# Effects of a 1 per cent hydrocortisone conditioner on the prevention of immediate and late-phase reactions in canine skin

C. RIVIERRE, S. M. DUNSTON, T. OLIVRY

**Ten laboratory beagles were used to determine whether a 1 per cent hydrocortisone conditioner applied topically for three consecutive days would inhibit IgE-mediated immediate and late-phase reactions induced in their skin. The trial was blinded, controlled with the product's vehicle and designed with a crossover. It consisted of three phases: one period without treatment (control phase) and two periods of treatment with either the active ingredient or the vehicle. Immediate and late-phase reactions were induced by the intradermal injection of rabbit anti-canine IgE polyclonal antibodies. Twenty minutes after the intradermal challenge, the diameter of the wheal, but not the erythematous flares, were significantly reduced after the application of the active product. In contrast, IgE-mediated cutaneous late-phase reactions, evaluated by measurements of dermal thickness and eosinophil counts six hours after challenge and the numbers of dermal CD3-positive T lymphocytes after 24 hours, were not reduced by its application.**

THE pathogenesis of canine atopic dermatitis has not been fully elucidated. Nevertheless, it is believed to involve immediate and late-phase reactions resulting from the activation of dermal mast cells by IgE (Reedy and others 1997).

Immediate phase reactions are characterised clinically by a wheal and flare that appear and disappear within an hour after stimulation by an allergen. Allergen cross-linking of IgE induces the degranulation of sensitised mast cells and provokes the release of vasodilatory mediators which are responsible for the formation of the wheal (Brazis and others 1998).

Late-phase reactions are suspected to play an important role in the pathogenesis of atopic dermatitis in human beings (Becker and others 1988, Zweiman 1993). They were first described in 1873 by Blackey and have recently been studied in more detail by Charlesworth and others (1989), Frew and others (1991) and Charlesworth (1994). In man, cutaneous late-phase reactions are characterised by erythema and induration (Charlesworth and others 1989, 1991), lesions which are similar to those of atopic dermatitis (Charlesworth and others 1989). Late-phase reactions induced by an allergen begin a few minutes after challenge, peak after between six and 12 hours, and decrease in intensity over the next 24 to 48 hours (Charlesworth and others 1989, Zweiman 1993). Their pathophysiology is complex and involves the interactions of several cell types (including eosinophils, neutrophils, basophils, mast cells and allergen-specific T lymphocytes) and mediators (histamine, leukotrienes, platelet-activating factor and various cytokines) (Becker and others 1988, Frew and others 1991, Gaga and others 1991, Charlesworth 1996).

IgE-mediated late-phase reactions have been identified in allergic dogs for over a decade. In dogs sensitised experimentally to ragweed, the intradermal injection of allergen results in macro- and microscopical late-phase reactions (Becker and others 1988). These cutaneous reactions are similar to those observed in people with atopic dermatitis and are characterised by sequential granulocytic and mononuclear dermal infiltrates (Becker and others 1988). Similar reactions have been observed in the skin of dogs with naturally occurring atopic dermatitis after the intradermal injection of extracts of house dust mites (Thomsen and others 1993). The relevance of late-phase reactions to the pathogenesis of canine atopic dermatitis is supported indirectly by the reduction in pruritus and the severity of skin lesions after treatment with misoprostol (Olivry and others 1997), a prostaglandin $E_1$ analogue which selectively abolishes late-phase cutaneous allergic reactions (Alam and others 1993).

A recent study has demonstrated that IgE-mediated late-phase reactions can be reproduced in the skin of normal dogs after intradermal injections of anti-canine IgE polyclonal antibodies (Olivry and others 1998). Moreover, it was shown that the kinetics of the cellular infiltrates were similar to those observed after the skin of dogs with atopic dermatitis was challenged with house dust mite allergen (Olivry and others 1998). In normal canine skin, anti-IgE induced late-phase reactions are characterised by an increase in the thickness of the skin six hours after challenge, by peaks in the numbers of eosinophils and neutrophils after six hours that gradually decrease over 24 hours, and by an increase in the numbers of $CD3^+$ T lymphocytes and $CD1^+$ dendritic antigen-presenting cells between 12 and 24 hours (Olivry and others 1998).

