Diagnostic Approach to Dermatology Cases

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Dermatology problems are the most common presenting complaint of pet owners. Skin problems are frustrating to both the client (and patient!) and the veterinarian. Why are they so frustrating? The answer lies in two parts: First, the pathogenesis of every skin problem needs to be clarified. It is inherently obvious that you cannot manage a disease condition when you don’t pay attention to the reason it is present. Second, it is necessary to understand the diagnostic and therapeutic options. Throughout the entire process, client education remains a key to overall success. Client compliance is higher and client satisfaction depends on your ability to communicate your plan with the client to allow them to “invest” in the process.

Pathogenic Factors of Skin Diseases

In most cases, we see that patients with skin disease have a collection of problems, not a single problem. These can be defined as follows:

- **Predisposing factors (or underlying conditions):** breed, hair coat, immunocompetency, behavior of the pet, etc
- **Primary factors (the cause of the problem):** allergies, ectoparasites, scaling disorders, neoplasia, autoimmune diseases, psychogenic disturbances, infectious agents, etc.
- **Perpetuating factors (secondary issues):** infectious agents (bacteria and fungi such as *Malassezia* spp. yeast), otitis externa, hyperplastic changes of the skin, etc.

If we truly want to identify and successfully manage the patient, all three pathologic factors must be addressed. A good way to describe the pathogenesis to clients is by explaining that there is a “what” and a “why”. The “whats” are those things currently active in the dog or cat. They include yeast infections, bacterial infections, alopecia, scaling, hyperpigmentation, etc. The “whys” are the reason the “whats” are present...but you usually can’t see them until the “whats” are controlled.

The understanding of this process is the key to diagnosis and management of patients with skin disease.

**Overall Philosophy**

1. Identify the perpetuating factors (e.g., secondary infections) and control them
2. Identify and treat the primary factor (i.e., underlying problem)

This seems simple. Of course, as Einstein said, “Everything should be made as simple as possible, but not one bit simpler.” There is no single “correct” plan to follow which will yield a diagnosis. It may be necessary to utilize all the diagnostic tests available to the veterinarian in order to discover the cause of pruritus in a patient. However, certain keys will help the clinician to isolate the cause or at least to narrow down the possible underlying etiologies of dermatologic issues in each clinical case. These important principles to aid in diagnosis include:

1. Diagnostic tests and procedures should be performed in a uniform manner. Don’t forget the data base: skin scrapings, trichogram, impression smears, and fungal culture. Be sure to record diagnostic procedures and their results in the medical record.
2. Client education is important: explain what you are doing and WHY!
3. Accurate records should be kept of drugs used, dosages and their efficacy.
4. Follow-up examinations should be scheduled.

Clinical Manifestations

The most frequent "problems" identified in dermatology include: pruritus, pruritus, and pruritus. After
that….we are concerned with hair loss, inflammation, scale/crusts, draining tracts, hyperplastic changes, nodules/tumors (i.e., lumps and bumps), malodor, and a variety of other lesions. These problems are often “packaged” in clinical scenarios that include: otitis externa, perianal dermatitis, acral lick dermatitis, pododermatitis, and other regional dermatoses.

Since pruritus is such a prevalent issue, we will highlight that problem. Itch (pruritus) is the sensation that is felt by the animal. Animals show their "itchiness" by one or more of the following: scratching, chewing (or biting), licking, and rubbing. Pruritus may be so severe as to cause overt pain. Dermatoses associated with pain include: trauma, chemical irritants, toxins, burns and frostbite, ectoparasites, severe infections, neoplasia, and drug eruptions.

The degree of pruritus shown by a patient is a sum of all the pruritogenic factors. In most patients, there is one (or more) primary factor of pruritus, such as atopic dermatitis. Then, secondary factors, as referred to as flare factors, add to the overall itchiness of the patient and exacerbate the disease.

Clinical Conditions Associated with Pruritus (90% of cases in dogs have one or more of these)
- parasites
- allergies
- infectious (bacterial / yeast)

Diagnostic Approach:

Step 1 : The Initial Visit
The Signalment is an important consideration. The age of the patient is used to prioritize possible causes of the pruritus. Obviously some breeds are more predisposed to specific pruritic conditions, such as the Golden retriever and atopity, or the American cocker spaniel and familial seborrhea.

