A Review of Otitis
Tips from a dermatologist to help you manage these
Kacie Blessing, DVM, DACVD
Animal Dermatology Clinic, San Diego, Ca

Thank you!

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Introduction
Garret Pachinger,
VMD, DACVECC
COO, VETgirl

Introduction
Justine A. Lee,
DVM,
DACVECC, DABT
CEO, VETgirl

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  - garret@vetgirlontherun.com
  - justine@vetgirlontherun.com
Introduction

Kacie Blessing DVM, Diplomate ACVD

OUTLINE
• Anatomy
• How to examine
• Etiology, Clinical signs
• Diagnostic workup
• Treatment

Anatomy

• Vertical canal -> Horizontal canal -> TM
• 5-10 cm long, 4-5 mm wide
• Lined by skin
• Sebaceous/ceruminous glands
• Hair follicles
• Generously vascularized
• Sensory innervation:
  • Trigeminal nerve
  • Facial nerve
  • Vagus nerve
  • Second cervical nerve

Tympanic Membrane

• Separates external ear from middle ear
• Thin and slightly opaque
• Thinner in the center
• Thicker in the periphery
• Upper portion: pars flaccida
• Larger, lower portion: pars tensa

Tympanic Membrane - Hair
Manubrium of the Malleus
- Attached to the pars tensa
- Open end of the “C” points towards the nose
- Distal end – umbo membrane tympani
  - Germinative epithelium
- Stria mallearis – line of the “C” shape

Cats vs Dogs
- Cats more short and straighter ear canal

Cat Anatomic Differences
- Manubrium is less curved
- Middle ear – ventral tympanic bulla
  - Divided by an incomplete septum
  - Two communicating compartments
    - Dorsal – more lateral
    - Ventral – more medial

Anatomy Breed Variations
- Pinnal type
  - Shape, prevention of foreign material

Anatomy Breed Variations
- Shape and openness of external orifice
- Diameter of external ear canal
- Thickness of skin and degree of glandular material of ear canal
- Amount and size of hair in ear canal
- Shape of bone and skull comprising middle and inner ear
- Amount of hair

OUTLINE
- Anatomy
  - How to examine
- Etiology
- Clinical signs
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- Treatment
Otoscopic Examination Technique

- VERY IMPORTANT!!!!
- PRACTICE MAKES PERFECT
  - Acquired skill
  - Atraumatic
  - Visualize cone placement

Technique

- Straighten the canal
- Pull canal over tip of cone
  - Pull pinnae up
  - Then lateral and down
  - Towards the otoscope cone

Auricular Projection

- Pain when pressure put against it
- Especially if inflamed

Other Examination Techniques

- Use two cones
- Adequate light
- Don’t cross contaminate
- Restraint
  - Train your staff
  - Treatment room
  - Sedation
  - Anesthesia

Light and More Light

Otoscopes
Otoscopic Cones

Clean Cones

- Bacteria are found in cones
- Ten minutes disinfectant soaks required
- 2 cones from 50 hospitals were cultured
  - Contamination in 29%
  - 3% pathogenic bacteria

Otoscopic Examination

- Patency or stenosis
- Color Changes
- Proliferative changes
- Ulcerations
- Exudates
- Foreign Objects
- Parasites
- Tumors
- Excessive Hair

Dilated Pars Flaccida

OUTLINE

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Otitis

- Inflammation of the ear
  - Externa
  - External ear canal, orifice, pinna
  - Media
    - Middle ear
  - Interna
    - Inner ear structures
Classifying Otitis Externa
• Variety of classification schemes
  • Acute or chronic
  • Purulent, ceruminous, erythroceruminous, ulcerative
• Etiology
  • Predisposing, primary, secondary
  • 3Ps - Predisposing, Primary, Perpetuating

PSPP System
• Primary
• Secondary
• Perpetuating Factors
• Predisposing Factors

Otitis - Primary
• Allergy
  • CAFR
  • Atopy
  • Contact
  • Flea allergy
• Parasites
  • Demodex
  • Otodectes
  • Ticks
  • Chiggers
• Endocrine
  • Cushings
  • Hypothroid
  • Sex hormone
• Foreign bodies
  • Hair
  • Plant awns
  • Fostail
  • Sand/dirt

Otitis - Primary
• Autoimmune
  • BP
  • Epidermolysis bullosa
  • Lupus
  • PF
• Canine distemper
• Immune mediated
  • Drug reaction
  • EM
  • Vasculitis

