There are various diagnostic tests that can be performed "in house" by veterinarians to help with everyday dermatological cases. It is important that these tests be performed correctly in order to gather the information necessary to help make the diagnosis. A great deal of information can be obtained by performing these tests.

**Skin Scrapings**

Skin scrapings should be the most common diagnostic test performed in veterinary dermatology. A dull scalpel blade or similar instrument is moistened with mineral oil and used to scrape away some of the epidermis, in which may reside a number of different parasites. There are 2 types of skin scrapes that should be performed. A superficial skin scrape to rule out ecotoparasites of the superficial epidermis and deep skin scrapes to look for demodex (except demodex gatoi).

**Superficial skin scraping**

1. Apply a small amount of mineral oil directly to the skin to be scraped - this helps dislodge debris and makes it easier to collect the scraped material.
2. Hold a dulled scalpel blade perpendicular to the skin; use moderate pressure to scrape in the direction of hair growth.

   The most productive sites for sarcoptic mites include the ear margin and lateral elbows. Anecdotal reports suggest that *Demodex gatoi* in cats may be more easily found on the lateral shoulder.

**Deep skin scrapings**

1. Select a clinical affected area (alopecia) if possible. If the area is haired, clip the area.
2. Hold a dulled scalpel blade perpendicular to the skin; use moderate pressure to scrape in the direction of hair growth.
3. After several scrapes, the skin should become pink with the capillaries becoming visible and oozing blood. This assures that the material collected is from deep enough within the skin to collect the follicular Demodex mites.
4. Squeeze (pinch) the skin to express the mites from deep in the follicles into a more superficial area so that they are more easily collected.
Trichograms
A trichogram is used to visualize the hair for evidence of pruritus (self-inflicted alopecia), dermatophytosis, endocrine alopecia, pigmentation defects, and growth phase.

Performing a Trichogram:
1. Grasp individual hair with hemostatic forceps and pluck hair completely (approximately 20)
2. Lay hair on microscope slide (with mineral oil) with hair oriented in the same direction.
3. Examine hairs at low power for morphology, concentrating on hair bulb, shaft and pigmentation

The hairs are examined for integrity of the shaft, stage (anagen, catagen, or telogen), and pigmentation. If most of the hairs have been sheared off, this is likely the result of licking, as seen in cats that excessively groom. Hair breakage is also seen in coat-dilution alopecia and traction alopecia. Damage to the shaft can be seen with several uncommon conditions, but dermatophytosis is the most common cause. When a hair bulb is present, it is important to document whether the follicles are predominantly in anagen, telogen or catagen. Anagen bulbs are round shaped, while telogen bulbs are often spear shaped. Predominance of telogen follicles can be indicative of endocrinopathies, nutritional disorders and metabolic diseases. This is not an exact science, however, and there is a great deal of breed variability.

Wood's Lamp (Ultraviolet Light, Black Light) Evaluation
The diagnostic value of the Wood's lamp is limited to a screening test for Microsporum canis. Negative fluorescence does not rule out M. canis because fewer than 50% of these infections routinely fluoresce, and is not useful for the diagnosis of dermatophytosis caused by other organisms, including M. gypseum and Trichophyton mentagrophytes.

A Wood's lamp uses ultraviolet light filtered through a cobalt or nickel oxide to cause some fungi to glow green in a darkened room. A tryptophan metabolite is the fluorescing material, not the fungi or spores themselves. This metabolite is only seen when the fungus is growing on hair shafts; it is noticeably absent on scale, claws or material growing on a culture plate. Only M. canis fluoresces (also M. distortum, M. adouinii and T. schoenleinii in humans), and then only about 50% of the time. Whereas dermatophytes fluoresce an apple-green color, most scales and medications glow a more blue or violet hue. The examination must be performed in a darkened room. A complete examination of the skin surface will require almost 5 minutes. If positive hairs are present, these should be plucked and used for a DTM culture. Remember that fluorescence seen on surface scale, crusts or on claws is going to be false-positives. Also, since the fluorescence is due to metabolites, not viable spores or fungi, a positive fluorescence might persist even in the face of successful systemic therapy.

