
VMX
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VETERINARY MEETING & EXPO
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Oh Oh Otitis:

Clinical Approach to the Troublesome Ear

Presenter: Heather Akridge, DVM, DACVD

Date: Sunday, January 26th 2025

Addie

Gigi and Leo

Learning Objectives

1. Understand the prevalence and type of common ear infections to include primary and secondary causes and comorbidities
2. Recognize the importance of history, examination (especially otoscopic examination), and diagnostics
3. Summary of otic diagnostics (utilizing for diagnosing and monitoring)
4. Factors to consider in treatment regiments
5. Considerations if not resolving and avoiding relapses and recurrences

OTITIS:
Clinical Approach and Case Evaluation

How to approach

How to approach

1. History
2. Acute versus Chronic
3. Underlying Diseases: Multifactorial
    + Predisposing
    + Primary
    + Perpetuating
4. Examination
5. Diagnostics
    + Cytology
        + In-clinic: slide/stain versus IDEXX inVue Dx™ Cellular Analyzer
        + Reference lab
    + Mite prep
    + Culture
    + Imaging
6. Treatment based on findings
7. Q&A

History, history, history

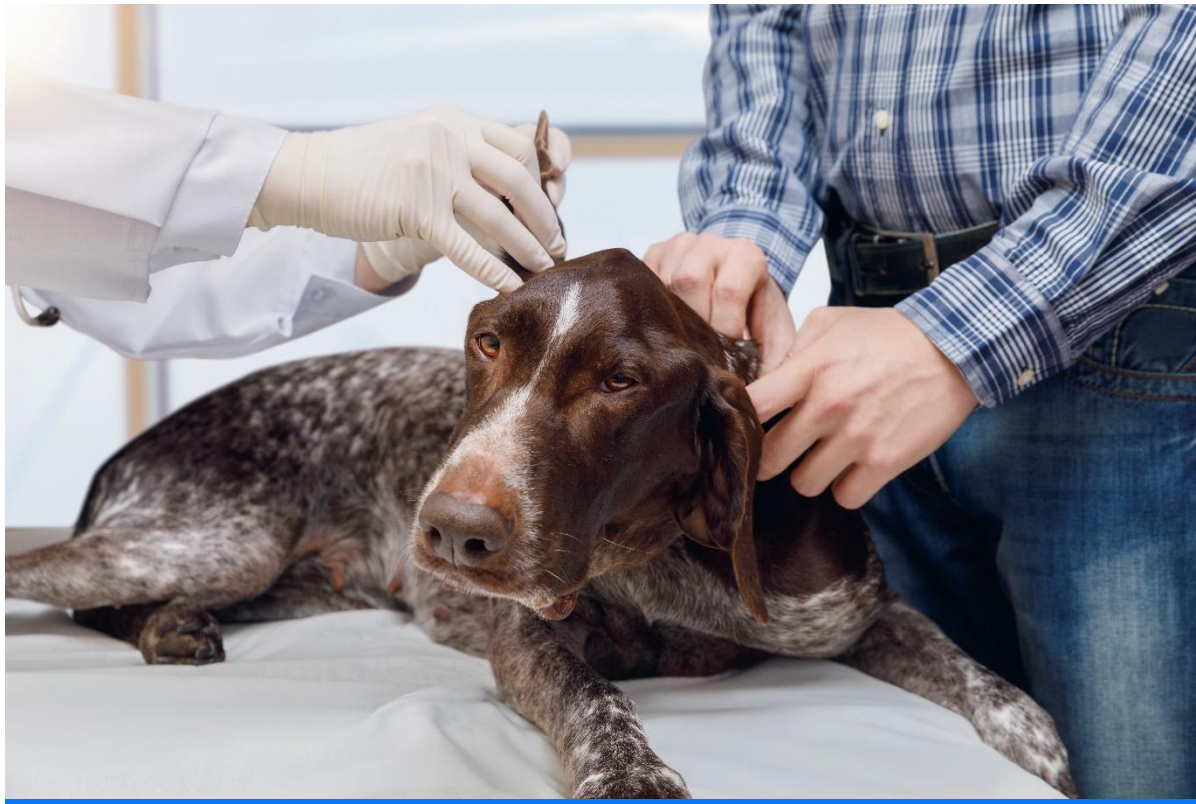
HISTORY

- How long have ear issues been present?
- Age pet was obtained?
- Age pet started having issues?
- Current Age, Breed, Gender?
- First episode or Previous episodes?
- Seasonal or Nonseasonal?
- Pruritus (head shake, rub, scratch)?
- Odor?
- Unilateral or Bilateral?
- Skin Issues?
- Swimming?
- Systemic abnormalities?
- Concurrent diseases or medications oral/topical?
- Have owners been cleaning with anything or applying anything topically?
- Been groomed recently?
- Exposure other animals with issues (shelter/kennel)?
- Any medications that have helped or worsened?
- Monthly heartworm and flea/tick preventatives?

Otitis Approach

- Acute
  - Often less than 3 months duration
  - Uncomplicated and new
  - Without acquired proliferative changes to canal(s) or pinna (pinnae)
- Chronic
  - Often longer than 3 months duration
  - Often history of underlying skin/ear disease
  - Presence acquired proliferative changes to canal(s) and pinna (pinnae)
- Persistent: Struggle to clear the otitis and get the ear to appear healthy

  or
- Recurrent: Struggle to prevent development of a new infection



Consider the episode of otitis in the big picture scope—not just this one occurrence.

Short-term plan: Clear infection
Long-term plan: Maintenance to prevent relapses or recurrences

Consequences of Repeat Infections

- Chronic inflammatory changes (pathologic changes)
- Pain
- Aversion of ears being touched/cleaned
- Antimicrobial resistance
- Otitis media (hearing loss, nerve damage)

Consider if these factors and causes have been addressed?

Predisposing

- Conformation
  - Congenital narrowing
  - Hair
  - Glandular tissue
  - Pendulous ears
- Excessive moisture
  - Swimming
  - Bathing
  - Humidity
- Inappropriate treatment
  - Overcleaning
  - Undertreating
  - Hair plucking
- Upper respiratory infections (cats)

Primary

- Hypersensitivities
  - Cutaneous adverse food reaction
  - Atopic dermatitis
  - Allergic or irritant contact reaction
- Parasites
  - *Otodectes*/*Demodex*
  - Ticks
- Foreign body
- Space-occupying lesion
  - Polyp versus tumor
- Keratinizing disorders
- Endocrine
- Autoimmune

Secondary

- Bacteria
  - Gram-positive cocci
  - Gram-positive rods
  - Gram-negative rods
- *Malassezia*
- Biofilm

Perpetuating

- Epidermal and glandular hyperplasia
  - Cobblestone appearance
- Stenosis
  - Occlusion
  - Fibrosis
  - Mineralization
- Otitis media
- Tympanic membrane abnormalities
- Cholesteatoma formation

Factors and causes

Veterinary Dermatology

AN INTERNATIONAL JOURNAL

Aetiology of canine otitis externa: a retrospective study of 100 cases

Manolis N. Saridomichelakis, Rania Farmaki, Leonidas S. Leontides, Alexander F. Koutinas
Vol. 18 / Issue 5 / 2007

- Otitis externa (OE) was chronic-recurrent (63%) or bilateral (93%) in the majority of the cases
- Most common primary causative factors: allergic dermatitis (43%), grass awns (12%), and otoacariasis (7%)
  - No primary factor (32%) and more than one factor (3%)
- Secondary causative factors: *Malassezia* spp. (66%), cocci (38%), and rods (22%)
- Most important perpetuating factors: ear canal stenosis (38%) and tympanic membrane perforation-otitis media (25%)

