance

The lowest dosage reached that maintained remission at the end of phase II was given EOD for another 6 weeks. Owners continued to be contacted weekly via telephone and asked to report their cat's pruritus level in addition to any changes in hunger, thirst, urination, aggression or affection. If at any point during phase III a cat came out of remission with an owner reporting a pruritus score of $>2/10$, the dosage was adjusted as described for phase II. Once a cat had maintained remission for 6 weeks on an EOD dosage, that cat completed phase III and finished the study. The end of study evaluation included a physical and dermatological examination, calculation of FEEAS, and measurement and photographs of self-induced alopecic lesions by

the primary investigator. Owners were again asked to report any changes in hunger, thirst, urination, aggression or affection since starting the medication. Serum chemistry/CBC, urinalysis and fructosamine level were analysed for each cat at the end of the study.

Statistical analysis

All analyses were performed using SAS version 9.2 (SAS Institute Inc., Cary, NC, USA). Hair length, change in pruritus and FEEAS, weight, age and continuous blood and urine parameters were compared between drug groups and remission groups using unpaired *t*-test. The folded form *F* statistic was used to test whether variances were equal between treatment groups. If unequal, then Satterthwaite's approximation for degrees of freedom for Student's *t*-test was used. The change from baseline laboratory values was tested for significance for select parameters by Student's paired *t*-test for each drug group separately and all cats pooled. The proportion of cats in remission at 1 and 2 weeks and the proportion of cats temporarily coming out of remission during phases II and III and nominal laboratory parameters were compared between groups by chi-squared analysis if the sample size was ≥ 24 or Fisher's exact test if the sample size was <24 . Ordinal (scale) laboratory parameters and client-observed changes were compared by the Mann-Whitney *U*-test. Pearson correlation was used to correlate pruritus and FEEAS. All hypothesis tests were two sided, and the significance level was $\alpha = 0.05$.

Results

Study population

Thirty-two client-owned cats with pruritus due to allergic disease were enrolled in this study. The age of the cats ranged from 1 to 13 years (median 6.7 years). Seventeen cats were neutered males (53%), and 15 were spayed females (47%). Body weight ranged from 3.6 to 8.14 kg (median 4.76 kg). The following cat breeds were represented: 26 domestic short hair (81.3%), one domestic medium hair (3.1%), one Bengal (3.1%), one Abyssinian (3.1%), one Bombay (3.1%) and two Burmese (6.3%). There were no significant differences in sex, age, weight or body condition score between groups.

Three cats (9.4%), one in the T group and two in the M group, failed to achieve remission after having their initial induction dosage doubled and continued once daily for a second 7 day period. Two cats (6.3%), one from each group, failed to maintain remission when their induction dosage was decreased to EOD. These five cats did not continue in the study and were excluded from phase II and III analysis. Overall results for achievement of remission are presented in Table 2.

Two cats (6.3%), one from each group, were withdrawn at the end of phase I due to an increase in alanine aminotransferase (ALT) outside the normal reference range (953 and 154 IU/L). One of these two cats (M group) also exhibited increased aspartate aminotransferase outside the normal range (207 IU/L). Another cat (3.1%), which was in the M group, was withdrawn at the end of the induction phase owing to the development of hyperglycaemia (274 mg/dL) and glucosuria (2+). These three cats were excluded from phase II and phase III analyses.

Data from two cats in the T group were excluded from phase II analyses owing to noncompliance with the study protocol at the end of that phase. These two cats resumed appropriate protocol during phase III, and their

Table 1. Phase II tapering schedule

Week	Dose	Frequency
1	Effective induction dose	Every other day
2	75% of effective induction dose	Every other day
3	50% of effective induction dose	Every other day
4	25% of effective induction dose	Every other day

Table 2. Phase I data showing the number (*n*) and percentage of the group that achieved remission by each week of the induction phase, as well as the number and percentage of cats that maintained remission once their effective induction dose was reduced to EOD

Group	Total enrolled (<i>n</i>)	Remission by week 1 [<i>n</i> (%)]	Remission by week 2 [<i>n</i> (%)]	Achieved remission [<i>n</i> (%)]	Maintained remission at EOD dose [<i>n</i> (%)]
M	16	7 (44)	7 (44)	14 (88)	13 (81)
T	16	7 (44)	8 (50)	15 (94)	14 (88)

Abbreviations: EOD, every other day; M, methylprednisolone; T, triamcinolone.