Otitis - Primary
• Glandular disorders
  • Altered secretions
  • Sebaceous gland hyper/hypoplasia
  • Eosinophilic granuloma complex
  • Juvenile cellulitis

Otitis - Secondary
• Bacteria
• Yeast
• Fungal – Aspergillus
• Medication reaction
• Over cleaning
• Excessive moisture
• Maceration
• Physical trauma

Otitis - Secondary
• Epithelium
  • Excessive production
  • Altered migration
  • Failure of migration
• Ear canal
  • Edema
  • Proliferative changes
  • Stenosis
• Calcification

Otitis – Perpetuating Factors
• Tympanum
  • Fistula
  • Rupture
• Pocket
• Glandular
  • Apocrine blockage/dilation
  • Hidradenitis
  • Sebaceous hyperplasia
• Middle ear
  • Filled with debris
  • Otitis media
  • Stenomas
Otitis – predisposing Factors
- Conformation
  - Excessive hair growth
  - Hasty concave pinna
  - Pendulous pinna
  - Stenotic canals
- Excessive moisture
  - Environment (heat, humidity)
  - Water
- Obstructive ear disease
  - Feline apocrine cystoadenomatosis
  - Neoplasia

PSPP System
- Primary
- Secondary
- Perpetuating Factors
- Predisposing Factors

OUTLINE
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Diagnostic Approach to Otitis
- History
  - Acute vs chronic and/or recurrent
  - Concurrent signs occurring?
- Physical examination
  - Type and location of inflammation or discharge
  - Evaluate other anatomical locations
  - Proliferative state of tissue

Sample Collection
- Different organisms can be found from different locations within
  - Ear canal
  - Middle ear
  - Even from the same location
- Ways to collect:
  - Tip of cone
  - Cotton swab
  - Ear loop scraping wall of canal
  - Soft tube aspiration
Cytology Examples

- Normal Ear
  - Keratinocytes
  - Wax
  - Lipid
  - Cocci
  - Yeast

Normal Ear Cytology

<table>
<thead>
<tr>
<th></th>
<th>Dogs (n=74)</th>
<th>Cats (n=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Yeast</td>
<td>8 (mean 1.12)</td>
<td>5 (mean 0.53)</td>
</tr>
<tr>
<td>Maximum Bacteria</td>
<td>30 (mean 2.45)</td>
<td>10 (mean 1.78)</td>
</tr>
</tbody>
</table>

*Rods and cocci were not separated


Abnormal Cytology

- Organisms based on /oif
  - > 5 cocci/oif
  - > 1 rod/oif
  - With inflammatory cells
  - Any bacteria considered significant
  - Phagocytosis or toxic changes is significant
  - Malassezia
  - Dogs: >3/oif
  - Cats: >1/oif
  - Other yeast or pseudohyphae

Cytology Examples

- TNTC cocci and rods
- Neutrophils
- Nuclear streaming
- Intracellular cocci

- TNTC cocci
- Rare rods
- Malassezia
- Nuclear streaming
Mixed Infections
Common

Cytology
CANT OVER EMPHASIZE THE IMPORTANCE OF THIS
• Neutrophils
• Eosinophils
• Cocci
• Yeast
• Acantholytic cells
• Dermatophyte
• Demodex

Change your stains

WHAT ABOUT CULTURES??????

Culture & Sensitivity
• Indications
  • Canines per clinician
  • Otitis media – systemic therapy
  • Empiric therapy is ineffective
  • Large amounts of WBC’s with little bacteria
  • Rods? Mixed infection?
• Always do a cytology before culturing
  • If mixed infection want to see predominant organism
  • Is there yeast, inflammatory cells?

Culture & Sensitivity
• Potential problems
  • Multiple organisms not always identified
  • Based on serum levels
  • Higher concentrations obtained with topicals
  • Sensitivity reflects blood levels of antibiotics
  • Multiple strains of same organism with different sensitivities
  • Cost effectiveness
Other Issues with Culture & Sensitivity

- Bacterial cultures from otic samples grow two, three and sometimes more isolates 50% of the time
  - Corynebacterium
    - Normal microflora or pathogen?
    - Enterococcus
      - Normal microflora or pathogen?
  - Bacterial C&S do not grow malassezia