Corticosteroids have been shown to inhibit mast cell degranulation in mice (Inagaki and others 1997), and allergen-induced late-phase reactions in the lungs, upper airways and skin of people (Andersson and Pipkorn 1987, Charlesworth and others 1991, Charlesworth 1994, 1996). Systemic glucocorticoids (prednisone) can inhibit the migration of eosinophils and basophils into artificial blisters during late-phase reactions in people, and inhibit the formation and release of chemotactic mediators and leucocyte-priming cytokines (Charlesworth and others 1991).

This study was designed to determine whether a 1 per cent hydrocortisone conditioner (ResiCORT with Spherulites; Virbac) could prevent the wheal formation characteristic of the immediate phase reaction and/or the cellular infiltrate typical of late-phase reactions in the skin of normal dogs challenged with anti-canine IgE antiserum.

## MATERIALS AND METHODS

### Study design

The study was blinded, controlled with a placebo (the vehicle for the active ingredient), and had a crossover design. Ten laboratory beagle dogs were used, sufficient to provide a 95 per cent power to detect a 50 per cent difference between two groups of values with a coefficient of variation of 30 per cent at $P=0{\cdot}05$. The study was divided into four periods (Fig 1): one period without therapeutic intervention ('control'), and two similar periods of treatment with either the active product or vehicle of three days, separated by a wash-out period of 12 days. The study protocol was reviewed and accepted by the College's Animal Care and Use Committee.

*Veterinary Record* (2000) **147,** 739-742

**C. Rivierre,** DrVet, **S. M. Dunston,** BS, MS, **T. Olivry,** DrVet, PhD, Comparative Allergy Research Program and Department of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606, USA

### Application of the conditioner

The treatments were given on days 5 to 7, and days 19 to 21 (Fig 1). The sponsoring company provided two sets of vials: one set contained the 'active product' and the other set contained the vehicle of the conditioner ('placebo'). The identity of the two sets of vials was blinded to the investigators. The 10 dogs were divided by computer randomisation into two groups of five, one of which was treated first with the active product and then with the vehicle, and the other with the vehicle first and then with the active drug. The order of application was reversed for the crossover part of the trial.

The left side of the thorax was used for the first application and the right side for the second application. On days 5 and 19, the side of each dog's chest was bathed with an hypoallergenic shampoo (Allergroom; Virbac). The active product or vehicle was then applied once daily for three days. The haircoat was not clipped before the conditioner was applied, to mimic the normal use of the product. Before each daily treatment, the side of the thorax was wetted with lukewarm water, and approximately 1 ml was applied per 100 $cm^2$. The thorax was not rinsed after the product had been applied.

A washout period of 12 days, from day 8 to day 19, was considered sufficient to minimise the risk of any interference between the two treatments.

### Induction of IgE-mediated late-phase reaction

Before any treatment, on day 1 of the control period and 24 hours after the last application of the product for the two treatments, that is on day 8 and day 22 (Fig 1), an area of 10 cm x 3 cm was clipped with electric clippers on the dorsal thorax (control period), left side of the thorax (first treatment period) and right side of the thorax (second treatment period). IgE-mediated reactions were induced by intradermal injections of 0·05 ml of solution of rabbit anti-canine IgE polyclonal antibodies containing 1·4 mg/ml (Olivry and others 1998). Two injections were made, 2 cm apart, in the centre of the clipped areas. To avoid self-trauma at the site of injection a coat was kept on the dogs until all the biopsies had been obtained.

### Clinical evaluation

Twenty minutes after the intradermal challenge with anti-canine IgE antibodies, the macroscopical characteristics of the wheals were evaluated. The degree of erythema was graded from 0 to 2 as follows: (0) no erythema, (1) mild erythema or (2) marked erythema. The maximum diameter of the wheals was measured in millimeters. Six hours after the challenge, the diameter of the erythematous papules was also measured in millimeters.