The History should include the age at onset of the problem, the progression of the disease, the severity of the pruritus, and the response to any home or veterinary therapy. As always, the history should include the past medical history, environmental history and history of organ systems other than the skin.

The Physical Examination is a critical diagnostic procedure! A complete and thorough examination is warranted. It is at this time that the clinician looks to confirm the historical perspective of the client (and referring veterinarian) and recognizes other lesions or patterns previously not noted. Keys include any pattern of pruritus or alopecia, evidence of the severity of pruritus (saliva stains, broken hairs, etc.) or evidence of any systemic disease process.

Step 2 : The Dermatology Data Base
The data base tests are always performed….in every case….at every visit. Failure to do these tests will dramatically reduce your ability to diagnose perpetuating causes of pruritus and will lead to mistakes.

Skin scrapings: Done to rule-out ectoparasites. Repeat as necessary.

Trichogram: Hair "plucks" to examine roots and hair shafts for ectoparasites, fungi, etc. this is an easy, rapid, inexpensive procedure that will help identify follicular mites, and dermatophytosis (by an experienced investigator).

Evaluate for yeast: This may be done with impression smears (slides, tape, adhesive slides), but should be done on all cases. Alternative diagnostics include (dry) skin scrapings and cotton swabs in facial folds. Key areas to evaluate are: 1) interdigital – top of the feet, 2) bottom of the feet, 3) axillary and inguinal areas, 4) perianal and perineal areas, 5) ventral aspect of the neck.

Fungal evaluation: Includes KOH, Wood's lamp examination, or culture. The trichogram actually provides the minimum diagnostic procedure for dermatophytosis. It is essentially a
KOH preparation without the KOH. Wood’s lamp examinations are helpful but may be misleading. Fungal culture, the most definitive test for dermatophytosis, is indicated when there are suspicious lesions, when the trichogram (KOH) is suspicious, and when the trichogram is clearly positive.

**Optional Tests at this Time**

Fungal culture: Sure, I mentioned that above, but it warrants another comment. Dermatophytosis is more prevalent in some geographical areas than others, so in those areas where fungal infections are truly common (e.g., Missouri, Florida and others), a fungal culture should be part of the data base…and done on all dermatology patients.

Fecal floatation: This procedure may be used to identify ectoparasites such as Sarcotopes spp., Demodex spp. and Cheyletiella spp., since the mites may be ingested by the patient during pruritus (i.e., biting) and these parasites often pass through the entire GI tract! This is a LOW sensitivity test, but when positive, it is very rewarding!

Ear cytology: Cytology of both external ear canals should be done on every patient with otitis externa…and it should be repeated at every recheck examination. The only reason it is listed here under “optional” is that it isn’t necessary if the ears are clinically normal and there is no history of ear involvement.

Bacterial culture: Bacterial cultures would be indicated if appropriate lesions are present on the patient (draining tracts, pustules, etc.) or if cytology indicates the presence of significant organisms. Specific indications for bacterial culture include presence of rod-shaped bacteria in dermatologic lesions, or failure of the patient (with apparent bacterial pyoderma) to respond to appropriate therapy.

Skin biopsy: histopathological examination of the skin is required to diagnose most autoimmune skin diseases, most neoplastic skin diseases, and several uncommon skin problems. It may also provide supportive evidence for virtually any other skin disorder (e.g., allergy, endocrinopathies, seborrhea). The keys to maximizing the value of the skin biopsy include: 1) selection of appropriate samples (in general, take a piece of everything that looks different), 2) good technique in sample collection (site preparation, technique), 3) selection of a pathologist who has an interest in dermatology. Skin biopsies are another piece of the puzzle…they do not always (often?) provide the definitive diagnosis.