Duplicate Culture Study

- 15 ears sampled by loop from external ear canal
  - Level near junction of vertical and horizontal canal
  - Bacteria, rods, neutrophils or DNA were evaluated on cytology
  - Two culture swabs inoculated from same loop
    - Group 1 correctly labeled
    - Group 2 mislabeled

Duplicate Culture Results

- 13 cases grew bacteria
  - 1/13 (7.7%) had the exact same strain of bacteria isolated on sensitivity

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Grown on both samples (n=cases)</th>
<th>% Different strains/sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>Corynebacteria species</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Staph intermedius</td>
<td>2</td>
<td>100</td>
</tr>
</tbody>
</table>

More Studies Support Mixed Infections


- Variability of laboratory identification and antibiotic susceptibility reporting of Pseudomonas spp. isolates from dogs with chronic otitis externa.
  - 3 laboratories agreed on the presence of Pseudomonas spp. in 15/18 (83.3%) ears sampled
  - None of the 16 Pseudomonas spp. with MIC data reported had identical patterns of antibiotic susceptibility between two labs

Triplicate Culture Study

- 3 cultures taken
  - Two from the same identical swab
  - One sample following ear cleaning
    - Ear loop scraped along the canal wall

Results of Triplicate Culture

- The two identical cultures results:
  - Both grew Staph. Intermedius, Strep canis, Pseudomonas aeruginosa, Proteus mirabilis
    - None had the same sensitivity pattern = 8 different strains
  - 3rd culture grew all 4 of the same organisms
    - But different strains than the first two
    - Additional organisms grown: Corynebacteria jeikeium and E. Coli.
    - Total of 14 different strains of bacteria from one ear canal
Empirical antimicrobial selection vs. Culture & Sensitivity

- 20 cases of pseudomonas otitis
  - Treatment started empirically while awaiting C&S results
  - Ear flushing was performed with Tris EDTA
  - 7/20 had a pure culture
  - 13/20 had a mixed culture

When Do I Culture?

- Otitis media – systemic therapy
- Empiric therapy is ineffective after a few attempts
- I know that the ear is clean but can’t get infection under control
- Large amounts of WBC’s with little bacteria – and not concerned about topical medication
- Fungal infections
- Sampling technique

Other Dx Test

- Radiographs
- CT
- MRI

Advanced Imaging - CT

- Allows more precise evaluation of bony structures
- Tympanic bulla contours evaluated
- Detection of bony proliferation or osteolysis
- Otitis media:
  - Sensitivity 83%
  - Specificity 89%

Advanced Imaging - MRI

- Allows a distinction of fluid and soft-tissue that CT and radiographs don’t
- In a normal bulla MRI is a signal void due to air
- Used for concerns of soft tissue changes

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Importance of Flushing

Why flush?

• Removal of foreign objects and debris
• Most rapid way to remove infection right away
• Remove wax and debris to evaluate TM, presence of a tumor or polyp
• Removing debris and infection can alleviate secondary concerns rapidly
• Underlying condition should be assessed to and treated

How to flush?

• Use ceruminolytics to enhance debris break-up
• Use body temperature sterile saline or water
• Use a bulb syringe or red rubber attached to a flush/suction device (often a syringe)
• Do not create a suction—be sure that excess water can escape around the flushing instrument
• Rinse thoroughly to decrease irritation and potential ototoxicity

Types of Flush

• Essential for successful therapy
  • Ceruminolytic
    • Douxo Micellar® Ceva
    • Cerumene® Vetroquinol
    • Milytic Otic® Vetbiotek
  • Antibiotic-potentiating agent
    • Tris-EDTA disrupts the bacterial cell wall
    • Affects the MIC of some antimicrobials
### Treatment Components

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Route Administered</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic</td>
<td>Topical</td>
<td>Bacterial infection ear canal</td>
</tr>
<tr>
<td>Antibiotic</td>
<td>Systemic</td>
<td>Bacterial otitis media, proliferative changes over 50% lumen, topical reactions</td>
</tr>
</tbody>
</table>

### Treatment Components

<table>
<thead>
<tr>
<th>Antifungal</th>
<th>Route Administered</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antifungal</td>
<td>Topical</td>
<td>Yeast overgrowth, present with inflammatory cells and no bacteria</td>
</tr>
<tr>
<td>Antifungal</td>
<td>Systemic</td>
<td>Otitis media with yeast from middle ear</td>
</tr>
</tbody>
</table>