Table 3. Efficacious doses for the induction and maintenance of remission from pruritus at the end of each phase

Group	Study period	<i>n</i>	Mean (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)
M	Induction	14	1.41	0.80	2.20
	End phase II	9	0.48	0.21	1.05
	End phase III	9	0.54	0.21	1.57
T	Induction	15	0.18	0.09	0.26
	End phase II	9	0.05	0.02	0.12
	End phase III	11	0.08	0.02	0.24

data were included for end phase III analysis. Four cats (two from each group) were excluded completely for phase II and III analyses owing to noncompliance with the study protocol during both phases.

Efficacious doses

Doses that were effective in inducing and maintaining remission are summarized in Table 3. Data on the number and percentage of cats in each group that maintained remission at each of the set tapered doses are summarized in Table 4.

Phase I: induction

There were no significant differences between groups in the percentage of cats in remission by 1 week (44% both groups) or by 2 weeks or less (includes 1 and 2 week data; 88% M, 94% T). There was no significant difference between the groups in the percentage of cats that achieved remission by week 1 versus week 2 versus those that did not achieve remission.

Phase II: tapering

There was no significant difference between the groups in the lowest percentage of the induction dose required to maintain remission on an EOD basis. Furthermore, no significant difference was found between the groups in the percentage of cats that came out of remission and required an increase to the last effective EOD dose.

Phase III: maintenance

Between the M and T groups, there was no significant difference in the percentage reduction from the original effective induction dosage that resulted in maintenance

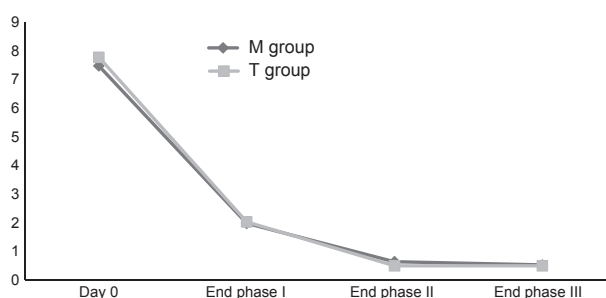
of remission for a 6 week period. Additionally, there was no significant difference between the groups in the percentage of cats coming out of remission and requiring an increase in dosage during phase III. Only one cat required an increase from their phase II dosage during phase III.

Pruritus and lesion scores

No significant differences were noted between the M versus the T group in the mean change in pruritus or FEEAS from baseline to the end of phase I, II or III. There were also no significant differences in these parameters between the groups that achieved remission at 7 versus 14 days after beginning the study. The mean decrease in pruritus score for the M and T groups over the duration of the study is displayed in Figure 2. The mean decrease in FEEAS over the study period for the M and T groups is displayed in Figure 3. The range in FEEAS at day 0 was 11–152 for the M group and 12–93 for the T group. At completion of the study, the range in FEEAS was 0–55 in the M group and 0–62 in the T group. The mean pruritus score for the three cats that failed induction and the two cats that failed EOD dosing was 8.7 at day 0 (range 7–9.5). The mean FEEAS for these five cats was 61.8 (range 12–138) at day 0.

Blood/urine evaluation

In both groups, there were significant increases from baseline (day 0) for serum albumin and fructosamine, and significant decreases from baseline in the absolute num-

**Figure 2.** Mean pruritus score (y-axis) in each group at day 0 and each phase of the study.**Table 4.** Compiled data of phases II and III showing the number (*n*) and percentage within that group of cats that completed the study and maintained remission at each set percentage of the effective induction dose (I) on an EOD basis

Group	Completed study (<i>n</i>)	Maintained remission at 100% I [<i>n</i> (%)]	Maintained remission at 75% I [<i>n</i> (%)]	Maintained remission at 50% I [<i>n</i> (%)]	Maintained remission at 25% I [<i>n</i> (%)]
M	9	—	2 (22.2)	1 (11.1)	6 (66.6)
T	11	2 (18.2)	—	2 (18.2)	7 (63.6)