Six hours and 24 hours after the challenge the thickness of the skin at the site of the injection was measured with calipers, and the thickness of normal skin in the same area of the body was also measured. The difference between these two values is reported as the 'increase in skin thickness'.

### Collection of skin biopsy specimens

Six hours after each challenge, the dogs were sedated with medetomidine (Domitor; Pfizer) at a dosage of 750 $\mu g/m^2$ given intravenously, and lidocaine (Lidocaine 2 per cent; Phoenix Pharmaceuticals) was injected subcutaneously into one of the sites previously injected with anti-canine IgE. After five minutes, an 8 mm punch biopsy specimen was taken and the biopsy site was sutured with 2-0 metric blue monofilament nylon (3-0 Dermalon). An erythromycin gel (Erythromycin topical gel 2 per cent USP; Stiefel Laboratories) was applied to prevent secondary infection of the biopsy sites. The sedation was then reversed with an intramuscular injection of atipamezole (Antisedan; Pfizer), at the dose used for medetomidine.

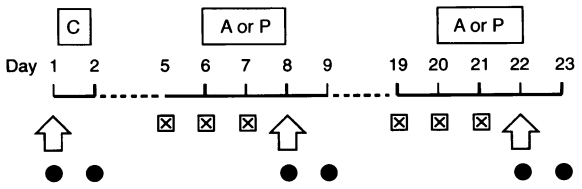


**FIG 1: Schematic representation of the design of the study. Checked boxes: application of 1 per cent hydrocortisone conditioner or vehicle. Open arrows: induction of IgE-mediated late-phase reaction. Closed circles: collection of skin biopsy specimens six and 24 hours after injection of the antiserum. A Active ingredient, P Placebo, C Control**

The specimens were fixed in neutral buffered formalin and embedded in paraffin. Sections 5 µm thick were stained by Luna's technique for the examination of eosinophils (Luna 1968).

Twenty-four hours after the challenge, the procedure was repeated on the second site which had been injected with anti-canine IgE. The specimens collected were processed in the same way and stained by an immunohistochemical technique using polyclonal antibodies specific for the cytoplasmic domain of the epsilon chain of mammalian CD3 (Mason and others 1989).

### Enumeration of cellular infiltration

Dermal eosinophils were counted in the skin sections from the biopsies collected six hours after challenge, and dermal $CD3^+$ T lymphocytes were counted in the sections obtained 24 hours after challenge. Both cell types were counted in the entire surface of the skin sections with an Olympus VANOX AHB3 microscope at 5 x 20 magnification with rectangular grids covering 0·06 $mm^2$. The cell counts were expressed as the number of cells per $mm^2$.

### Statistical analysis

The results of the clinical evaluations, and the counts of eosinophils and T lymphocytes in the three groups were compared by means of a non-parametric repeated measures analysis of variance (Friedman's test) using computer software (GraphPad Prism). Dunn's post-tests were used to determine the significance of differences between selected groups of values.

## RESULTS

### Clinical evaluation

Twenty minutes after the injection of IgE antiserum, there were no significant differences in the degree of wheal erythema among the three groups (Table 1). However, the diameters of the wheals were significantly different (Table 1, Fig 2), the diameter being significantly smaller in the group treated with the active ingredient than in the control group. Although the 95 per cent confidence intervals between the groups treated with the active ingredient and the vehicle did not overlap, the difference between their wheal diameters was not significant with the conservative statistical tests used.