### Some Topical Medications

<table>
<thead>
<tr>
<th>Name</th>
<th>Antibiotic</th>
<th>Antifungal</th>
<th>Steroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posatex</td>
<td>Orbifloxacin</td>
<td>Posaconazole</td>
<td>Mometasone</td>
</tr>
<tr>
<td>Mometomax</td>
<td>Gentamicin</td>
<td>Clotrimazole</td>
<td>Mometasone</td>
</tr>
<tr>
<td>Otomax</td>
<td>Gentamicin</td>
<td>Clotrimazole</td>
<td>Betamethasone</td>
</tr>
<tr>
<td>Surolan</td>
<td>Polymyxin B</td>
<td>Miconazole</td>
<td>Prednisolone</td>
</tr>
<tr>
<td>Sresaderm</td>
<td>Neomycin</td>
<td>Thiabendazole</td>
<td>Dexamethasone</td>
</tr>
<tr>
<td>Claro</td>
<td>Florfenicol</td>
<td>Terbinafine</td>
<td>Mometasone</td>
</tr>
<tr>
<td>Osurnia</td>
<td>Florfenicol</td>
<td>Terbinafine</td>
<td>Betamethasone</td>
</tr>
</tbody>
</table>

### Topical Medications

- Concentrations much higher than achieved by systemic routes
- Often much higher than MPC
- Synergy of antibiotics, antifungals and steroids
- Need a tolerant patient
- Owner must be able to medicate

### Long Acting Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Manufacturer</th>
<th>Duration</th>
<th>Antibiotic</th>
<th>Antifungal</th>
<th>Steroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.N.T</td>
<td>BCP Veterinary Pharmacy</td>
<td>14-21</td>
<td>Enrofloxicin</td>
<td>Ketoconazole</td>
<td>Triamcinolone</td>
</tr>
<tr>
<td>Otic Armor</td>
<td>Allwern Inc</td>
<td>90</td>
<td>Bandage</td>
<td>Bandage</td>
<td>None</td>
</tr>
<tr>
<td>Cameo Otic</td>
<td>Pfizer Pharmaceutical</td>
<td>7</td>
<td>Antiseptic</td>
<td>Antiseptic</td>
<td>None</td>
</tr>
<tr>
<td>Osurnia</td>
<td>Elanco</td>
<td>1/7-45</td>
<td>Florphenicol</td>
<td>Terbinafine</td>
<td>Betamethasone</td>
</tr>
<tr>
<td>Claro</td>
<td>Bayer</td>
<td>30</td>
<td>Florphenicol</td>
<td>Terbinafine</td>
<td>Mometasone</td>
</tr>
</tbody>
</table>

### Systemic therapy

- Presence of otitis media
- Proliferative changes
  - Especially if canal occluded
- Owner capability
- Failure of topical treatment
- Adverse topical reactions
Systemic Antibiotics and Antifungals

- Otitis media
  - Difficult for topical therapy to reach middle ear even with ruptured TM
  - Usually based off culture
  - May empirically select based on otic cytology findings

Glucocorticoids

- Inflammation, pain
- Topical mediation reactions
- Intrallesional
- Decrease exudate
- Proliferative tissue/stenosis

- Prednisone: 1-2 mg/kg initially then taper
- Triamcinolone: 0.1-0.2 mg/kg initially then taper

Treatment Duration

- DON’T STOP TREATMENT TOO SOON
- RECHECK IS VERY IMPORTANT
- Negative cytology
- Ideally until canals and tympanum have normalized
- Can ear self clean normally?
- Pets with perpetuating +/- predisposing factors may require long term or life long maintenance therapy

When to Turf? Surgery?

- Polyps
- Mass/neoplasia
- PSOM
- Neurologic
- Severe stenosis
- Not responding

Ototoxicity

- Aminoglycosides
  - Systemic: Streptomycin, Gentamicin, Amikacin
  - Topical: Polymyxin B and E, Neomycin, Tobramycin, Chloramphenicol

- Chloramphenicol
- Polymyxin B and E
- Propylene glycol
- Acrilex acid
- Benzalkonium chloride
- Benzethonium chloride
- Centramide
- Chlorhexidine
- Ethanol
- Iodine and iodophors

Topical Reactions

- Can happen with any medication, flush, topical
- Cytology – inflammation with no bacteria

- Stop all topicals
- Rinse with water
- Oral Steroids
Summary

• Challenging
• Try to find the underlying cause
• CYTOLOGY
• EAR FLUSHING
• Treat secondary infections
• RECHECKS