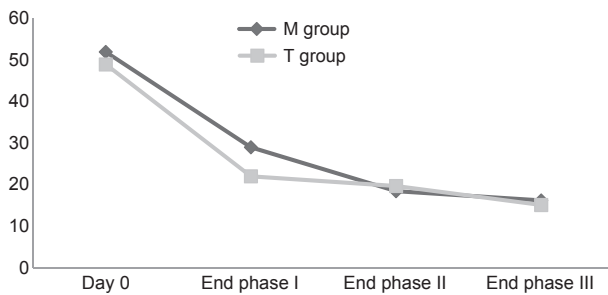


Figure 3. Mean feline erythema, excoriation and alopecia score (FE-EAS; y-axis) for each group at day 0 and at the end of each phase of the study.

ber of eosinophils at the end of phases I and III. These results are summarized in Table 5. The fructosamine level did not exceed the upper limit of the reference range (450 $\mu\text{mol/L}$) in any case. There were seven cases in the M group and eight cases in the T group where the absolute eosinophil count exceeded the upper limit of the reference range (1000 cells/ μL) at day 0. By the end of phase III, there were no cases in the M group and only one case in the T group where the absolute eosinophil count exceeded this range.

Amylase elevations outside of the normal reference range (100–1200 IU/L) occurred significantly more often in the T group (66.7%) than in the M group (14.3%) at the end of phase I ($P = 0.0042$). The mean increase in amylase level from the baseline was 136.1 IU/L for the M group and 358.8 IU/L for the T group ($P = 0.0006$). By the end of phase III, the mean increase in amylase from the baseline remained significantly different between the groups, with the M group exhibiting a mean change of -43.6 IU/L and the T group exhibiting a mean change of 165.1 IU/L ($P = 0.0384$). Amylase elevations exceeding the normal reference range were not significantly different between the groups at the end of phase III.

There was no significant difference in the incidence of laboratory abnormalities between cats that achieved remission by the end of the first week of phase I versus cats that had to have their induction dose doubled for a second week in order to achieve remission. However, at the end of phase III, none of the cats that had achieved remission after the first week of phase I had amylase elevations outside of the normal reference range, while 44% of the cats that required their induction dose to be doubled for a second week of induction had amylase ele-

variations outside of the normal reference range ($P = 0.0325$). By the end of phase III, there were no significant differences between the groups in the incidence of laboratory abnormalities outside of the normal reference ranges.

Client-observed changes

A statistically significant increase in thirst was reported by owners of cats in the M group compared with the T treatment group during the first week of phase I ($P = 0.0479$). The only other statistically significant change in behaviour observed by clients was an increase in affection noted by owners of cats in the M group compared with the T group during the second ($P = 0.0253$) and fourth weeks ($P = 0.0108$) in phase II.

Hair length monitoring

An increase in mean hair length at sites of self-induced alopecia was observed in both groups at the end of each phase. These results are summarized in Table 6. There was a significantly larger change in hair length at the sites of self-induced alopecia in the T group than in the M group at the end of phase II ($P = 0.0191$). There were no significant differences between the groups in hair length at the end of phase I or III.

Discussion

In this study, remission was defined as a pruritus score of $\leq 2/10$ on the visual analog scale. These results show that mean dosages of 1.41 mg/kg/day (range 0.80–2.20 mg/kg/day) of methylprednisolone and 0.18 mg/kg/day (range 0.06–0.26 mg/kg/day) of triamcinolone for a 7–14 day period were effective at inducing remission of pruritus in 90.6% of allergic cats. This is in marked contrast to prednisolone at 1 mg/kg/day for 28 days, which showed reduction in pruritus in only five of 11 (45.5%) cats.⁵ Additionally, results of this study show that 0.54 mg/kg (range 0.21–1.57 mg/kg) EOD of methylprednisolone and 0.08 mg/kg (range 0.02–0.24 mg/kg) EOD of triamcinolone are effective at maintaining remission in the population that completed the study. These results suggest that triamcinolone is approximately seven times more potent than methylprednisolone. There were no significant differences in the number of cats in either group that reached remission, reached EOD maintenance, or were withdrawn due to laboratory abnormalities. No significant differences were noted between the groups in the percentage reduction of pruritus or FEEAS from

Table 5. Pooled data from M and T groups showing mean change from baseline and P -value for statistically significant parameters at the end of phases I and III