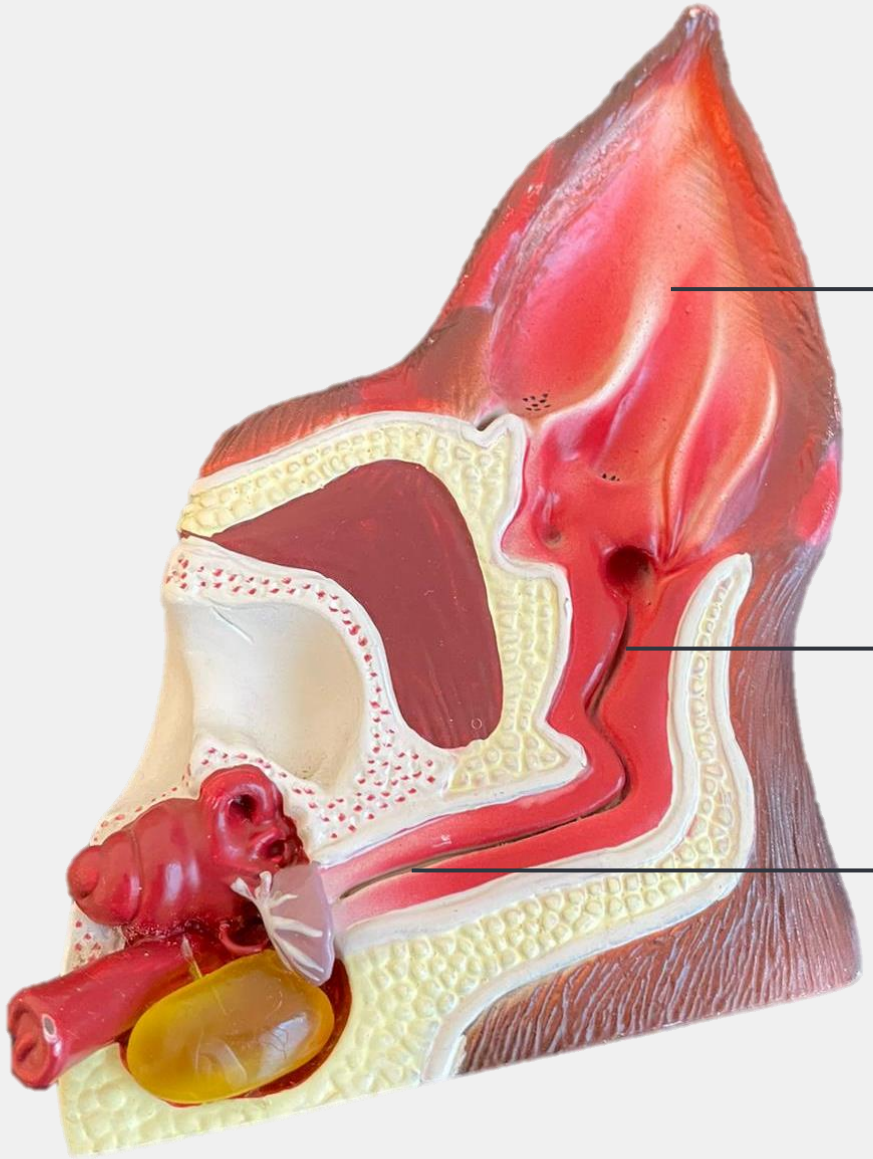
Source: Saridomichelakis MN, Farmaki R, Leontides LS, Koutinas AF. Aetiology of canine otitis externa: a retrospective study of 100 cases. *Vet Dermatol*. 2007;18(5):341–347. doi:10.1111/j.1365-3164.2007.00619.x

Examination

Note while examining

- Hearing affected
- Head tilt
- Neurologic abnormalities
- Ear pain
- Jaw pain
- Palpation of ear canal/pinna (mineralization versus firm versus pliable)
- Examine unaffected ear 1st
- Examine affected ear 2nd
  - Canal wall
  - Space-occupying lesions
  - Discharge
  - Ulceration or bleeding
  - Tympanic membrane
- Pinna and remainder of skin
- Full physical exam

Pinna anatomy



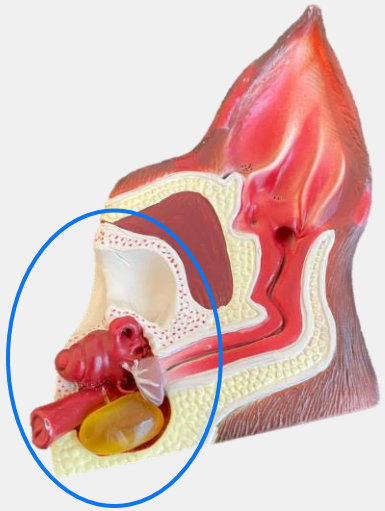
Pinna

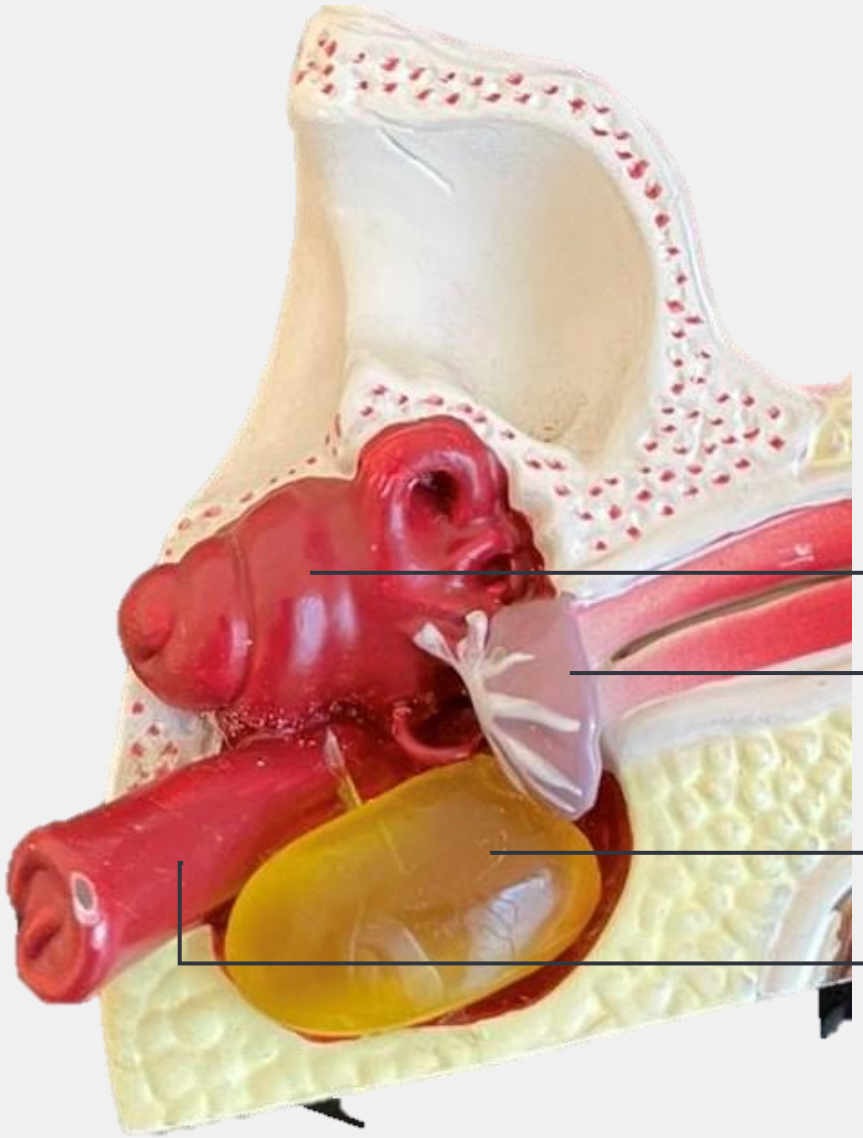
Vertical
ear canal

Horizontal
ear canal

Image courtesy of Dr Ariane Neuber Watts,
IDEXX Laboratories

Healthy ear canal and tympanic membrane





Cochlea

Tympanic membrane

Tympanic bulla

Eustachian tube

Image courtesy of Dr Ariane Neuber Watts, IDEXX Laboratories

Predisposing, primary, and perpetuating

As you start your examination, think about those 3 main factors.