Cultures
There are several different types of culture procedures. They are used to identify specific microbial pathogens. We will focus on routine DTM cultures.
DTM fungal cultures are used to isolate and identify dermatophyte organisms. Dermatophyte test media is made with special ingredients that inhibit bacterial growth and turn red when dermatophytes grow.

Performing a DTM Culture
1. Select samples for culture. Wood's lamp can be used to help select contaminated hairs or scales.
2. Longer hairs should be clipped short and the area cleaned with alcohol to decrease contaminant. Inoculate material onto Dermatophyte Test Medium. I prefer the DermDuets by Bacti-lab.
3. If media are in capped vials, be sure the caps are not tightened.
4. Keep at room temperature but in darkened environment (some recommend incubating).
5. Check cultures daily for evidence of fungal growth and color change of DTM from amber to red. A daily log should be kept. Most dermatophytes grow as fluffy white colonies. Ignore any color change that occurs after 2 weeks.
6. Examine microscopically all fungal growth for purposes of identification.

Diascopy
This simple test is useful to differentiate vasodilatation from ecchymosis.
1. Place a glass slide over an erythematous lesion.
2. Observe for blanching of skin while depressing slide. The skin under the slide will either blanch (turn white as the blood is pressed out) or remain erythematous. Urticarial lesions are caused by dilated blood vessels that leak fluid but not red cells; therefore, the red lesion will blanch when pressure is applied. Ecchymosis (suggestive of vasculitis) is caused by red blood cells leaking out of the vessels. These erythematous lesions will not blanch since the red blood cells are in the dermis.

Cytology

Material for cytological evaluation may be obtained in various ways. Those most commonly used in dermatological cases include fine-needle aspiration, impression smears, Tzanck preparation and swab cytologies.

Tzanck preparation is used to obtain a sample from an intact pustule, vesicle or bullae. A 25 gauge needle is used to lift the “roof” of the lesion. A small amount of exudates is then obtained by using the bevel of the needle and smearing it onto a glass slide. The slide is then stained with a Diff-quik type stain and examined under the microscope. Acantholytic cells can be suggestive of pemphigus but severe superficial bacterial infections can lead to acantholysis causing acanthocytes to be seen on cytology.

A fine needle aspirate involves inserting a needle into a tissue, applying gentle suction with a syringe, and withdrawing the needle while maintaining backward pressure on the syringe plunger. The needle is then detached and the barrel of the syringe is filled with air. The needle is then re-attached to the syringe, and the material in the hub of the needle is expressed onto a clean
microscope slide. This is a simple, nonsurgical method of characterizing many cysts, nodules, tumors, and pustules.

An impression smear is made by touching a microscope slide to the tissue being evaluated. The smear may then be stained to highlight certain cell types and products. A preferred stain for cytologic examination is Diff-Quik (Dade Diagnostics). I prefer to use Durotak adhesive slides for my impression smears of the skin.

Swab techniques are used most often for otic samples. I prefer to use Gram Stain when the otic exudate is purulent to help identify gram negative organisms.

**Biopsies**

Biopsy for histopathological examination is especially important in dermatology, since the tissue to be sampled (skin) is so readily accessible. Biopsies are valuable diagnostic tools but should not be expected to tell the entire story. They reveal the changes only in a small region of skin surface at a particular point in time.

Skin samples may be removed by excision with a scalpel blade or more commonly with a special punch to remove a small core of tissue. A 4-mm or 6-mm punch is preferred. It is also very important to remember to not prep, shave, etc the area to be biopsied as the superficial crust often contains important pathology.