Six hours after the challenge, a macroscopic papular reaction was observed in three of the dogs treated with the active

**TABLE 1: Clinical evaluation of immediate and late-phase reactions to rabbit anti-canine IgE polyclonal antibodies expressed as median (95 per cent confidence interval) values of erythema scores or dimensions in mm**

| Measurement | Treatment group Active | Vehicle | Control |
|---|---|---|---|
| Erythema at 20 minutes | 1 (0·8-1·8) | 2 (1·2-2) | 1 (0·3-1·2) |
| Wheal diameter at 20 minutes | 9 (8·5-9·5)** | 10·5 (9·6-12·6) | 11 (10·5-12·7)** |
| Reaction diameter at 6 hours | 0 (0-4·1) | 0 (0-2·6) | 0 (0-2·8) |
| Increase in skin thickness at 6 hours | 1 (0-2·7) | 1 (0·4-1·6) | 1 (0·3-1·2) |
| Increase in skin thickness at 24 hours | 0 (0-0·6) | 0 (0-0·6) | 0·5 (0-1·6) |

** $P<0·01$

**TABLE 2: Dermal cell counts during IgE-mediated late-phase reactions expressed as median (95 per cent confidence interval) numbers of cells per mm² of dermis**

| Cells | Treatment group Active | Vehicle | Control |
|---|---|---|---|
| Eosinophils at 6 hours | 29 (0-119) | 22 (0-144) | 35 (0-198) |
| CD3+ T lymphocytes at 24 hours | 33 (20-70) | 76 (38-223) | 60 (41-93) |

ingredient, one of those treated with the vehicle and two of the control dogs. The diameter of the reactions was not significantly different between the three groups (Table 1).

Six hours after the challenge the median increases in skin thickness at the sites of injection were identical in the three groups. At the 24-hour examination, the median increases in thickness in the groups treated with either the active ingredient or the vehicle were smaller than in the control group, but the differences were not statistically significant (Table 1).

### Dermal cell counts

Six hours after the challenge the median number of dermal eosinophils was lower in the groups treated with the active ingredient or the vehicle than in the control group, but the difference was not significant (Table 2).

Twenty-four hours after the challenge there were fewer CD3+ T lymphocytes in the biopsies from the dogs treated with the active ingredient than in the biopsies from the other two groups but the difference was not statistically significant (Table 2).

## DISCUSSION

The results suggest that the application of the 1 per cent hydrocortisone conditioner for three days partially inhibited the wheal, but not the flare immediate phase reaction provoked by the injection of rabbit anti-canine IgE polyclonal antibodies into normal canine skin. However, the conditioner did not prevent the development of either the induration or the cellular infiltration characteristic of an IgE-mediated cutaneous late-phase reaction.

A similar inhibitory effect of corticosteroids on the IgE-mediated immediate phase reaction has been demonstrated in people and mice (Pipkorn and others 1987, Inagaki and others 1997). Prednisone given orally for two days was shown to suppress the clinical signs and the release of mast cell mediators during antigen-induced acute phase responses in the nose (Pipkorn and others 1987). The suppression of the reaction was explained by a reduction in the number of mucosal mast cells rather than by the inhibition of the release of mast cell mediators (Pipkorn and others 1987). In another study, the topical application of a 0·05 per cent clobetasol propionate cream resulted in a reduction of the wheal-and-flare responses after an allergen challenge (Andersson and Pipkorn 1987). Other experiments, however, have not been able to confirm the efficacy of corticosteroids in the prevention of mast cell degranulation (Poothullil and others 1975, Schleimer and others 1983, Pipkorn and others 1987, Charlesworth and others 1991). Differences in study design, the type and concentration of glucocorticoid used, and in the route of administration may account for the differences observed in the studies in people. Finally, the conditioner tested here was recently shown not to abolish wheal-and-flare reactions after the intradermal injection of histamine into normal and pruritic dogs (Thomas and others 1999). The discrepancy between these results and those of the present study can be explained by the lack of an antihistamine effect by corticosteroids. Whereas glucocorticoids could inhibit the activation of mast cells and the release of mediators in canine skin, they would have little suppressive effect on histamine-induced vasodilation and congestion in the superficial dermis.

Whether the previous administration of corticosteroids interferes with the reactivity to intradermal allergy skin tests is uncertain. Glucocorticoids do not seem to suppress skin test reactivity in people (Galant and others 1973, Slott and Zweiman 1974, Olson and others 1990), but they are believed to do so in cats (Bevier 1994) and dogs (Kunkle 1994).