Predisposing

+ Is there narrowing?
+ Is there hair (how much)?
+ Is there glandular tissue (amount)?

Primary and Perpetuating

+ Discharge (type, color, amount)
+ Canal (ulcerated, macerated)
+ Obvious space-occupying lesions
+ Tympanic membrane
+ Translucent versus opaque versus hemorrhagic
+ Inflammation

Examination of canal will impact next steps diagnostically, as well as treatment choices.

Otoscopic examination video

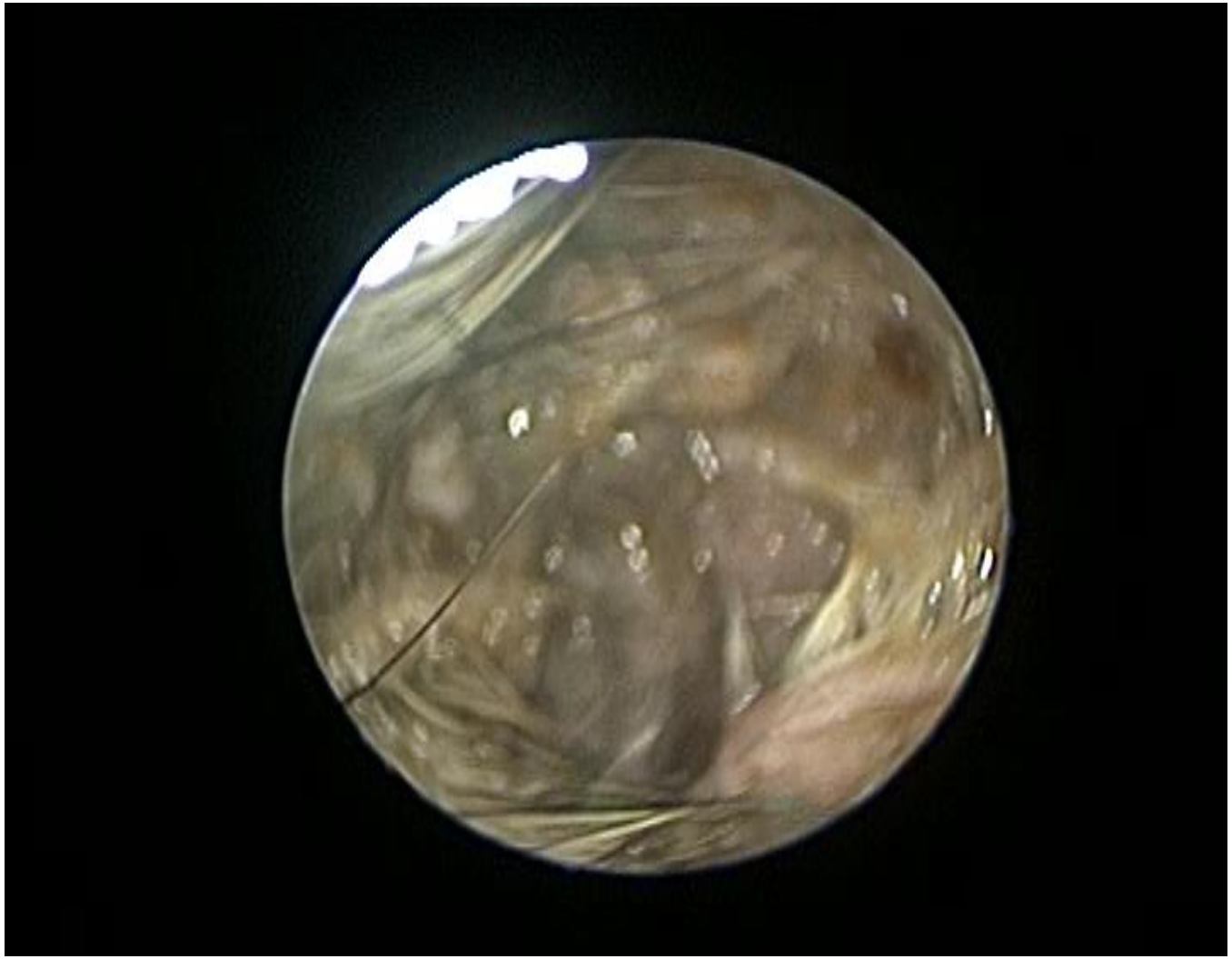


Image courtesy of Dr Ariane Neuber Watts, IDEXX Laboratories

Example of ear canal stenosis

Image courtesy of Dr Ariane Neuber Watts, IDEXX Laboratories

Example of sebaceous glandular hyperplasia

Image courtesy of Dr Ariane Neuber Watts, IDEXX Laboratories

Diagnostics

Diagnostics

All of these diagnostics have their place in otitis

Cytology

- Slide with stain (Diff-Quik or Gram stain)
  - Examine in-clinic: technicians versus doctors
  - Send out to reference lab: clinical pathologist
- IDEXX inVue Dx™ Cellular Analyzer (no slide or stain)

Mite prep

- Swab-mixed mineral oil, coverslip, low light
- Curette sampling/ lactophenol cotton blue staining

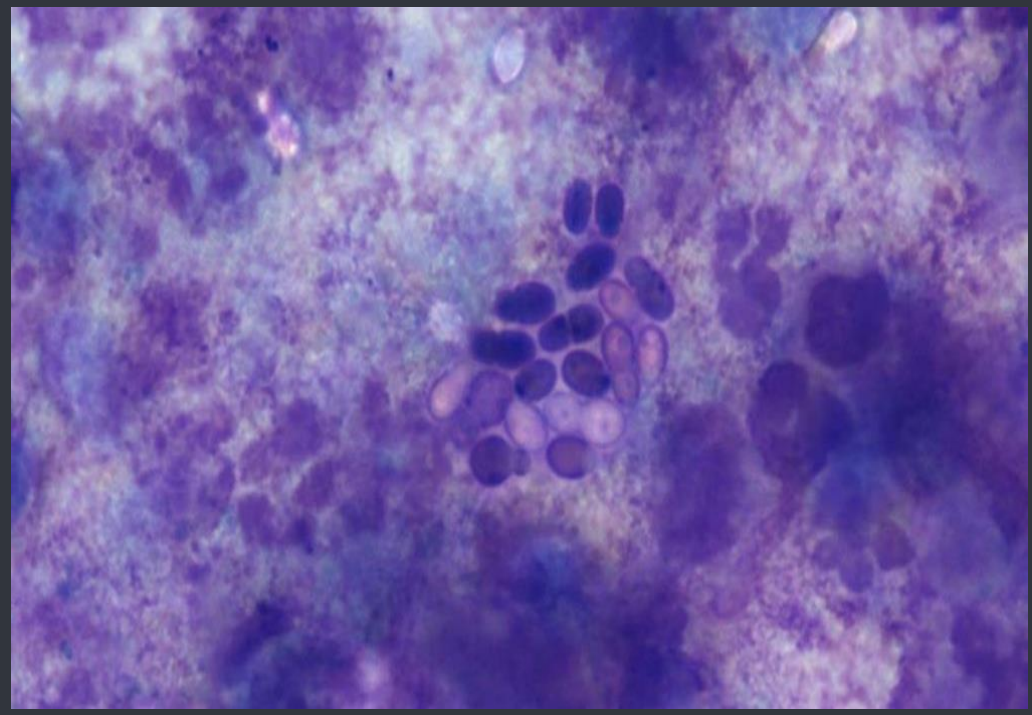
Culture (external versus middle ear)