A biopsy must include all skin layers, including the epidermis, dermis and subcutis. For most skin biopsies the procedure can be painlessly performed by injecting some local anesthetic beneath the skin, removing the sample, and closing the small defect with 1-2 sutures. Only occasionally is it necessary to induce general anesthesia to gather samples, but this is typically done when the intended site is the face, ears, or distal limbs. Obtaining multiple biopsies of different lesions greatly increases the chances of finding diagnostic changes. When possible, primary lesions should be selected for biopsy. Biopsy of chronic, excoriated, infected, scarred or ulcerated lesions rarely leads to a diagnosis.

Samples from inflammatory dermatoses should be obtained with important lesions in the center of site, rather than at the junction with normal skin. Additional peripheral biopsies are helpful in neoplastic processes to provide further prognostic information. It is important to not crush the sample when excising the tissue. Once the tissue is obtained, it should be placed on a firm substrate (such as a tongue depressor).

The carefully selected biopsy samples should be sent to a competent and patient pathologist who is prepared to view multiple sections in search of diagnostic changes. Accordingly, veterinarians must provide the pathologist with well-chosen material, a complete history and a list of suspected diagnoses. It is important to include previous diagnostics, past therapeutics and sites of biopsies.
**Flea comb**

Flea combing can be used to find evidence of fleas and *Cheyletiella* mites. Material and scale that fall on the table or on a sheet of paper placed under the patient during combing should be closely examined. Flea dirt can be sprayed with alcohol or water and will turn into a red-orange stain.

**Allergy testing**

Atopic Dermatitis – Intradermal testing (IDT, IDST) and aeroallergen-specific IgE serum testing (ASIST, in vitro testing) are considered important tests for the demonstration of IgE-mediated hypersensitivity in atopic dogs. However, false positives and negative reactions can occur using either testing method for a variety of reasons. Therefore, the most important criteria used in the diagnosis of atopic dermatitis are the patient’s history and clinical findings. Flea allergy dermatitis, food allergy dermatitis, sarcoptic mange, malassezia dermatitis, and bacterial pyoderma should be eliminated before a diagnosis of atopic dermatitis can be made. IDST and ASIST are then used to select aeroallergens for allergen-specific immunotherapy (ASIT).

**IDT (Skin Tests) vs. ASIS (Serum Tests)**

The majority of veterinary dermatologists and allergists consider intradermal skin testing (IDST) the standard when diagnosing and evaluating a patient for atopic dermatitis (AD). It has the advantage of testing the organ that is directly affected by the disease and has a lower incidence of false positive reactions compared to *in vitro* testing. In addition to detecting cutaneous IgE reaginic antibody it can detect other non-IgE reaginic antibodies, i.e., IgGd. Many specialists also like the test because they can perform it quickly, interpret the test directly and start immunotherapy the same day. The major disadvantages include the influence of drugs, stress and hormone status that the affects results of testing, the need to purchase and maintain allergens for testing, learning the techniques of performing and interpreting the test, the inability to test dogs with severe skin disease, the need to sedate and shave the patient, and in some cases the lack of sensitivity in classic atopic dermatitis cases. There are many reasons why classic AD cases do not test positive. Most commonly it is inadequate drug withdrawal times. General rules to follow include no oral glucocorticoids for 3–6 weeks, no topical glucocorticoids for 10–21 days, no injectable glucocorticoids for 8–10 weeks and no antihistamines for 7–10 days. Other causes for negative tests include the technique of injections, outdated testing solutions, other drugs that affect or lower blood pressure such as some tranquilizers, stress, off season testing and so called anergy (testing in a peak time during excessive mast cell degranulation).

It is also important to remember that ASIS and IDT can BOTH be considered valid tests:

**Allergen-Specific IgE Serology (Serum Allergy Tests)**

Choosing serum-based allergy tests

Numerous laboratories/companies currently offer ASIS. The following factors should be considered when choosing a laboratory for ASIS:
1. Avoid group testing, which could lead to inclusion of allergens in treatment solutions which the animal has no IgE to. Individual testing is recommended.