**Now what?**

**Step 3: Manage Perpetuating Factors**

Now is the time to control all perpetuating factors: the yeast infections treated appropriately, the bacterial infections controlled with appropriate systemic and topical therapy, and any other “secondary” issues are controlled. A complete integrated flea control program is recommended at this time, even if there is no clear evidence of flea infestation, for those in heavy flea burden areas. If there are NO perpetuating factors found (which is very unusual) then we proceed to step 5.

**Managing Malassezia dermatitis**

*M. pachydermatis* (formerly called *Pityrosporum canis*) is a non-obligatory, lipophilic, budding yeast considered part of the normal flora of the skin and external ear canal. Malassezia infections are almost always secondary conditions (perpetuating factors of pruritus). Primary factors (underlying causes) include atopy, other allergic skin diseases, endocrine imbalances, systemic illness, immunodeficiency syndromes, including glucocorticoid administration, nutritional deficiencies. Predisposing factors include breed, presence of seborrheic dermatitis, increased temperature, increased humidity (e.g., swimming), and immunodeficiency conditions.

The key clinical feature of yeast dermatitis is pruritus. This condition results in INTENSE pruritus in
most patients (similar to scabies and flea allergy). Pruritus may be manifested by licking of the feet, rubbing the face, scooting the anal area, rubbing (face, abdomen) or by scratching. The intense pruritus often results in hair loss due to inflammation (shifting of the follicle growth phase to telogen) and/or direct damage to the hair.

Diagnosis is confirmed by recognizing the agent by cytology. Adhesive microscope slides or clear tape are often used to sample the skin. (See “Dermatology Diagnostics” for more information on techniques) Some animals develop hypersensitivity reactions to the yeast, so absolute numbers of yeast found on the patient do not necessarily correlate with the severity of the pruritus. Treatment is based on clinical features AND the presence of (some) yeast.

Treatment involves topical anti-yeast therapy and systemic therapy. Topical therapy alone is sufficient in most cases to clear the infections. Effective ingredients: selenium disulfide (Selsun Blue [OTC]), salicylic acid, ketoconazole (Nizoral-Janssen, Mal-A-Ket or Malacetic Ultra-DermaPet, or KetoChlor:Virbac)), miconazole (or Miconazole Shampoo-EVSCO or MalaSeb™-DVM Pharmaceuticals), chlorhexidine (Hexidine-Virbac), nystatin, enilconzole (not available in the USA), clotrimazole, and terbenifine. Actic acid/boric acid combination also have efficacy against yeast. Shampoos are the most commonly used topical for antifungal therapy, but sprays, topical wipes, ointments/creams area also available. Note: some of these ingredients are found in human, over-the-counter dandruff shampoos. Examples: 1% selenium sulfide is the active ingredient in Selsun Blue® (Abbott) and Head & Shoulders® intensive care shampoos; 1% ketoconazole is the active ingredient of Nizoral AD® (Janssen) shampoo.

2% lime sulfur is also highly effective for yeast dermatitis, though the esthetics of using lime sulfur often preclude its use except for severe cases. Sprays containing miconzole (EVSCO-Vetoquinol), miconazole plus chlorhexidine (Malaseb Spray), or acetic acid/boric acid/ketoconazole (Mal-A-Ket-DermaPet) are very useful to spot treat difficult areas. We also use them to further moisten the towelettes (that are barely damp when packets are opened) to improve their efficacy.

Systemic therapy (generally oral) is recommended in patients with severe disease, for patients with extensive hair coats (especially if the owners to not want to clip the hair short), in cases where the owners cannot (or will not) bathe their pet, or when the animal is known to have an adverse reaction to shampoos.

Specific Recommendations:
1. Bathe the patient 3 times weekly using an anti-yeast shampoo. Lather, allow to sit for ten minutes, then rinse. Use cool water for bathing (heat exacerbates pruritus). Towel dry (no blow dryers since they may also exacerbate the pruritus). After 2-3 weeks, reduce frequency to twice weekly. After an additional 2 weeks, bathe weekly. If the animal is exceptionally greasy, a benzoyl peroxide or selenium sulfide shampoo may be alternated with the antifungal shampoo.

2. Use sprays, towelettes, or pledgets to spot treat difficult areas, such as interdigital areas (top and bottom), lip folds, periocular areas, and perianal areas. This may be done daily or 2-3 times a week. Note: the sprays work well for claw fold infections or to treat interdigital or perianal infections.