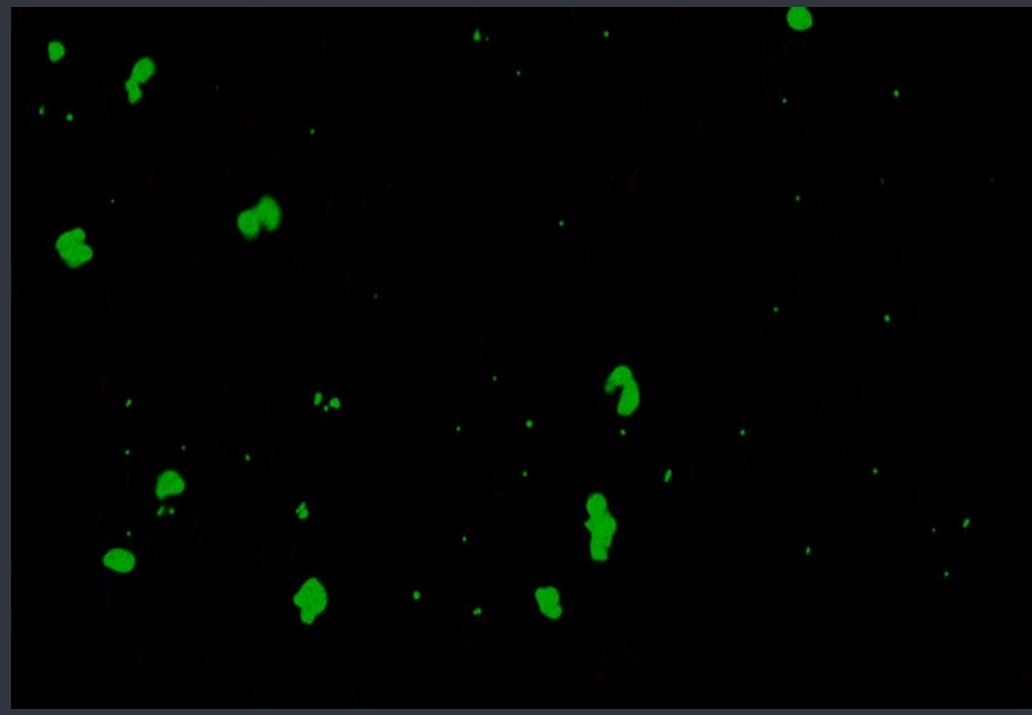
- Aerobic
- Fungal

Imaging

- Radiographs
- Computed tomography (CT): most cost-effective
- Magnetic resonance imaging (MRI)

Cytology, cytology, cytology





Upper image courtesy of Elizabeth A. Layne, DVM, DACVD, Sandy, UT

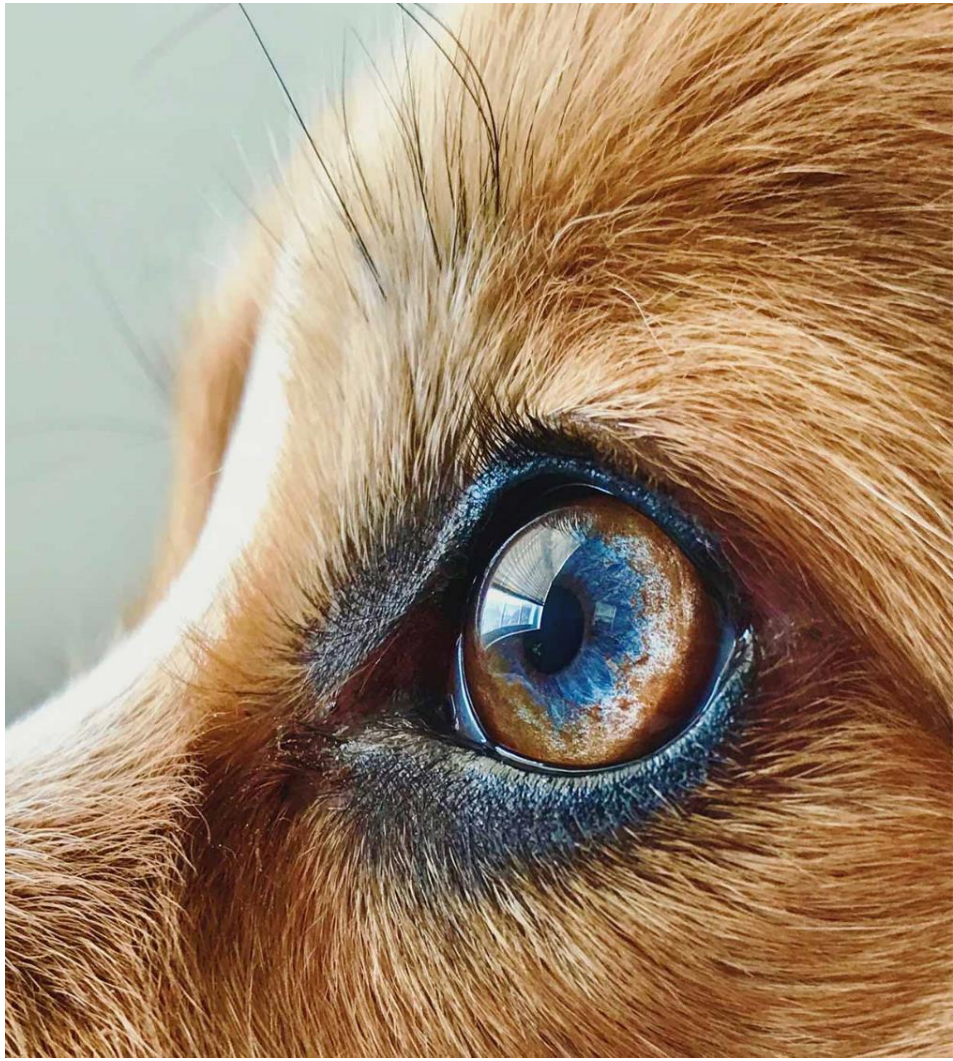
Lower image from IDEXX inVue Dx™ Cellular Analyzer

Ear swab cytology—how?

If only one option for a diagnostic: cytology always and forever

Pros

+ Organism identification
+ Better quantification in vivo
+ Immediate results
+ Helpful in selection of treatment
+ Monitor response to treatment
+ Helpful in deciding if/what type culture needed
+ Helpful in interpreting culture (pathogen versus contaminant)



Cytology

- Type of organism
- Number of organism per hpf
- Subjective versus objective quantification
- Types of cells
  - Neutrophils (intracellular versus extracellular organism)
  - Eosinophils
  - Acantholytic cells
  - Biofilm evidence
- Pitfalls
  - Evaluation can be challenging (depends on quality of microscope)
  - Rods versus melanin granulins
  - Cocci versus stain precipitant
  - Need for trained staff
  - Lack of consistency of examiner

Cytology **always** and **forever**

Cytology

Modified Wright (Diff-Quik™)

- Does not differentiate **gram-positive** versus **gram-negative** organisms
- Cocci versus rods versus yeast
- Inflammatory cells
- Fairly simple and faster than Gram stain
- Often needs heat fixing if more ceruminous and not adhering well
- 3-step stain
- High-dry 40× objective versus oil immersion 100× objective