2. Screening tests, although inexpensive, can be misleading and should be avoided. All serum in vitro testing should not be used as a diagnostic tool but a tool to select allergen treatment. Although there are technologic differences between the companies, no company comparisons based on hyposensitization have been made with most companies and individuals researchers reporting very similar successes with many of the companies commercially available.

3. Client service, support staff by qualified veterinary specialists,

4. Regional allergen testing, number of items tested and list of hyposensitization extracts

5. Cost

There are significant differences between the assays performed by each of the laboratories, including: allergen source, reacting phase (liquid or solid), IgE-specific detection reagent (monoclonal antibody, polyclonal antibody, α chain of IgE receptor), and methods of calculating, reporting and interpreting results.

In general most ASIS assays have good sensitivity (ability to identify true allergen hypersensitivity), but have been perceived to have variable and lower specificity (ability to correctly identify the absence of allergen hypersensitivity). Low specificity is associated with false positive results, resulting in possible incorrect diagnosis and incorrect formulation of ASIT.

**ASIS for food allergens**

Despite the fact that studies suggest ASIS is not helpful in the diagnosis of food allergy, most laboratories offer food allergen panels for serum testing. These should not be used in place of appropriate hypoallergenic elimination diet food trials.

**Food allergy**

**Clinical Signs**

The clinical signs of food allergy can be quite variable. The clinical signs are going to be nonseasonal but seasonal peaks can occur if the patient has concurrent allergies (i.e. flea allergy dermatitis or atopic dermatitis). The signs are almost always cutaneous but concurrent gastrointestinal signs can be seen in some patients. While the great majority of dogs with food hypersensitivity manifest pruritus of the ears and feet, the distribution can also be extremely variable. Generalized pruritus may occur but some dogs will have the classic “ears and rear” involvement. In addition, pruritus localized to the ears may be the only symptom. Both primary and secondary skin lesions can be seen. These include erythematous papules, pustules (from secondary infection), seborrhea, angioedema/urticaria, excoriations, and traumatic alopecia. There is a subset of food allergic dogs that present with non-pruritic, recurrent pyoderma. Other, less common symptoms of food allergy include gastrointestinal signs, malaise, and seizures. Although many food allergic dogs may present with initial symptoms at less than 6 months of
age, food allergy can occur at any age. In general food allergy occurs in young and old dogs. Nonseasonal pruritus is also the most common symptom of food allergy in the cat. Often, pruritus is intense, and directed around the head and neck. However, generalized pruritus can occur. Food allergy has also been implicated as a cause of miliary dermatitis, eosinophilic granuloma complex, eosinophilic folliculitis/furunculosis, and self inflicted alopecia in the cat. Less common manifestations of food allergy in the cat include gastrointestinal symptoms, angioedema/urticaria, and conjunctivitis. Gastrointestinal signs may include increased defecation frequency, soft feces, intermittent diarrhea and flatulence.

**Diagnosis**

Food allergy can mimic other dermatological conditions, so it is important that a minimum derm database has been performed. Skin scrapings both deep and superficial, dtm tests and skin cytologies should be performed to rule out other pruritic dermatosis and concurrent bacterial or Malassezia infections. With severe pruritus, I would also recommend empirical treatment for sarcoptic mange.

The most reliable method of diagnosing food allergy and the only one recommended is a hypoallergenic dietary trial. Antigens are available for intradermal allergy testing, and some of the serum ELISA or RAST allergy tests measure food antigens. The predictability of these tests or their correlation with provocative challenge is poor. **Neither skin testing nor serologic testing is a reliable diagnostic test for food allergy and should be avoided.**

The goal of the hypoallergenic diet is to clean the animal's system out of all previously fed foods with the ultimate goal being resolution of pruritus and/or dermatitis. Owners are reminded that the food trial is a TEST conducted at home. Our goal is to find out what foods should be avoided and then return to an appropriate commercially available diet. The idea is to do it once, do it right, and get the pet on a food it can eat that does not cause it problems. This test is accomplished by placing the animal on a controlled, limited ingredient diet for 8-12 weeks and monitoring the animal for signs of improvement.