In this study, the application of the 1 per cent hydrocortisone conditioner for three days did not significantly inhibit either skin induration or cellular emigration during the late-phase reaction induced by anti-canine IgE antiserum. The results do not agree with the results of previous studies in which glucocorticoids were shown to inhibit the formation of macroscopic lesions and the influx of eosinophils during a late-phase reaction provoked in human skin (Andersson and Pipkorn 1987, Charlesworth and others 1991). These differences may be related to the nature of the corticosteroid pretreatment, because hydrocortisone is among the weakest within this class of drugs. The results might have been different if a stronger topical glucocorticoid had been used. Furthermore, the dogs' unclipped haircoats might have prevented the conditioner's active ingredient from penetrating the epidermis optimally. It is also possible that more frequent or longer applications of the conditioner could have resulted in better absorption of the drug and an increased anti-inflammatory effect. It is also possible that the signs of the late-phase reaction might have been more strongly inhibited if the conditioner had been applied after rather than before the injection of the anti-canine IgE antibody, that is, to obtain a therapeutic instead of a preventive effect.

The results of this study show that pretreatment with a 1 per cent hydrocortisone conditioner slightly reduced the diameter of the wheals induced by the immediate phase reaction produced by the injection of anti-canine IgE. In spite of this slight reduction the clinical and histological signs of the late-phase reaction were not suppressed. Whether the results of the study might be extrapolated to the management of pruritic dogs would require carefully controlled clinical trials.

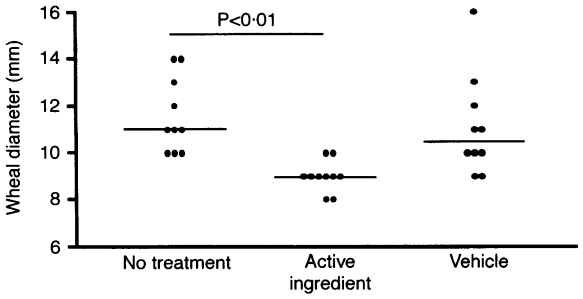


**FIG 2: Scatter plot of the wheal diameters 20 minutes after the intradermal challenge with anti-canine IgE antibiotics. Bars indicate the median values within each group**

## ACKNOWLEDGEMENTS

This study was funded by a grant from Virbac-Allerderm. The authors thank Ms Hilary Jackson for her critical review of the study protocol and manuscript and Bruce Hammerberg, North Carolina State University for providing the rabbit anti-canine IgE polyclonal antibodies.

## References

ALAM, R., DeJARNATT, A., STAFFORD, S., FORSYTHE, P. A., KUMAR, D. & GRANT, J. A. (1993) Selective inhibition of the cutaneous late but not immediate allergic response to antigens by misoprostol, a PGE analog – Results of