Gram stain

- Differentiates **gram-positive** versus **gram-negative** organisms
- Cocci versus rods versus yeast
- Inflammatory cells
- More intensive steps and takes longer than Diff-Quik
  - Heat fix
  - Primary stain (crystal violet)
  - Iodine stain
  - Decolorizer with ethanol, acetone, or mixture of both
  - Counterstain with safranin
- High-dry 40× objective versus oil immersion 100× objective

Reference lab clinical pathology

- More expensive
- Also subjective
- Must request quantification
- Options Diff-Quik or Gram stain
- Several-day turnaround

Image courtesy of Elizabeth A. Layne, DVM, DACVD, Sandy, UT

Subjective cytologic scoring

	Normal	Gray zone	Abnormal
Malassezia			
Dog	≤ 2	3–4	≥ 5
Cat	≤ 2	3–11	≥ 12
Bacteria			
Dog	≤ 5	6–24	≥ 25
Cat	≤ 4	5–14	≥ 15

Recommended criteria for evaluating the significance of organisms present on otic cytology (based on mean number of organisms per high-dry 40× field of view)

Source: Ginel PJ, Lucena R, Rodriguez JC, Ortega J. A semiquantitative cytological evaluation of normal and pathological samples from the external ear canal of dogs and cats. *Vet Dermatol*. 2002;13(3):151–156. doi:10.1046/j.1365-3164.2002.00288.x

These are examples of other subjective scales clinicians will use

Classification	Description
Rare	1–3 organisms per *entire slide*
Occasional	Average of 1–5 organism per OIF
1+	Average of 6–10 organism per OIF
2+	Average of 11–20 organism per OIF
3+	Average of 21–30 organism per OIF
4+	Average of 31–40 organism per OIF
TNTC (too numerous to count)	Massive amount of organisms per OIF you can't possibility count them; rapidly detected without difficulty

Abbreviation: OIF is for oil immersion field.

OSU dermatology service semiquantitative scale for classification of microorganisms on cytologic sample viewed under 100×

Cytology scale

0 = No bacteria/yeast/inflammatory cells present

1+ = Occasional bacteria/yeast/inflammatory cells present, but slide must be scanned carefully for detection

2+ = Bacteria/yeast/inflammatory cells present in low numbers but easily detectable

3+ = Bacteria/yeast/inflammatory cells present in larger numbers and quickly and easily detectable

4+ = Massive amount of bacteria/yeast/inflammatory cells present and quickly and easily detectable

Source: Goal two: skin and ear cytology. In: Ohio State University College of Veterinary Medicine. *OSU CVM Veterinary Clinical and Professional Skills Center Handbook*. 2018. Accessed September 4, 2024. https://ohiostate.pressbooks.pub/osuvcpslhandbook/chapter/derm_exam-basic-techs_goal-two/

New innovation in ear cytology

IDEXX inVue Dx™ Cellular Analyzer: slide-free workflow and consistent clinical insights

Revolutionary workflow

Slide-free, load-and-go

Plug-and-play integration

Pay-per-run

Deeper insights

High-value menu

Consistent and objective results

Advanced optics, deep learning AI

IDEXX inVue Dx™ Cellular Analyzer

Never before could you diagnose and act on clinically important cell types with reference laboratory-level accuracy, in real time, with a slide-free workflow.

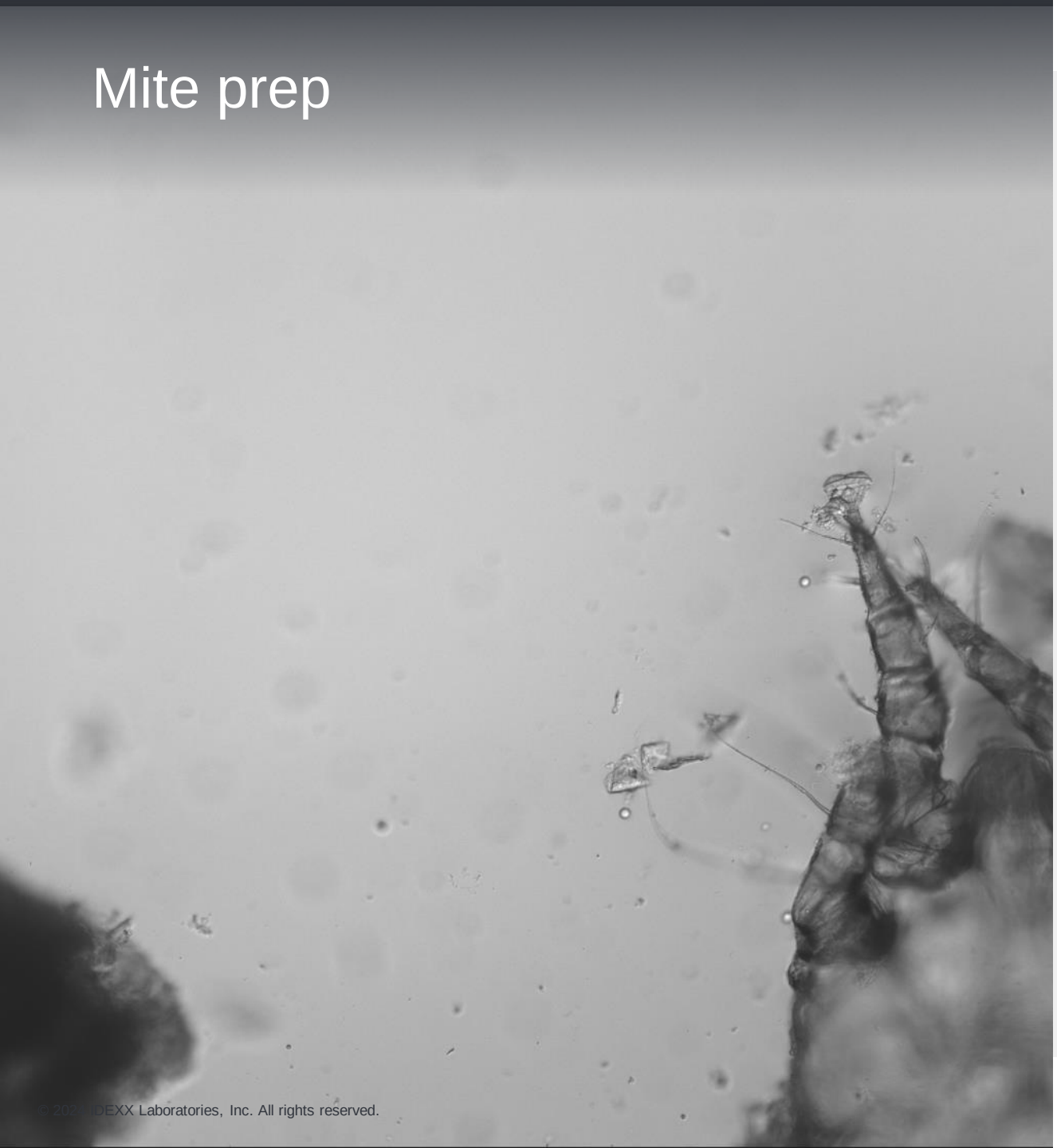
- Slide-free workflow ensures consistency and accuracy without the time-consuming process of making slides
- Automated results in 10 minutes with reference laboratory-level accuracy
- Provides more diagnostic insights than traditional slide methods:
  - Multidimensional interrogation of cells in their natural state
  - Multiple wavelengths of light and fluorescence illuminate unique elements in each cell
  - Deep-learning models trained by IDEXX's global network of board-certified pathologists
- Ear cytology of both left and right ears in one run:
  - Semiquantitative results:
    - Rod-shaped bacteria
    - Cocci-shaped bacteria
    - Yeast
  - Presence detected:
    - White blood cells
    - Mites