After taking a thorough dietary history, a commercial single novel-protein, and ideally novel carbohydrate diet with very limited ingredients is selected as the initial diet. Alternatively if the client is willing, a home-cooked diet using a novel carbohydrate and protein source can also be utilized. Alternatively, there are now commercial diets that utilize hydrolyzed protein sources. The hydrolysis process alters the molecular weights of the proteins to the range of 5,000–12,200 daltons in the available veterinary formulations. In general the major food allergens (in people) are in the 12,000–70,000 dalton range. The hypothetical advantage of these diets is that if the molecular weight of the protein is small enough, it will not elicit an immunologic response in patients sensitive to the original protein.

A handout describing the restrictions of an elimination diet and a diet diary are given to the owner at the start of the food trial. The owner must be advised that substitutions, additions, snacks or treats (except fruits and veggies) are not permitted during the test period. **All flavored vitamin supplements, preventative medication, and fish oil supplements must be stopped or a non-flavored version substituted during the food trial.** All raw hide chew toys, pig ears, cat
food, cat feces, etc must be placed out of reach. Outdoor pets should be confined during the course of the trial to prevent dietary indiscretions. Even the litter box must be made unattainable to the indiscriminate canine palate. It is also very important to Switch to non-chewable heartworm preventive! A recent study at NCSU showed that once-a-month heartworm pill (containing soy and beef) is sufficient to keep a soy-allergic dog symptomatic.

The owner is advised to record the amount of the hypoallergenic diet fed/eaten, other food fed/eaten, level of pruritus, and character of stool on a daily basis. The diary is brought to each office visit for review by the clinician. Often information not volunteered by the owner (e.g., animal boarded for a week during which time pruritus increased) is revealed in the diet diary. The owner is advised that their pet should not gain or lose weight while on the diet. The truth is that many animals whose pruritus has been treated with glucocorticoids have gained an excessive amount of weight and can stand to lose. The hypoallergenic dietary trial is an excellent time to help this along.

Scheduled follow up evaluations (4 weeks and 8 weeks) are key to assess the pet's response and to adjust the diet as deemed necessary. A realistic expectation is a 50% improvement in about 70% of the food allergic animals after 4 weeks on the elimination diet. Because some food allergic pets have multiple simultaneous allergies, complete resolution of pruritus may not occur. If a superficial pyoderma or fleas are present, these conditions must be treated and eliminated before a fair evaluation of the elimination diet can be made. Evaluate the pet at 4 weeks and if pruritus/dermatitis persists, continue the diet for an additional 4-6 weeks.

The Dietary Challenge

The dietary trial is incomplete and a diagnosis of food allergy cannot be made without provocative challenge. This is accomplished by re-feeding the previously fed commercial pet food for 7-14 days. The diagnosis of food allergy is made when the signs reoccur upon feeding the commercial pet food, and is confirmed with resolution of clinical signs when the elimination diet is re-fed. Most often they recur within a 24–48 hour period. The exception to this is the patient with recurrent pyoderma. Signs may not be observed for 7–10 days after initiating the challenge. Owners are asked to make a list of the ingredients in the commercial diet. A positive reaction (itching or dermatitis) on provocative exposure of this diet means that the animal is allergic to at least one of the items on the list.

A negative reaction with exposure to the previously fed base-diet does NOT rule out diet hypersensitivity however. It is not unusual for the offending agent to be a treat (commercial or from the table), rawhide, or dietary supplement. Owners are advised that if their pet improves during the elimination period, but does not relapse on the commercial diet than this diet can be fed as the maintenance diet. However, if an owner desires to introduce another food or treat, it must be done with the same degree of careful, monitored exposure.