a double-blind, placebo-controlled randomized study. *American Review of Respiratory Diseases* **148,** 1066-1070
ANDERSSON, M. & PIPKORN, U. (1987) Inhibition of the dermal immediate allergic reaction through prolonged treatment with topical glucocorticosteroids. *Journal of Allergy and Clinical Immunology* **79,** 345-349
BECKER, A. B., CHUNG, K. F., McDONALD, D. M., FRICK, O. L. & GOLD, W. M. (1988) Cutaneous allergic response in atopic dogs: relationship of cellular and histamine response. *Journal of Allergy and Clinical Immunology* **81,** 441-448
BEVIER, D. E. (1994) Effect of methylprednisolone acetate and oral prednisolone on immediate skin test reactivity in cats. In Proceedings of the Annual Members' Meeting of the American Academy of Veterinary Dermatology and American College of Veterinary Dermatology. Charleston, SC. pp 45-47
BLACKEY, C. (1873) Experimental researches on the causes and nature of catarrhus aestivus (hay fever or asthma). London, Baillière-Tindall & Cox. pp 77-89
BRAZIS, P., QUERALT, M., deMORA, F., FERRER, L. & PUIGDEMONT, A. (1998) Comparative study of histamine release from skin mast cells dispersed from atopic, ascaris-sensitive and healthy dogs. *Veterinary Immunology and Immunopathology* **66,** 43-51
CHARLESWORTH, E. N. (1994) The skin as a model to study the pathogenesis of IgE-mediated acute and late-phase responses. *Journal of Allergy and Clinical Immunology* **94,** 1240-1250
CHARLESWORTH, E. N. (1996) Late-phase inflammation: influence on morbidity. *Journal of Allergy and Clinical Immunology* **98,** S291-S297
CHARLESWORTH, E. N., HOOD, A. F., SOTER, N. A., KAGEY-SOBOTKA, A., NORMAN, P. S. & LICHTENSTEIN, L. M. (1989) Cutaneous late-phase response to allergen – Mediator release and inflammatory cell infiltration. *Journal of Clinical Investigation* **83,** 1519-1526
CHARLESWORTH, E. N., KAGEY-SOBOTKA, A., SCHLEIMER, R. P., NORMAN, P. S. & LICHTENSTEIN, L. M. (1991) Predisone inhibits the appearance of inflammatory mediators and the influx of eosinophils and basophils associated with the cutaneous late-phase response to allergens. *Journal of Immunology* **146,** 671-676
FREW, A. J., VARNEY, V. A., GAGA, M. & KAY, A. B. (1991) Immunohistology of human allergic late-phase skin reactions. *Skin Pharmacology* **4** (Suppl 1), 71-78
GAGA, M., FREW, A. J., VARNEY, V. A. & KAY, A. B. (1991) Eosinophil activation and T lymphocyte infiltration in allergen-induced late-phase skin reactions and classical delayed-type hypersensitivity. *Journal of Immunology* **147,** 816-822
GALANT, S. P., BULLOCK, J., WONG, D. & MAIBACH, H. I. (1973) The inhibitory effect of antiallergy drugs on allergen and histamine induced wheal and flare response. *Journal of Allergy and Clinical Immunology* **51,** 11-21
INAGAKI, N., TSUNEMATSU, M., SAKURAI, T., MATUSO, A. & NAGAI, H. (1997) Effect of prednisolone on IgE-dependent biphasic cutaneous reactions in BALB/c mice. *General Pharmacology* **28,** 93-97
KUNKLE, G. (1994) Steroid effects on intradermal skin testing in sensitized dogs. In Proceedings of the Annual Members' Meeting of the American Academy of Veterinary Dermatology and American College of Veterinary Dermatology. Charleston, SC. pp 54-55
LUNA, L. G. (1968) In Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology. 3rd edn. New York, McGraw-Hill. pp 111-112
MASON, D., CORDELL, J., BROWN, M., PALLESON, G., RALFKIAER, E., ROTHBARD, J., CRUMPTON, M. & GATTER, K. (1989) Detection of T cells in paraffin embedded tissue using antibodies against a peptide sequence from the CD3 antigen. *Journal of Clinical Pathology* **42,** 1194-1200
OLIVRY, T., GUAGUÈRE, E. & HÉRIPRET, D. (1997) Treatment of canine atopic dermatitis with the prostaglandin E1 analog misoprostol: an open study. *Journal of Dermatological Treatment* **8,** 243-247
OLIVRY, T., MURPHY, K. M., DUNSTON, S. M. & MOORE, P. F. (1998) Characterization of the inflammatory infiltrate during IgE-mediated late-phase reactions in dogs with atopic dermatitis. In Proceedings of the Annual Members' Meeting of the American Academy of Veterinary Dermatology and American College of Veterinary Dermatology. San Antonio, TX. pp 71-72
OLSON, R., KARPINK, M. H., SHELANSKI, S., ATKINS, P. C. & ZWEIMAN, B. (1990) Skin reactivity to codeine and histamine during prolonged corticosteroid therapy. *Journal of Allergy and Clinical Immunology* **86,** 153-159
PIPKORN, U., PROUD, D., LICHTENSTEIN, L. M., SCHLEIMER, R. P., PETERS, S. P., ADKINSON, N. F., KAGEY-SOBOTKA, A., NORMAN, P. S. & NACLERIO, R. M. (1987) Effect of short-term systemic corticosteroid treatment on human mediator release after antigen challenge. *Journal of Clinical Investigation* **80,** 957-961
POOTHULLIL, J., UMEMOTO, I., DOLOVICH, J., HARGREAVE, F. E. & DAY, R. P. (1975) Inhibition by prednisone of late cutaneous allergic responses induced by antiserum to human IgE. *Journal of Allergy and Clinical Immunology* **57,** 164-167
REEDY, L. M., MILLER, W. H. & WILLEMSE, T. (1997) Introduction to allergy. In Allergic Skin Diseases of Dogs and Cats. 2nd edn. Philadelphia, W. B. Saunders. pp 1-25
SCHLEIMER, R. P., SCHULMAN, E. S., MacGLASHAN, D. W., PETERS, S. P., HAYES, G. K., ADAMS, L. M., LICHTENSTEIN, L. M. & ADKINSON, N. F. (1983) Effects of dexamethasone on mediator release from human lung fragments and purified human lung mast cells. *Journal of Clinical Investigation* **71,** 1830-1835
SLOTT, R. I. & ZWEIMAN, B. (1974) A controlled study of the effect of corticosteroids on immediate skin test reactivity. *Journal of Allergy and Clinical Immunology* **54,** 229-234
THOMAS, R. C., LOGAS, D., RADOSTA, L. & HARRISON, J. (1999) Effects of a 1% hydrocortisone conditioner on haematological and biochemical parameters, adrenal function testing and cutaneous reactivity to histamine in normal and pruritic dogs. *Veterinary Dermatology* **10,** 109-116
THOMSEN, M. K., KRISTENSEN, F. & ELLING, F. (1993) Species specificity in the generation of eicosanoids: emphasis on leukocyte-activating factors in the skin of allergic dogs and humans. In Advances in Veterinary Dermatology. 2nd edn. Eds P. J. Ihrke, I. S. Mason, S. D. White. Oxford, Pergamon Press. pp 63-78
ZWEIMAN, B. (1993) The late-phase reaction: role of IgE, its receptor and cytokines. *Current Opinion in Immunology* **5,** 950-955