Parameter	Phase	Mean change from baseline	P -value
Albumin (g/dL)	I	0.386	<0.0001
Albumin (g/dL)	III	0.33	<0.0001
Fructosamine ($\mu\text{mol/L}$)	I	42.9	<0.0001
Fructosamine ($\mu\text{mol/L}$)	III	49.1	0.0005
Absolute eosinophils (cells/ μL)	I	-608	0.0001
Absolute eosinophils (cells/ μL)	III	-352	0.0041

Table 6. Mean changes in hair length for each group at sites of self-induced alopecia

Drug	Study period	n	Mean change from baseline (cm)	Minimum (cm)	Maximum (cm)
M	End phase I	14	0.13	-0.60	0.60
	End phase II	9	0.01	-0.50	0.70
	End phase III	9	0.31	-0.20	1.00
T	End phase I	15	0.28	-0.20	0.60
	End phase II	9	0.67	-0.25	1.50
	End phase III	11	0.69	-0.30	2.00

baseline to the end of the study. This indicates that these established dosages are equal in efficacy and in adverse reactions detectable during the study period by CBC, serum chemistry, fructosamine level or urinalysis.

Deleterious laboratory abnormalities did not occur in cats that completed the study. However, statistically significant increases from the baseline were observed for serum albumin and amylase in both the M and the T groups. This is consistent with findings from a previous study investigating biochemical parameters following parenteral administration of methylprednisolone in cats.¹⁹ Dehydration and laboratory error are the major causes of hyperalbuminaemia in small animals.²⁰ It is postulated that cats in the present study may have not been drinking enough water to compensate for excessive urination secondary to steroid administration. While increased urination was not reported to be significant during any phase of the study, owners frequently commented that this parameter was difficult to evaluate owing to use of a litter box and/or because of multicat households. Renal dysfunction and pancreatitis may cause hyperamylasaemia in small animals.²¹ However, the hyperamylasaemia observed in this study was not considered clinically significant, because it is an unreliable indicator of pancreatitis in cats,^{19,21} and no cat in the study exhibited clinical signs or other laboratory abnormalities consistent with these disease processes. While the fructosamine levels remained within the reference range in all cases throughout the study, a statistically significant mean increase was noted in both groups. Furthermore, three cats were withdrawn at the end of the induction phase owing to liver enzyme (two cats) and serum and urine glucose elevations (one cat) above the normal reference ranges. These data suggest that while our established dosages have been shown to be well tolerated within the population that completed the study, regular monitoring of CBC, serum chemistry, fructosamine and urinalysis is warranted in cats receiving oral glucocorticoids at these dosages.

Three of the 32 cats failed to achieve remission after the induction phase and two more failed to maintain remission when the effective induction dosage was tapered to an EOD schedule. These data suggest that 15.6% of our study population was refractory to the dosages used in this protocol. One of these cats went on to achieve remission after having the induction dosage increased to 0.32 mg/kg once daily of triamcinolone for a third 7 day period. The dosage of triamcinolone was subsequently tapered, and this cat has continued to do well on 0.12 mg/kg every 48–72 h. Another cat that failed the induction phase went on to be controlled with ASIT, methylprednisolone at 1.1 mg/kg EOD and chlorpheniramine 1 mg/kg once daily. The third cat that failed the induction phase has been successfully managed with ciclosporin at 5.4 mg/kg once daily. The two cats that failed to maintain remission after having their induction dosage tapered to EOD were lost to follow-up. It would be valuable for future studies to investigate cases such as these that are refractory to our established dosages. Such studies could require elimination diet trials to evaluate whether the presence of adverse food reactions contributes to these failures. Further studies may also aim to

evaluate the response of these cases to combination therapy with ciclosporin and/or ASIT.

For the three cases that were withdrawn at the end of the induction phase owing to laboratory abnormalities, the CBC or serum chemistry, fructosamine level and urinalysis were repeated within 1.5–4 weeks of discontinuing the steroid medication. In all cases, the abnormalities resolved once the steroids were withdrawn. The cat with elevations in aspartate aminotransferase and ALT went on to achieve and maintain remission with chlorpheniramine (0.53 mg/kg twice daily). The cat with the elevation in ALT went on to achieve and maintain remission with ciclosporin (5.9 mg/kg once daily). The cat with the steroid-induced hyperglycaemia and glucosuria failed a trial with chlorpheniramine (0.44 mg/kg twice daily) and was lost to follow-up.