3. In cases where systemic medications are warranted: ketoconazole (dogs) or intraconazole (cats) is given at 5 mg/k, PO od for 21-30 days. Ketoconazole should be given with food to enhance absorption.

KEY POINT: Once an animal has a yeast infection, it is very likely that it will continue to have yeast “problems”, especially if a primary (ie, underlying) condition is not found. Anti-yeast therapy should NEVER be completely discontinued. It may be phased back (e.g, bathing once every 7-10 days or towelettes only 1-2 times a week), but if completely stopped, it is likely that the yeast infection will recur.

Managing Pyoderma

Bacterial infections are common perpetuating (ie, secondary) factors in dermatology. Staphylococcus intermedius (pseudintermedius), S. schleferi, and S. aureus may all play roles in pyoderma in dogs.
and cats. In addition, we are seeing increasing numbers of methicillin-resistant organisms (MRSI, MRSA, MRSS) in our patients. Methicillin resistance should be suspected when a patient fails to respond to standard-of-care for bacterial skin disease or in cases with recurring infections.

Cytology is a crucial diagnostic procedure to identify bacterial disease. Samples may be collected from pustules, draining tracts, under the scale/crust of an epidermal collarette, or by aspiration of an abscess or mass. Culture and sensitivity testing is indicated in recurring cases, in cases with cytologic evidence of atypical infections, or in cases that fail to respond to standard-of-care therapy. Swabs may provide sufficient material for culture, if taken from an intact lesion (i.e., pustule). In deep draining lesions, proliferative lesions, or severe lesions, culture should be from tissue biopsies. (Lesions may be gently scrubbed or cleaned, then a 4-6 mm punch biopsy instrument used to take a deep core of tissue, followed by sterile removal of the outer part of the sample. The deeper core is minced for culture.)

Standard of care for pyoderma depends on the organism involved, the location of the lesion, and severity of the lesion. Cephalosporins are considered ideal agents for managing staphylococcal infections. Fluoroquinolones are used for mixed infections or when the organism is resistant to first-line antibiotics (potentiated amoxicillin, cephalosporins, macrolides, etc.).

The two important considerations of antibiotic therapy are dosage and duration of therapy. In general, each drug should be used at the high end of the recommended dosage range. We want the drug concentrations to exceed the MIC for the organism, and ideally to exceed the MPC (mutant prevention concentration)...a concept that will likely change the future of antibiotic therapy in humans and animals. Of course, we consider the pharmacokinetics of the agents as well, especially whether the agent is a concentration-dependent antibiotic (e.g., fluoroquinolones, aminoglycosides) or time-dependent antibiotics (e.g., cephalosporins, macrolides).

The proper duration of therapy for bacterial skin disease varies with the distribution of the infection, depth of the infection (superficial vs. deep pyoderma), and the organism involved. In general, most bacterial infections of dogs warrant a 4 week course of systemic antibiotic therapy. Deep pyoderma (e.g., furunculosis) may require 6-12 weeks of therapy to resolve the infection. A rule-of-thumb is to treat a bacterial skin infection for 2 weeks past clinical “cure”.

SEE TABLE FOR DOSAGES

Topical antimicrobial therapy consists mainly of shampoos for generalized disease and topical creams/ointments for localized lesions. Active ingredients of commercial antibacterial shampoos (in descending order of efficacy) are: benzoyl peroxide (Pyoben-Virbac; OxyDex-DVM; Benzoyl Plus-EVSCO/Vetoquinol), ethyl lactate (Etiderm™-Virbac), chlorhexidine, povidine-iodine, tricolsan, and sulfur/salicylic acid. Products containing phytosphingosines may also have antibacterial properties, but have not been appropriately evaluated at this time. Shampoo therapy is rarely successful as the sole treatment of bacterial dermatitis, but may be beneficial as adjunctive therapy or to help reduce the frequency of recurrence. Bathing may be done every 5-21 days, as the situations warrant.