The final maintenance diet is determined by how the pet reacted on challenge. Of course the challenge list is not all-inclusive, so there may be some degree of trial and error involved with finding a final diet. In addition, it is always possible that the pet may develop new allergies in the future. However, this appears to be an infrequent occurrence in adult dogs.
Atopic Dermatitis

Atopic dermatitis (AD) is thought to be a genetically inherited, Type I hypersensitivity to environmental allergens. Common allergens include grass, tree, and weed pollens, molds, house dust and house dust mites. Although progress is being made, the mode of inheritance has not been definitively determined. The idea of heritability is supported by the increased incidence within certain breeds and breeding lines, but the clinical manifestations of AD are most likely multifactorial. Although allergen-specific IgE has been considered very important in the pathogenesis of atopic dermatitis, it is not essential to the development of the disease. In unpublished studies using an experimental model of canine atopic dermatitis, production of allergen-specific IgE could, in some dogs, be decreased below levels that are considered positive according to the guidelines provided by the manufacturer of the allergy test used. Despite this, those dogs would still flare up with atopic dermatitis once exposed to the allergen. Thus other, non-IgE mediated pathways can be important in some individuals. This form of the disease is called intrinsic disease in human medicine. This is to differentiate it from the more classic, extrinsic form, in which allergen-specific IgE is present. Clinically, the two forms are not distinguishable and there is speculation that the intrinsic form could just be an early phase of the extrinsic form. The knowledge that this can occur in veterinary medicine changes the way we handle atopic dogs. Thus, it is possible to have dogs in which other pruritic causes of dermatitis have been properly ruled out and a clinical diagnosis of atopic dermatitis is established and yet a negative allergy testing occurs. Certainly the patient can be tested at another time of the year and with other allergens, but it is important to remember that the negative test does not rule out the clinically established diagnosis of atopic dermatitis. Since no allergens can be detected to place in the allergy vaccine, these individuals are particularly difficult to manage.

Clinical Signs

The clinical signs of canine atopic dermatitis have been characterized over the past several decades. Pruritus and erythema are considered to be hallmark signs of atopy. Usually, dogs develop clinical signs between 6 months and 3 years of age. Most dogs will initially have distinct seasonality. With time, however, the majority will go on to develop nonseasonal symptoms. In certain geographic locations, a lack of seasonality from the beginning is common. The more common areas of pruritus in the atopic dog include the face, ears, paws, extremities, and/or ventrum. While many dogs will exhibit pruritus in most or all of these locations, some will have fairly localized symptoms. AD has historically been considered the "itch that rashes," meaning that there is no primary lesion associated with initial symptoms. Recently, some dermatologists have suggested that AD may be associated with a primary eruption. With chronicity, secondary lesions such as excoriation, lichenification, and hyperpigmentation may occur. Secondary bacterial pyoderma and Malassezia dermatitis are also common. Other symptoms associated with canine AD include changes to the quality of the hair coat, conjunctivitis, rhinitis, urticaria, pyotraumatic dermatitis, acral lick dermatitis, seborrhea, and hyperhidrosis. Aural pruritus, followed by bacterial or yeast infection, can be the sole symptom of atopy in the dog.
Differentials for pruritus in the dog include ectoparasites (scabies, demodicosis), infection (bacterial, fungal), allergies (flea allergy dermatitis, food allergy, contact allergies), metabolic causes (superficial necrolytic dermatitis), and neoplasia (epitheliotropic lymphoma). Differentials can be narrowed based on history, concurrent clinical signs, and basic diagnostics. A strong suspicion for atopic dermatitis should be made based on history, physical exam findings, and ruling out other pruritic diseases before "allergy testing" is performed.

**Medical Management**

Medical management of the AD should begin with the safest drugs to administer longer-term. Antihistamines may benefit 5–20% of pets, and they are always worth trying, though actually there is very little evidence that they are beneficial. Several should be tried for each patient. Good choices in dogs include diphenhydramine or hydroxyzine (2 mg/kg BID-TID). Combination with anti-inflammatory fatty acid supplements may provide additional benefit. There is no evidence that the newer, non-sedating antihistamine drugs now commonly used in human allergy have any additional benefit for animal use.