A limitation of this study was that elimination diet trials were not required as part of the inclusion criteria to restrict the population to nonflea, nonfood allergic dermatitis. Time constraints, multiple cat households and dietary preferences of individual cats were all contributory factors to the decision not to enforce elimination diet trials as part of the inclusion criteria. It is not definitively known whether food-induced allergic disease responds as well to oral glucocorticoids as nonfood-induced disease. About 50% of food allergic cats exhibit an incomplete response to glucocorticoid therapy.²² However, randomization would theoretically place a similar number of food-induced allergic cases in each group. The finding of no statistically significant difference between the groups with respect to numbers of cats that achieved and maintained remission would suggest that the inclusion of food-induced allergic cases did not significantly impact the results. Future studies could examine the dosages of oral steroids required for the induction and maintenance of remission from pruritus in confirmed food-allergic versus confirmed nonfood-allergic cats.

The limited extent to which the steroid medication was tapered was another limitation. The protocol allowed for a maximum tapering to 25% of the effective induction dosage to be given on an EOD basis. It is possible that some cases may maintain remission on a lower percentage of the effective induction dosage or a longer dosing interval. Alternative minimal dosing protocols should be explored in future studies.

The dosing and tapering regimen was selected based on published recommendations^{1–3} and the experience of the authors. Other protocols, such as initial dosing twice daily and/or slower tapering could be equally or more effective. To evaluate multiple different regimens was beyond the scope of the study. Now that some data regarding effective remission doses and the equivalency between triamcinolone and methylprednisolone have been established, further studies may evaluate whether different dosing schedules may improve efficacy.

The relatively short-term duration of this study did not allow for assessment of long-term safety. Glucocorticoids are often used for very long periods or for life in allergic cats. Therefore, long-term studies that evaluate efficacy and adverse effects of glucocorticoids over a period of years rather than months would certainly benefit this population. Future studies investigating long-term safety of

oral glucocorticoids could include adrenal gland response testing and glucose tolerance testing after cats are tapered to their lowest effective maintenance dose.

Owing to the risk of adverse effects secondary to glucocorticoid therapy in cats,^{6,8–13} these medications should be considered carefully before being used for the long-term management of allergic disease. However, they are necessary in some cases and also are often used for short-term pruritus relief while other therapies, such as ASIT, ciclosporin, diet or antimicrobials/antiparasitics take time to reach efficacy. These dosages and tapering schedules should be effective for these cases. While glucocorticoids may not be the best long-term option from a medical standpoint, there are many cat owners who cannot take advantage of other treatments owing to financial constraints or other practical limitations. Finally, there is a population of allergic cats that respond only to glucocorticoids. The fact that steroids are not an ideal therapy has not precluded them from being used commonly. Therefore, there exists a significant need for scientifically based dosing recommendations, particularly those that establish the lowest effective dosages. These established efficacious dosages are the starting point for treatment recommendations and future studies.

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Résumé

Contexte – La triamcinolone orale (T) et la méthylprednisolone (M) ont été recommandées à des doses variées pour contrôler le prurit associé aux dermatites allergiques félines.

Objectifs – Le premier objectif a été de déterminer les doses efficaces de méthylprednisolone (Pfizer, New York, NY, USA) et de triamcinolone (Boehringer Ingelheim Vetmedica, Inc., St Joseph, MO, USA) nécessaires à l'induction d'une rémission du prurit associé aux dermatites allergiques félines. Le deuxième objectif a été de comparer l'efficacité de plusieurs doses de maintenance à jours alternés. Le troisième objectif a été de déterminer si des résultats d'analyse anormaux se produisaient aux doses efficaces.

Effectifs – Trente-deux clients propriétaires de chats allergiques ont été répartis au hasard entre les groupes M ou T.

Méthodes – Les propriétaires ont rapportés les scores hebdomadaires de prurit ainsi que les changements de comportement. Une rémission était définie comme un score de prurit $\leq 2 / 10$, 0 étant le score

de prurit le plus bas et 10, le plus élevé. Une biochimie sérique, un hémogramme, la fructosamine et une analyse urinaire ont été évalués à jour 0, à la fin de la phase d'induction de 7-14 jours et à la fin de l'étude.