Topical therapy may be very helpful when focal lesions are present. Examples of focal bacterial dermatitis are acral lick dermatitis, intertrigo, lip fold dermatitis (very, very common), and some eosinophilic lesions in cats. Benzoyl peroxide and mupirocin ointment are the two best agents. BPO would be indicated if the lesion is moist, however, it may be irritating to some patients (especially cats). Mupirocin is an excellent topical antibiotic and ideal for lip folds and other fold pyodermas (applied 1-2 times daily to affected areas).
Step 4: The Recheck Examination

Most dermatology cases have numerous perpetuating factors, such as yeast infections and pyoderma. These conditions are treated appropriately, then the patient is re-examined by the same clinician (an important point). Three important things happen at the recheck examination:

1) Evaluation of your previous therapy for perpetuating factors revealed at the first visit
2) Re-visitation of the dermatologic history. The history should focus on how much pruritus remains and the pattern/distribution of any remaining pruritus…now that the perpetuating factors are gone. This is important information to help identify the primary factor.
3) Repeat the data base. Why? ..because things change! It is not unusual for animals to develop different perpetuating factors. For example, dogs with pyoderma may have significant numbers of Malassezia found on a subsequent visit.

Step 5: Identify the Primary Factor(s)

Other diagnostics, such as allergy testing, dietary trials, fecal flotation, and cytology (especially ears), and biopsy, may be performed according to “new” information received / “extracted” at the recheck examination. See the TABLE at the end for specific indication of the various diagnostics that may be done at this time. Isolation of the patient in a veterinary hospital or boarding facility may help to determine if the problem (e.g., pruritus) is due to a substance in the patient’s local environment. The reality is that the majority of our pruritic patients are allergic in nature. Therefore, allergy testing, of some type, is the most common diagnostic procedure that will be indicted at this time in the case management. Some tips:

1) TIMING IS EVERYTHING If the patient is pruritic, and the pruritus is non-seasonal, an allergy, either dietary or atopic, should be strongly considered. There are two options to clarify this further: 1) allergy test and if negative proceed with a dietary trial (my preferred choice) OR 2) begin a dietary trial and allergy test if the trial is negative. The main disadvantage of the second option is that it may take 12 weeks to see the full effect of a diet change. Therefore, it would be necessary to control all perpetuating problems for that full 12 weeks while you wait to see if the patient improves.

2) CLIENT EDUCATION is important. We tend to “play the odds” when it comes to performing diagnostic tests. That is, we first recommend the tests that are more likely to yield positive information, then move on to diagnostics that aren’t as sensitive or that are more specific for uncommon problems. Remember, most pruritic patients do not have bizarre diseases, they are more likely to have an unusual manifestation of a common disease, such as atopy.

Summary

The diagnostic approach to dermatology problems, and especially pruritus, is designed to eliminate those perpetuating factors, such as yeast and bacteria, that complicate the ability to diagnose and manage skin conditions. Once those perpetuating factors are controlled, the clinical picture becomes significantly less cloudy and distorted. That does NOT mean that it is always easy to diagnose the primary condition. However, following this plan will allow you to practice medicine in a more efficient and purposed manner.

Remember…..deal with the “what” (the perpetuating factors), then look for the “why”!