Mite prep

Otodectes cynotis, 10× field of view

Image courtesy of Christina Gentry, DVM, DACVD, TAMU Dermatology Teaching Collection

Mite prep

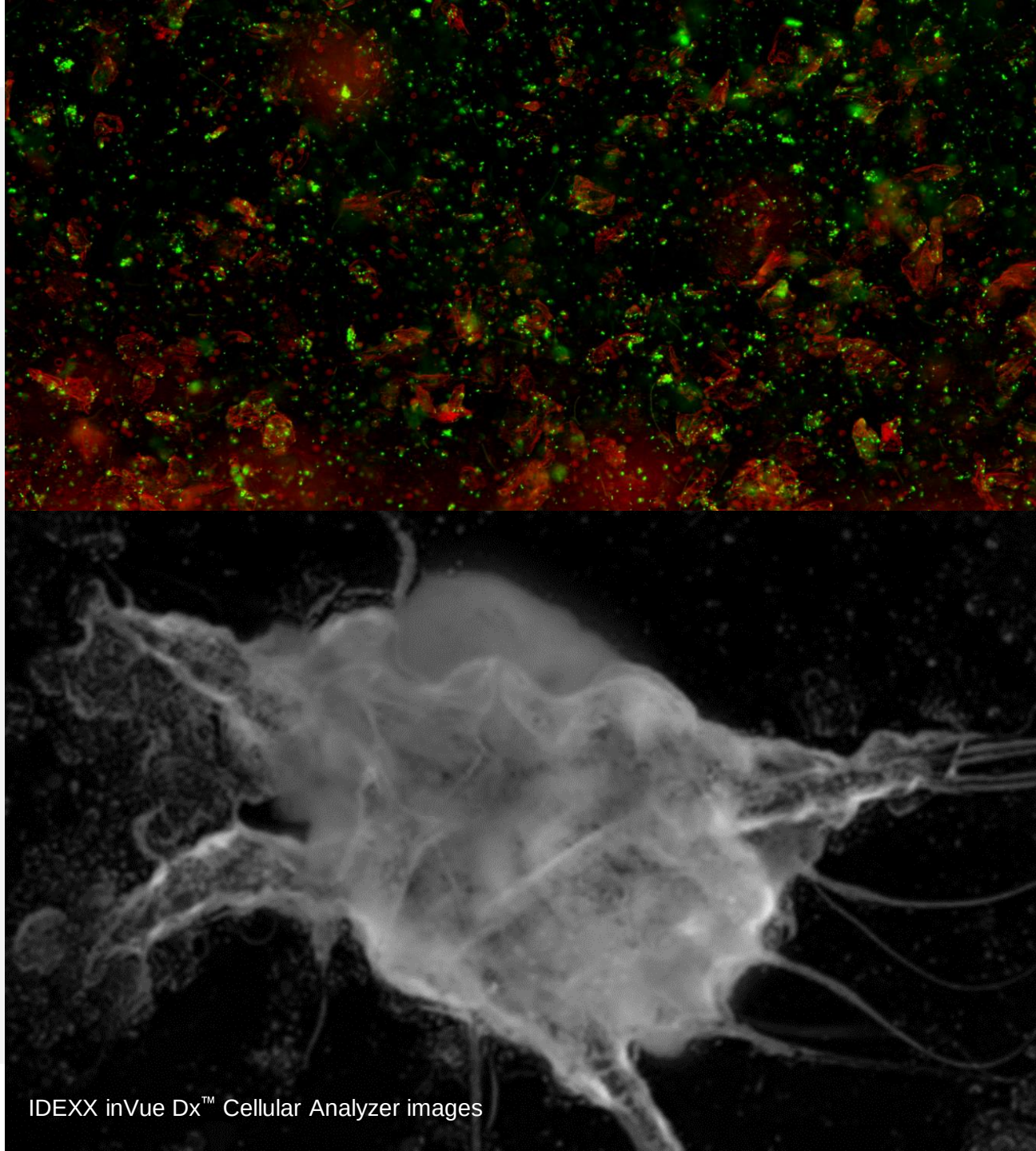


When to mite prep

+ Black, coffee ground debris
+ Ceruminous debris
+ Comedones
+ Seeing potential mites on otoscopic examination (movement)
+ Young patient
+ Immunocompromised patients
+ Inflammatory cells, no organisms
+ Lack of response to treatment

Ear mites seen via the IDEXX inVue Dx™ Cellular Analyzer

IDEXX inVue Dx™ evaluates for mites, bacteria, yeast, and white blood cells in a single run



IDEXX inVue Dx™ Cellular Analyzer images

Ear mites seen via the IDEXX inVue Dx™ Cellular Analyzer

Bacterial aerobic culture

Culture—normal flora versus pathogens

When to culture

- Concerns of otitis media (OM)
  - Ideally culture from middle ear to help in selecting systemic therapy that targets organisms in tympanic cavity
  - If from external canal, then try to extrapolate if suspicious of OM that the organism and resistance pattern is same as that in the middle ear
- Concerns of chronic otitis externa when bacteria are noted on cytology
  - Especially rods (help with organism identification)
    - If concern of *Pseudomonas* or if not certain if gram – or gram + rods
  - History of multidrug-resistant bacteria
  - Help guiding treatment in otitis externa
    - Extrapolate because topical therapy can get 10× potency topical, so not direct correlation with MIC, which is based on systemic blood levels
    - Previous long-term therapy and history of failure
    - Bacteria persist despite appropriate therapy

Culture—normal flora versus pathogens

Challenges with culture

- Not able to distinguish between normal resident bacteria, overgrowth, or true infection
- Difficult to follow response to treatment compared to cytology, because growth on culture can be impeded when topical therapy is being continued
- Growth amount on culture plate is not directly correlating with quantification in vivo
- Culture susceptibility data is limited and may not predict the true susceptibility of topical otic antibiotics
- External canal culture is not always the same as tympanic cavity culture

Common bacterial isolates from normal and diseased ears

Normal external canal	Otitis externa	Otitis media
Coag (−) *Staphylococcus*	Coag (+) *Staphylococcus*	Coag (+) *Staphylococcus*
Coag (+) *Staphylococcus*	β-hemolytic *Streptococcus*	β-hemolytic *Streptococcus*
β-hemolytic *Streptococcus*	*Pseudomonas* spp.	*Pseudomonas* spp.
Corynebacteria spp.	*Proteus* spp.	*Proteus* spp.
Coliforms	Coliforms	Coag (−) *Staphylococcus*
	Coag (−) *Staphylococcus*	Coliforms
	Corynebacteria spp.	α-*Streptococcus*
		Enterococcus

Abbreviation: Coag is for coagulase.

Source: Angus JC. Otic cytology in health and disease. *Vet Clin North Am Small Anim Pract*. 2004;34(2):411–424. doi:10.1016/j.cvsm.2003.10.005

Imaging

Imaging

Advantage and disadvantages of diagnostic imaging techniques

Diagnostic imaging techniques	Advantages	Disadvantages
Radiography	+ Can detect mineralization and neoplasia in the ear canal and bony changes in the bulla wall + Usually does not require sedation, general anesthesia, or intravenous contrast material	+ Has limited value in identifying soft tissue changes + Cannot rule out otitis media + Cannot distinguish between fluid and tissue in the middle ear + Not as sensitive as CT and MRI for predicting presence and severity of middle ear disease, such as otitis media
Ultrasonography	+ Relatively quick and noninvasive + Can detect thickening and fluid in tympanic bulla + Usually does not require sedation or general anesthesia	+ Cannot distinguish between fluid and tissue in the middle ear
Computed tomography (CT)	+ Provides excellent images of bony structures and can differentiate bony changes in bullae from soft tissue reactions + Can detect presence of fluid in tympanic bulla (i.e., otitis media) + Can detect otitis interna, tumors, and meningitis	+ Requires general anesthesia and administration of intravenous contrast material + Not as sensitive as MRI for identifying otitis interna, tumors, and meningitis + Expensive
Magnetic resonance imaging (MRI)	+ Better for assessing soft tissue structures of external ear, inner ear, adjacent neural structures, and brain + Can detect fluid in tympanic bulla (i.e., otitis media) and otitis interna + Can detect tumors and their specific location, as well as meningitis	+ May not identify mineralization of the external canals unless it is severe + Requires general anesthesia and administration of intravenous contrast material + Expensive

Source: Koch S. The challenge of chronic otitis in dogs—from diagnosis to treatment. *Today's Vet Pract*. 2017;7(3):60–70.