Résultats – Les doses journalières moyennes nécessaires à l'induction étaient de 1.41 mg/ kg pour M et 0.18 mg/ kg pour T. Les doses moyennes à jours alternés de maintenance étaient de 0.54 mg/ kg pour M et 0.08 mg/ kg pour T. Il y avait une diminution statistique significative des éosinophiles et une augmentation de la fructosamine pour les deux groupes du début à la fin de l'étude. Les taux de fructosamine ne dépassaient pas les valeurs usuelles dans tous les cas.

Conclusions – Ces résultats suggèrent que la triamcinolone est approximativement sept fois plus forte que la méthyprednisolone et que ces dosages sont efficaces et bien tolérés pour contrôler le prurit des chats allergiques.

Resumen

Introducción – la triamcinolona oral (T) y la metilprednisolona (M) se han recomendado en las varias dosificaciones para el control del prurito asociado a la dermatitis alérgica felina.

Objetivos – el primer objetivo fue determinar dosis eficaces de metilprednisolona (Pfizer, Nueva York, NY, USA) y de triamcinolona (Boehringer Ingelheim Vetmedica, Inc., St Joseph, MO, USA.) requeridas para inducir la remisión del prurito asociado a la dermatitis alérgica felina. El segundo objetivo fue comparar la eficacia de diversas dosificaciones de mantenimiento en días alternos. El tercer objetivo fue determinar si se observaban anomalías laboratoriales durante la administración de dosis efectivas.

Animales – treinta y dos gatos alérgicos de propietarios privados fueron seleccionados y asignados al azar a los grupos M o T.

Métodos – los dueños informaron semanalmente sobre el valor asignado del prurito y cambios de comportamiento. La remisión fue definida como valor asignado de prurito $\leq 2/10$, con 0 como el menor y 10 como el más prurítico. En el día 0 se evaluaron la analítica química del suero, hematología, fructosamina y urianálisis, y posteriormente en el día 7-14 al final del fase de inducción y a la finalización del estudio.

Resultados – las dosis medias diarias requeridas para la inducción fueron el 1,41 mg/kg para M y 0,18 mg/ kg para T. Las dosis medias de mantenimiento en días alternos fueron 0,54 mg/ kg para M y 0,08 mg/ kg para T. Se observó una disminución estadísticamente significativa de eosinófilos y un aumento en el nivel de fructosamina en ambos grupos desde el inicio a la finalización del estudio. Los niveles de fructosamina no superaron el rango de normalidad en ningún caso.

Conclusiones – estos resultados sugieren que la triamcinolona es aproximadamente siete veces más potente que la metilprednisolona, y que estas dosificaciones son eficaces y bien toleradas para el control del prurito en gatos alérgicos.

Zusammenfassung

Hintergrund – Triamcinolon (T) und Methylprednisolon (M) per os sind in unterschiedlichen Dosen zur Kontrolle des Pruritus bei allergischer Dermatitis von Katzen empfohlen worden.

Ziele – Das erste Ziel war die Bestimmung von wirksamen Dosen von Methylprednisolon (Pfizer, New York, NY, USA) und von Triamcinolon (Boehringer Ingelheim Vetmedica, Inc., St. Joseph, MO, USA), die ausreichten um eine Remission des Pruritus bei Katzen mit allergischer Hauterkrankung zu erzielen. Das zweite Ziel war ein Vergleich der Wirksamkeit von mehreren verschiedenen Erhaltungsdosen, die jeden zweiten Tag gegeben wurden. Das dritte Ziel war herauszufinden, ob bei den wirksamen Dosen im Labor feststellbare Abweichungen auftraten.

Tiere – Zweiunddreißig allergische Katzen im Besitz von KundInnen wurden zufällig in die M oder T Gruppe eingeteilt.

Methoden – Die BesitzerInnen berichteten wöchentlich über den Juckreizwert und die Verhaltensänderungen. Remission wurde definiert als ein Juckreizwert von $\leq 2/10$, mit 0 als am wenigsten und mit 10 als am stärksten juckend. Serumbiochemie, Blutbild, Fruktosaminbestimmung und Urinanalyse wurden am Tag 0, sowie am Ende der 7-14 tägigen Induktionsphase und am Ende der Studie durchgeführt.