Table. Common Antibacterial Agents Used to Treat Pyoderma

<table>
<thead>
<tr>
<th>Class</th>
<th>Specific antibiotic</th>
<th>Trade Names</th>
<th>Dosage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalosporins</td>
<td>Cephalexin</td>
<td>generic</td>
<td>22 mg/kg</td>
<td>q 12 hours</td>
</tr>
<tr>
<td></td>
<td>Cefpodoxime proxetil</td>
<td>Simplicef (Pfizer)</td>
<td>10 mg/kg</td>
<td>q 24 hours</td>
</tr>
<tr>
<td>Category</td>
<td>Drug Name</td>
<td>Brand Name</td>
<td>Dose Range</td>
<td>Frequency</td>
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<td>---------------------------</td>
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<tr>
<td>Fluoroquinolones</td>
<td>Enrofloxacin</td>
<td>Baytril (Bayer)</td>
<td>5.0-20 mg/kg</td>
<td>q 24 hours</td>
</tr>
<tr>
<td></td>
<td>Orfloxacin</td>
<td>Orbax (Schering-Plough)</td>
<td>2.5 - 7.5 mg/kg</td>
<td>q 24 hours</td>
</tr>
<tr>
<td></td>
<td>Marbofloxacin</td>
<td>Zenequin (Pfizer)</td>
<td>2.75-5.5 mg/kg</td>
<td>q 24 hours</td>
</tr>
<tr>
<td>Penicillins</td>
<td>Amoxicillin-clavulanate</td>
<td>Clavamox (Pfizer)</td>
<td>15 mg/kg</td>
<td>q 12 hours</td>
</tr>
<tr>
<td>Penicillins</td>
<td>oxacillin *</td>
<td>generic</td>
<td>22-40 mg/kg</td>
<td>q 8 hours</td>
</tr>
<tr>
<td>Penicillins</td>
<td>Oxacillin</td>
<td>generic</td>
<td>22-40 mg/kg</td>
<td>q 8 hours</td>
</tr>
<tr>
<td>Penicillins</td>
<td>generic</td>
<td>Clavamox (Pfizer)</td>
<td>q 12 hours</td>
<td></td>
</tr>
<tr>
<td>Penicillins</td>
<td>generic</td>
<td>Lincoin, Antirobe (Pharmacia)</td>
<td>q 12 hours</td>
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</tr>
<tr>
<td>Penicillins</td>
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<td>Azithromycin</td>
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<tr>
<td>Macrolides</td>
<td>Erythromycin</td>
<td>generic</td>
<td>10-20 mg/kg</td>
<td>q 8 hours</td>
</tr>
<tr>
<td>Macrolides</td>
<td>Azithromycin</td>
<td>Zithromax (Pfizer)</td>
<td></td>
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</table>
# Diagnostic Procedures Commonly Used to Evaluate Pruritus

<table>
<thead>
<tr>
<th>Initial Visit</th>
<th>Procedure</th>
<th>Purpose</th>
<th>Specific indications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signalment History Physical Examination Dermatology Exam</td>
<td>Breed and age considerations</td>
<td>Baseline information</td>
</tr>
<tr>
<td>Data Base (DB)</td>
<td>Skin scraping Cytology (yeast) Trichogram Cytology*</td>
<td>Evaulate for ectoparasites Evaluate for Malassezia infection Evaluate for demodicosis and dermatophyties</td>
<td>EVERY Visit</td>
</tr>
<tr>
<td>Optional tests</td>
<td>Fungal culture Ear cytology Fecal floatation</td>
<td>Identify or rule out dermatophytes Identify perpetuating factors of otitis Identify ectoparasites</td>
<td>Suspicious lesions or findings on DB Otitis externa Suspicion of parasitosis with negative SS</td>
</tr>
<tr>
<td>Recheck at 30 days</td>
<td>History Physical Examination Derm examination Skin scrapings Cytology for yeast Trichogram</td>
<td>Identify what if any improvement has occurred. Recognize changes Same as previously Same as previously</td>
<td>EVERY recheck</td>
</tr>
<tr>
<td>Or...Future visits</td>
<td>Allergy testing</td>
<td>Confirm atopic disease</td>
<td>Seasonal history Consistent Hx or physical findings: Foot licking, face rubbing, perianal pruritus, acral lick dermatitis, recurring pyoderma, otitis externa</td>
</tr>
<tr>
<td></td>
<td>Dietary trials</td>
<td>Identify food allergy</td>
<td>Non-seasonal history Same physical findings and hx as for atopic disease</td>
</tr>
<tr>
<td></td>
<td>Skin biopsy</td>
<td>Identify dermatoses</td>
<td>Abnormal skin (lesions of any type)</td>
</tr>
<tr>
<td></td>
<td>Environmental isolation</td>
<td>Identify allergy to household substances (eg, detergents, contact substances, etc.)</td>
<td>Negative food trials and allergy tests</td>
</tr>
</tbody>
</table>

* If appropriate (e.g., pustules, papules) primary or secondary lesions are present.