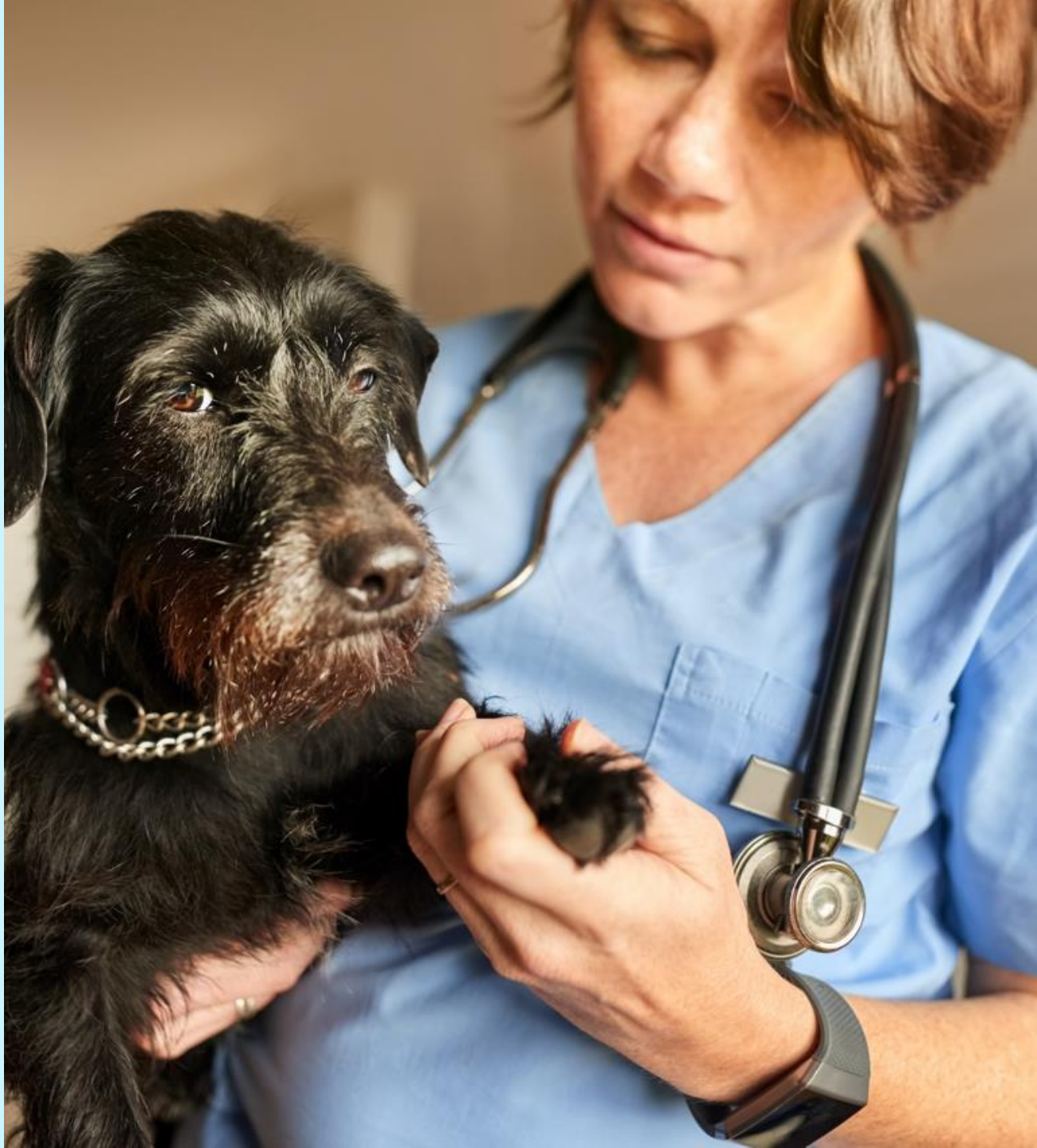
Treatment

Questions to Ask:

1. Are you struggling to clear the infection?
    -if so then --is there biofilm, otitis media, resistance, under dosing

2. Coming back quickly within 4-8 weeks if you are certain that otitis externa cleared?
    -more concerns of otitis media

3. Has it been cleared for several months and now this is a new infection?
    -not controlling underlying primary factor driving new infection (such as allergic otitis)



There are 5 general goals of otitis externa treatment

1. Eliminate discomfort and pain.
2. Clean and remove debris and exudate.
3. Control infection from the external ear and middle
   ears, if present.
4. Reverse chronic pathologic changes, when possible.
5. Identify and manage the underlying primary cause of the otitis.

Treatment

Otitis Externa:

- Get canal open if stenotic and minimal visibility
- Consider if too much debris if deep ear flush under general anesthesia needed
- Choose your ear cleaner (volume and frequency)
  - *What action do you need your cleanser to perform*
    - Wax, biofilm, pus
  - *Balance of keeping it clean (how dirty) vs irritation and not macerating*
- Tympanic Membrane intact or not (degree concern of ototoxicity)
  - *Dictates choice in active ingredient and vehicle*
- Antimicrobial (cocci vs rods vs yeast)
  - *Volume based on size of canal*
  - *Frequency based on how infected*
  - *Can it be targeted against yeast vs bacteria*
- Inflammation
  - *Potency of steroid based on inflammation*
  - *Concern of systemic absorption*

Treatment

Otitis Media:

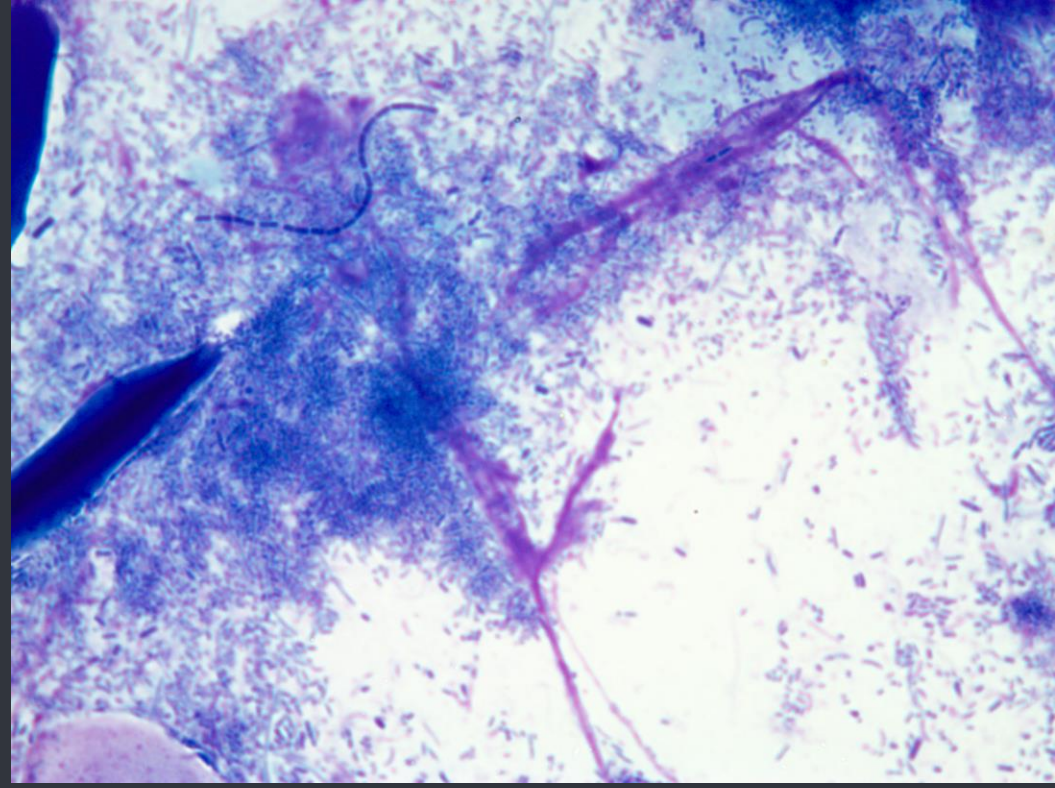
- Visualization of tympanic membrane
- If not visible consider deep ear flush under general anesthesia to remove debris
- Ruptured vs intact and unhealthy
- If not intact, restricts to choice of aqueous based products and safer active ingredients and choice of cleanser
- Cytology and Culture from middle ear ideally to choose systemic antibiotics