Ergebnisse – Durchschnittliche, einmal täglich zu verabreichende Dosen für die Induktion waren 1,41 mg/kg für M und 0,18 mg/kg für T. Durchschnittliche, jeden zweiten Tag zu verabreichende Dosen lagen bei 0,54 mg/kg für M und 0,08 mg/kg für T. Es bestand eine statistisch signifikante Abnahme an Eosinophilen und eine Zunahme des Fruktosaminwertes für beide Gruppen vom Beginn bis zum Ende der Studie. Die Fruktosaminwerte überstiegen in keinem Fall die Referenzwerte.

Schlussfolgerungen – Diese Ergebnisse lassen darauf schließen, dass Triamcinolon ungefähr sieben Mal stärker ist als Methylprednisolon und dass diese Dosen bei der Juckreizkontrolle von allergischen Katzen wirksam sind und gut toleriert werden.

要約

背景 - ネコのアレルギー皮膚炎に関連する痒みのコントロールには、様々な用量の経口トリアムシノロン (T) およびメチルプレドニゾロン (M) が推奨されている。

目的 - 最初の目的はネコのアレルギー皮膚炎に関連する痒みを緩和するのに必要なメチルプレドニゾロン (Pfizer, New York, NY, USA) とトリアムシノロン (BoehringerIngelheimVetmedica, Inc., St Joseph, MO, USA) の用量を決定することである。2つ目の目的は複数の異なった隔日投与の維持用量を比較すること。3つ目の目的は有効な用量において臨床検査値の異常が認められるかどうかを判断することである。

供与動物 - 32 頭のアレルギーを持ったネコをMまたはT群に無作為に割り付けた。

方法 - そう痒スコアと行動の変化を飼い主が毎週報告した。“緩和” の定義はそう痒スコア 0 を最小、10 を最も痒いとした時、2/10 以下となった時とした。血液生化学、全血球計算、フルクトサミンと尿検査を0日、7-14 日の導入期の最後と、試験の終了時に行った。

結果 - Mの導入に必要とする1日1回の用量は 1.41 mg/kg でTの導入に必要とする 1 日1回の用量は 0.18 mg/kg であった。隔日投与の維持用量はMで 0.54 mg/kg、Tで 0.08 mg/kgであった。両群で、基準値と治験の終了時を比べると、好酸球数の減少とフルクトサミンの増加が統計学的に有意であった。フルクトサミンの値はすべての症例で参照範囲を超えなかった。

結論 - これらの結果はトリアムシノロンはメチルプレドニゾロンのおよそ7倍強力であり、これらの用量は有効性があり、ネコのアレルギーの痒みのコントロール時に忍容性が高いことを示唆していた。

摘要

背景 - 口服各种剂量的曲安西龙 (T) 和甲强龙 (M) 被推荐用于控制猫过敏性皮炎引起的瘙痒。

目的 - 第一个目的是确定甲强龙 (辉瑞, 纽约, 纽约州, 美国) 和曲安西龙 (勃林格殷格翰兽药公司, 圣约瑟夫, 密苏里州, 美国) 能够缓解猫过敏性皮炎瘙痒的有效剂量。第二个目的是比较几种不同的隔日维持剂量。第三个目的是确定在有效剂量下是否会发生实验室检测异常情况。

动物 - 32 只有主人饲养的过敏猫随机分配到M或T组。

方法 - 主人每周报告瘙痒评分及行为变化。瘙痒最低为0分, 最高为 10 分, 缓解的定义是瘙痒评分 $\leq 2/10$ 。在 0 天, 7-14 天诱导期结束和研究结束时评估血清生化、全血细胞计数、果糖胺和尿液分析。

结果 - 平均每日诱导剂量需要M为 1.41 mg/kg 和T为 0.18 mg/kg。平均隔日维持剂量M为 0.54 mg/kg 和T为 0.08 mg/kg。从基础值到实验完成, 有统计学意义的是两组的嗜酸性粒细胞显著减少且果糖胺增加。任何病例中果糖胺水平都没有超过参考范围。

结论 - 以上结果说明曲安西龙强度是甲强龙的7倍, 且这些剂量对控制过敏症猫的瘙痒有效并耐受良好。