The "omega-3 and omega-6" anti-inflammatory fatty acids have been shown beneficial for some patients with AD. Most uncontrolled studies report 20-30% efficacy, and their effects seem to me relatively mild and of most benefit in early disease. The most important factor here is that the pet should receive a minimum of about 30 mg/kg/day of the anti-inflammatory fatty acids. There is no proven clinical effect of the "ratio" of these fatty acids in AD. Recently, pet food companies have increased the amount of fatty acids that are added to certain pet foods, including those intended for amelioration of skin or joint disease. In some cases, the amount of fatty acid present in these diets far exceeds "oral supplementation" levels. Therefore, if the pet eats one of these diets, supplementation with capsules or liquids is not necessary. Even when fatty acid supplementation does not appear to benefit a patient on its own, it may be beneficial as part of combination therapy. Synergistic effects with both antihistamines and with corticosteroids have been demonstrated.

Atopic dermatitis is generally quite responsive to corticosteroid drugs. They may be preferred for older animals that may not live to benefit from immunotherapy, or pets with highly seasonal disease. The chief disadvantages of longer-term use of corticosteroid drugs include development of steroid resistance or "tachyphylaxis," and adverse effects (of both annoying and medically-serious varieties). Oral prednisone or prednisolone (0.5-1 mg/kg/day, decreasing to every other day) are much preferred to other more potent drugs, or to injectable drugs, for reasons of longer-term safety. Concurrent use of the fatty acid supplements (as above) may decrease the required steroid dose. Animals receiving longer-term oral corticosteroids should have a urine culture performed twice annually to identify silent urinary tract infections. It is wise to check liver enzymes annually.

Topical low-concentration (0.015%) triamcinolone spray is a relatively new corticosteroid formulation approved for canine use in the USA (Genesis™, Virbac). In Europe, more recently a topical hydrocortisone aceponate spray has been approved (Cortavance™, Virbac). The latter corticosteroid is metabolized entirely in the skin, and is not absorbed into the systemic circulation, thus sparing the pituitary-adrenal axis. These solutions can be used for "trouble
areas" of atopic dermatitis, such as the ventrum, feet, anal area, etc., or can be sprayed over broader areas of the body. The major advantage of these product is good efficacy with lack of systemic corticosteroid side effects. They also may work even in patients where other corticosteroid formulations have failed. The triamcinolone product is licensed for use for 1 month at a time; with prolonged continuous use, some animals may develop cutaneous atrophy or calcinosis cutis.

Calcineurin inhibitors such as cyclosporine A work by inhibiting production and action of cytokines, and through other mechanisms as well. More recent clinical trials of cyclosporine in dogs with AD demonstrate that this drug has efficacy equal to that of oral prednisone. Only the "modified" version of this drug (Atopica™, Neoral™, and generic forms available) should be used in dogs, as it is much more reliably absorbed. The starting dose is 5 mg/kg/day, which can be given as a single dose or divided into multiple doses. Ideally, CsAM should be given without food, as this will enhance absorption. Improvement occurs gradually, usually beginning after 1–2 weeks of administration and reaching maximum at 4 weeks. If the drug is effective, gradually reduce the dose over a period of several weeks to the minimum required for relief. Perhaps 25% of patients will have some initial gastrointestinal discomfort from CsAM. In most cases, this will abate within a few weeks. Therapy with CsAM is remarkably free from long-term adverse effects. Protocols for combination of CsAM with ketoconazole for AD have not been developed. A major concern here would be potential for development of hepatotoxicity with long-term ketoconazole treatment. Concurrent administration of systemic corticosteroids should be absolutely avoided for more than a few weeks, as such combinations have been associated with development of fatal opportunistic fungal infections. Therapeutic monitoring (serum chemistries, blood counts, or CsA serum concentrations) is neither recommended nor necessary when using CsAM for AD patients.