## ABSTRACTS

# Diseases associated with eosinophilia in 105 dogs

THE diseases associated with an eosinophilia of more than $2{\cdot}2 \times 10^9$ eosinophils/litre were investigated retrospectively in 105 dogs. Thirty-six per cent of them had inflammatory diseases affecting organs such as the gut, lungs and skin with large epithelial surfaces; the best defined diagnosis was pulmonary infiltrates with eosinophils. Twenty-five per cent had a variety of diseases occurring at low frequencies, and 11 per cent had parasitic diseases caused by either sarcoptic mange or nasal mites. None of the dogs was atopic. In most of the disease categories rottweilers were over-represented.

LILLIEHÖÖK, I., GUNNARSSON, L., ZAKRISSON, G. & TVEDTEN, H. (2000) Diseases associated with pronounced eosinophilia: a study of 105 dogs in Sweden. *Journal of Small Animal Practice* **41,** 248-253

# Sialadenosis in dogs

SIALADENOSIS is a condition of unknown cause that may go undiagnosed in dogs. A prospective study of 13 dogs with enlarged salivary glands was carried out to identify the clinical findings, cytological and histological characteristics of the salivary glands and the response to treatment with phenobarbital in dogs with clinical signs typical of sialadenosis. Clinical signs commonly associated with sialadenosis included regurgitation, retching and gulping. Substantial cellular changes in the enlarged salivary glands were not detected by histological or cytological examination. Treatment with phenobarbital gave a rapid response, but most dogs required continuous treatment to prevent recurrence of clinical signs.

BOYDELL, P., PIKE, R., CROSSLEY, D. & WHITBREAD, T. (2000) Sialadenosis in dogs. *Journal of the American Veterinary Medical Association* **216,** 872-873