Duration of Treatment:

- Treat until resolved
- Typically want clinical and cytologic resolution
- Consider treating 1 week past resolution in Otitis Externa cases
- Consider treating 2 weeks past resolution in Otitis Medial cases (often mininum 6 weeks)

Rechecks and Monitoring are Necessary

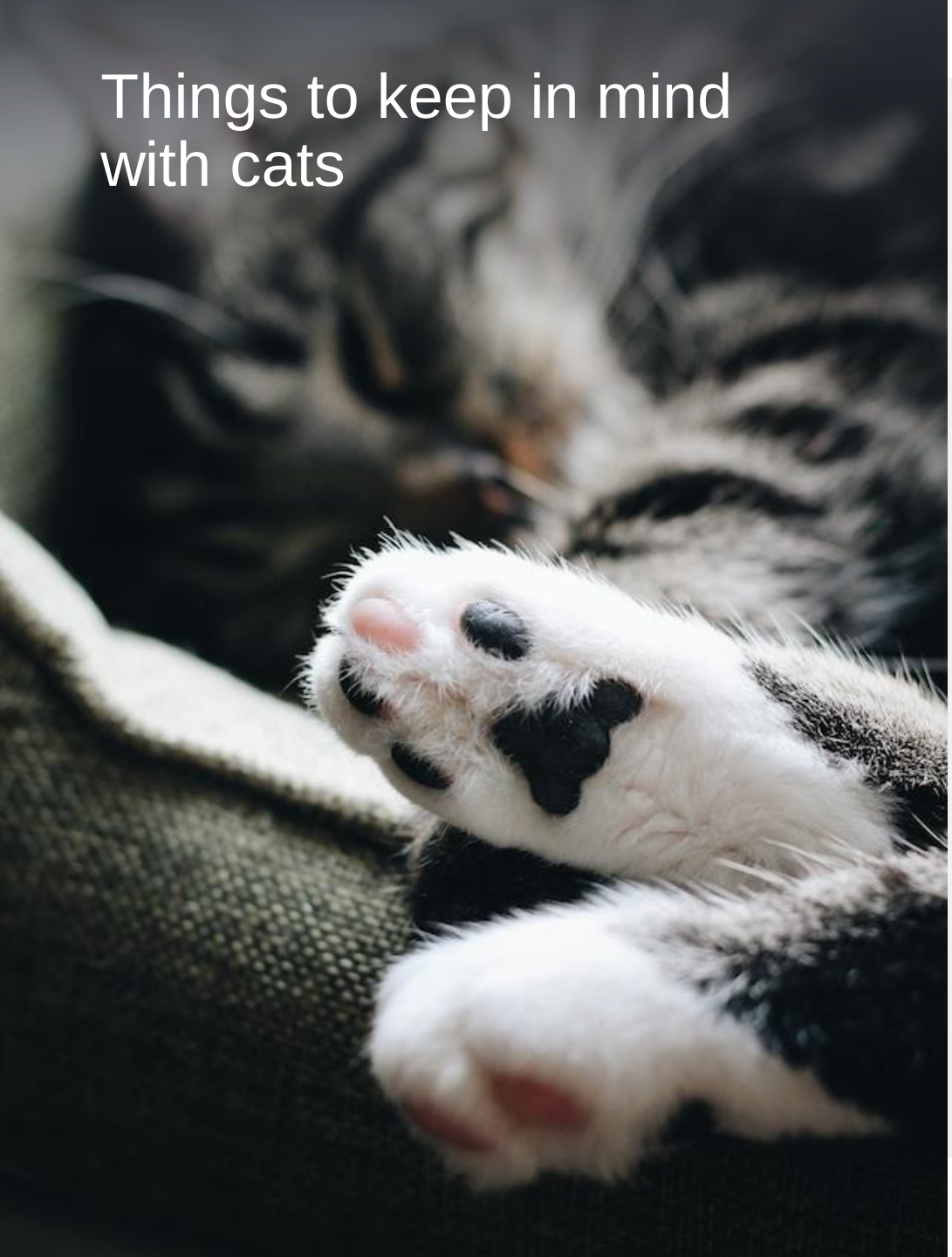
Image courtesy of Christina Gentry DVM, DACVD,
TAMU Dermatology Teaching Collection



Pseudomonas

- Acute vs Chronic
- Be aggressive
- More Chronic more likely Otitis Media
- Biofilm - Makes difficult to penetrate
  - More cleaning to remove
  - Deep Ear Flush
  - TrizEdta helps penetrate holes into gram negative cell wall
- Steroids can help decrease secretion and inflammation
- Follow-up is necessary to know if response
  - -use cytology and clinical exam
- Treat until full resolution (clinically and cytologically)

Things to keep in mind with cats



- Cats may develop otitis media without overt otitis externa (especially history of respiratory illness)
- Cats are less susceptible to secondary otic infections than dogs
- Cats may be more susceptible to ototoxicity than dogs
- Aqueous-based medications and gentle cleansers are advised
- Otic space-occupying lesions often cause otitis in older patients
- Ear mites are more prone to cause ear infections in cats versus dogs

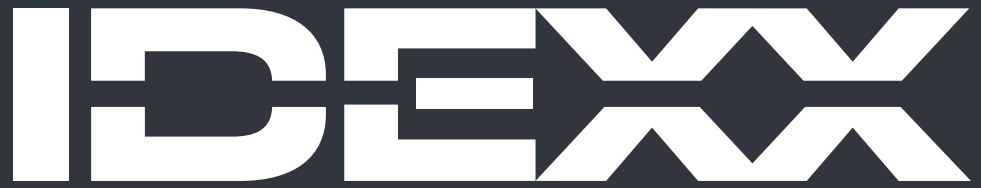
Conflict of Interest Disclosure:

I have financial interest, arrangement or affiliation with IDEXX Laboratories, Inc:

Full-time employee, Medical Consultant in Dermatology

The information contained herein is intended to provide general guidance only. As with any diagnosis or treatment you should use clinical discretion with each patient based on a complete evaluation of the patient, including history, physical exam and presentation, and laboratory data. With respect to any drug therapy or monitoring program, you should refer to applicable product insert(s) for complete description of dosage, indications, interactions, and cautions. Diagnosis, treatment, and monitoring should be patient specific and is the responsibility of the veterinarian providing primary care. (2024)

Questions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with all our heARTS
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