Allergen-Specific Immunotherapy

Allergen-specific immunotherapy (ASIT) is a treatment for atopic dermatitis in dogs and cats wherein extracts of allergens to which the patient is sensitive are injected, in gradually increasing amounts, to lessen or reverse the hypersensitivity state. ASIT has a strong advantage of being nearly free of adverse effects in the great majority of dogs and cats, even with prolonged use. Disadvantages include the fact that it takes several months or more to begin working, that it does not always work, and that it may be relatively expensive.

Most effects of ASIT are thought to be allergen-specific, rather than nonspecific. Thus, accurate testing to identify the offending allergens in each patient is of paramount importance to successful immunotherapy. In particular, the clinician must strive to avoid 'false positive' allergy test results, which would result in including an allergen in the patient's mixture that is not relevant to that individual's disease.

The exact protocol and schedule for injections will vary according to the allergen preparation; generally, the extract manufacturer will provide an appropriate schedule. Injections are given year-round, and the minimum initial trial period should be 12 months. As far as is known, concurrent treatments with antihistamines, fatty acid supplements, CsAM, or low-dose glucocorticoids will not interfere with response. Treatment is generally considered to be lifelong,
though it is possible to attempt discontinuation after 2 to 3 years of injections if the animal has responded very well. Expected response rate to immunotherapy is approximately 60-70% "good-to-excellent" response (defined as at least 50% improvement in clinical signs). Response can be seen as soon as 1 month, but more typically takes 3 to 6 months to occur, and the maximum response may take 1 year or longer. Adverse reactions to allergen immunotherapy include localized itch at the injection site and transient worsening for 12-24 hours after the injection (~10% of patients). Generalized anaphylaxis occurs in less than 1% of dogs and cats; such reactions are generally mild and further reaction can usually be prevented by pretreatment with an oral antihistamine 1–2 hours prior to each injection.

Sublingual immunotherapy is also available now. In dogs, the reported success rate of immunotherapy when delivered via sublingual administration is about 60% – these animals experience a significant reduction in clinical signs of allergy (such as itching and dermatitis) and have a reduced need for medications to treat allergic symptoms or secondary skin/ear infections. The success rate in cats is not yet known because at this point in time many more dogs than cats have been treated with this therapy. Sublingual immunotherapy might have a faster onset of action in some patients, but as with injectable immunotherapy, response time can vary among individual animals. The risk of adverse effects with sublingual immunotherapy is extremely low. In human allergic patients, sublingual immunotherapy is often recommended for patients who experience anaphylaxis with immunotherapy injections.

**Topical Management Of Pruritus**

Topical management can be used as *adjunctive therapy* in the management of the pruritic patient. In patients with generalized disease, topical therapy is applied by means of shampoo, rinse or conditioner. *These should always be applied with cool water.* Hot baths and high ambient temperature may potentiate pruritogenic stimuli. Shampooing mechanically removes surface debris, bacterial by-products and decreases percutaneous absorption of allergens. In addition, anti-pruritic medications can be effectively applied topically, in many instances.

Topical antipruritic products in the formulation of *gels, creams, lotions, sprays and ointments* will be helpful in patients with localized areas of pruritus. In selecting a product for topical therapy, one must consider the vehicle the drug is combined with. For acute eruptions, the nonocclusive, nonirritating lotion, spray or gel form should be used, whereas creams and ointments are best used in chronic lesions. Ear products with glucocorticoids can be used on the skin.

**Summary**

One of the most important concepts in the management of pruritic patients is the concept of threshold. Most allergic pets have multiple allergies and are prone to secondary infections. All these factors contribute to pruritus and push the animal towards that critical threshold of clinical manifestation. Thus clinicians should put as much effort as possible into identifying all contributing factors for each individual case and try to control them. This can be frustrating and challenging at times but ensures the highest likelihood of successfully managing atopic patients in the long run.