Uh oh otitis! Diagnostic tips to guide effective treatment

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IDEXX

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Disclosure Marta:
Full-time Employee of IDEXX

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 a product insert, for complete description of dosage, indications, interactions, and cations, Diagnosis, treatment, and monitoring should be patient specific and is the responsibility of the veterinarian providing primary care.

ILOs

- Understand the importance of primary, secondary, predisposing and perpetuating factors
- Explore the diagnosis of underlying common primary factors, and their role in otitis
- Develop an understanding of otic cytology, and the use of culture and microbiology results in otitis diagnosis

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Otitis:

What drops do I use?

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Otitis:

What drops do I use?

MIKROBIOLOGIE

24.09.25
07:10

Keim	Candida parapsilosis Bei Rindern wird C. parapsilosis im Zusammenhang mit Mastitiden isoliert. In der Regel sind prädisponierende Faktoren (z.B. Immunsuppression, Parasitenbefall oder Langzeitantibiose) für den Ausbruch einer Erkrankung notwendig. (In hoher Keimzahl)
Keim	Malassezia pachydermatis Malassezia pachydermatis besiedelt als Kommensale Haut und Ohren von Hunden, Katzen und anderen Tieren. Bei primärer Vorschädigung durch andere Erreger, immunsuppressiven Einflüssen u.a. kann es zu einer Vermehrung der Hefen und zu ihrer Beteiligung an pathogenen Veränderungen kommen. Malassezia ist i.d.R. empfindlich gegenüber gängigen Antimykotika (z.B. Nystatin, Clotrimazol, Miconazol). (In hoher Keimzahl)

Ear Aerobic Culture

Isolate 1
Moderate growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC	Sensitivity Range	
Ampicillin (1)	Resistant	N/A	(Intrinsic R)	
Amoxicillin-Clavulanic acid (1)	Resistant	N/A	(Intrinsic R)	
Enrofloxacin (2)	Resistant	>=4	0.12 sssiR	4
Gentamicin (2)	SENSITIVE	<=1	1 Sssir	16
Clindamycin (1)	Resistant	N/A	(Intrinsic R)	
Amikacin (2)	SENSITIVE	<=2	2 Ssssir	64
Tobramycin (2)	SENSITIVE			
Polymyxin B (3)	Intermediate	1	0.25 iiIirrr	16
Ofloxacin (2)	Intermediate			
Cephalexin (1)	Resistant	N/A	(Intrinsic R)	
Marbofloxacin (2)	Intermediate	2	0.5 ssIr	4
Cefovecin (2)	Resistant	N/A	(Intrinsic R)	
Ciprofloxacin (2)	Intermediate	1	0.06 ssssIrr	4

Pseudomonas aeruginosa may develop resistance during prolonged therapy with all antimicrobial agents. Therefore, isolates that are initially susceptible may become resistant within three or four days after initiation of therapy. Testing of repeat isolates may be warranted.
in mixed bacterial growth.
Note:
Standardised susceptibility tests do not reflect in vivo activity of topical antibiotics due to the high levels achieved in the target site with topical administration. Generic antibiotics quoted. The choice of antibiotic and knowledge of any contraindications is the Veterinary Surgeons responsibility. MIC units expressed in ug/ml. Antibiotics without a MIC have been predicted using international guidelines. For more information on interpretation of MICs visit idexx.co.uk/MIC

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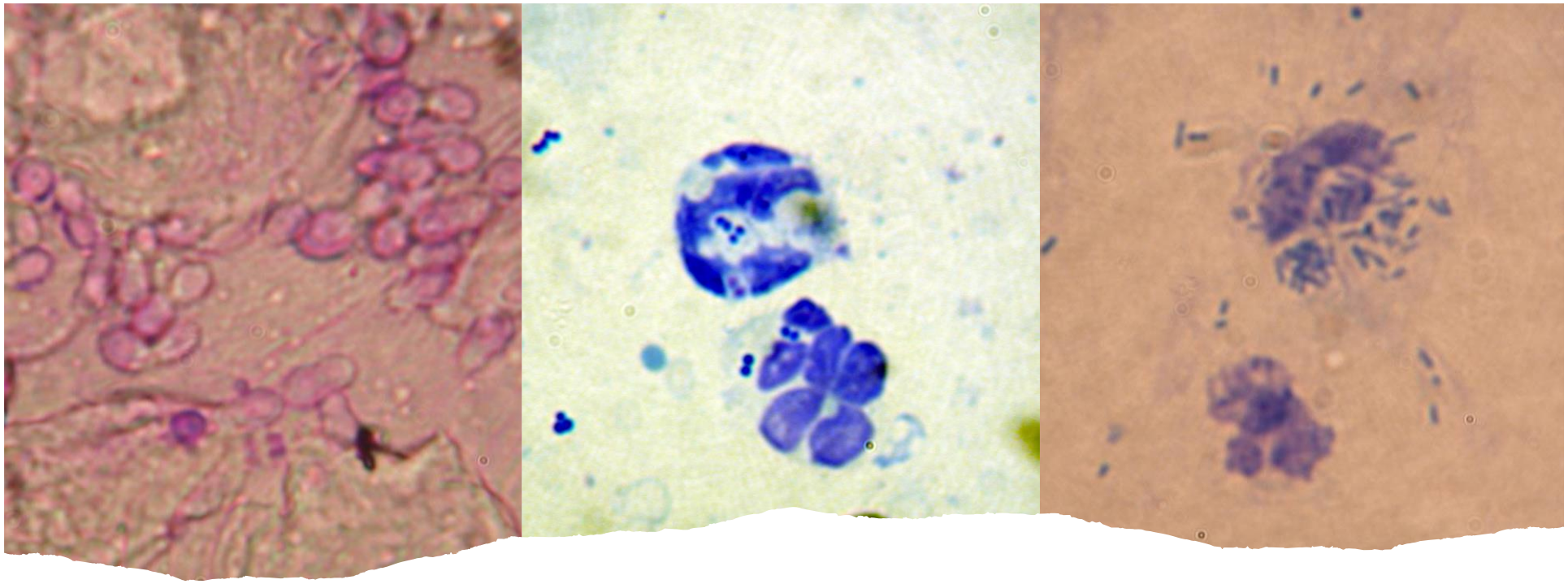
Otitis:

What drops do I use?



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Wrong question at the wrong time!

Look at the patient!

Look at the discharge, ears & TM (if otoscopy is possible)

Look at the cytology!

Choose cleaner/drops

Consider analgesia

GA flush?

PSPP

Further tests?

--> long term plan if needed

Multi-factorial disease

Not a B/W situation

Look at all the aspects & choose accordingly

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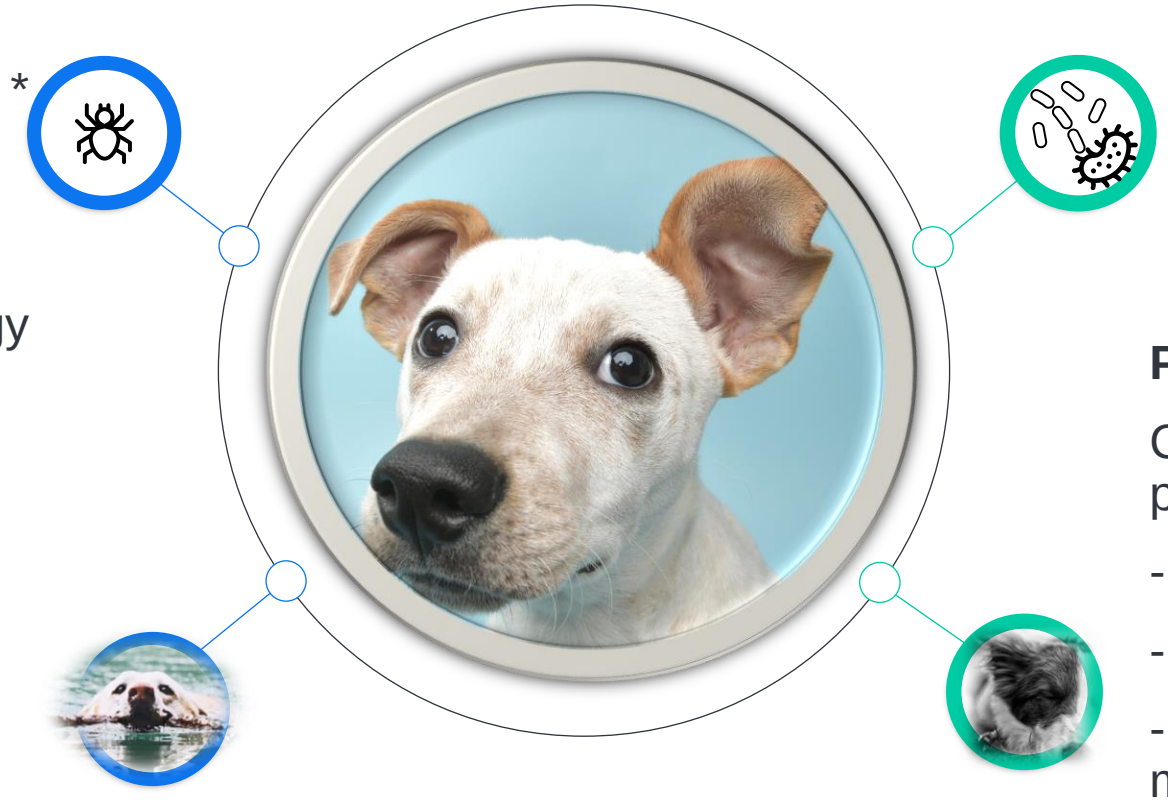
Otitis externa is a multifactorial disease PSPP

Primary causes:

- Hypersensitivity *
- Parasitic *
- Space occupying lesions *
- Foreign bodies *
- Endocrinopathies
- Immune system pathology
- Congenital abnormalities



Secondary Causes:

Infections (bacterial and fungal) are secondary and represent ***DYSBIOSIS***

Perpetuating factors:

Chronic acquired changes that prevent resolution

- hyperplasia and thickening
- ear canal stenosis
- occlusion, fibrosis and mineralization
- otitis media
- cholesteatoma

Predisposing factors:

- Anatomy and conformation
- Life style and management

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- Hypersensitivity *
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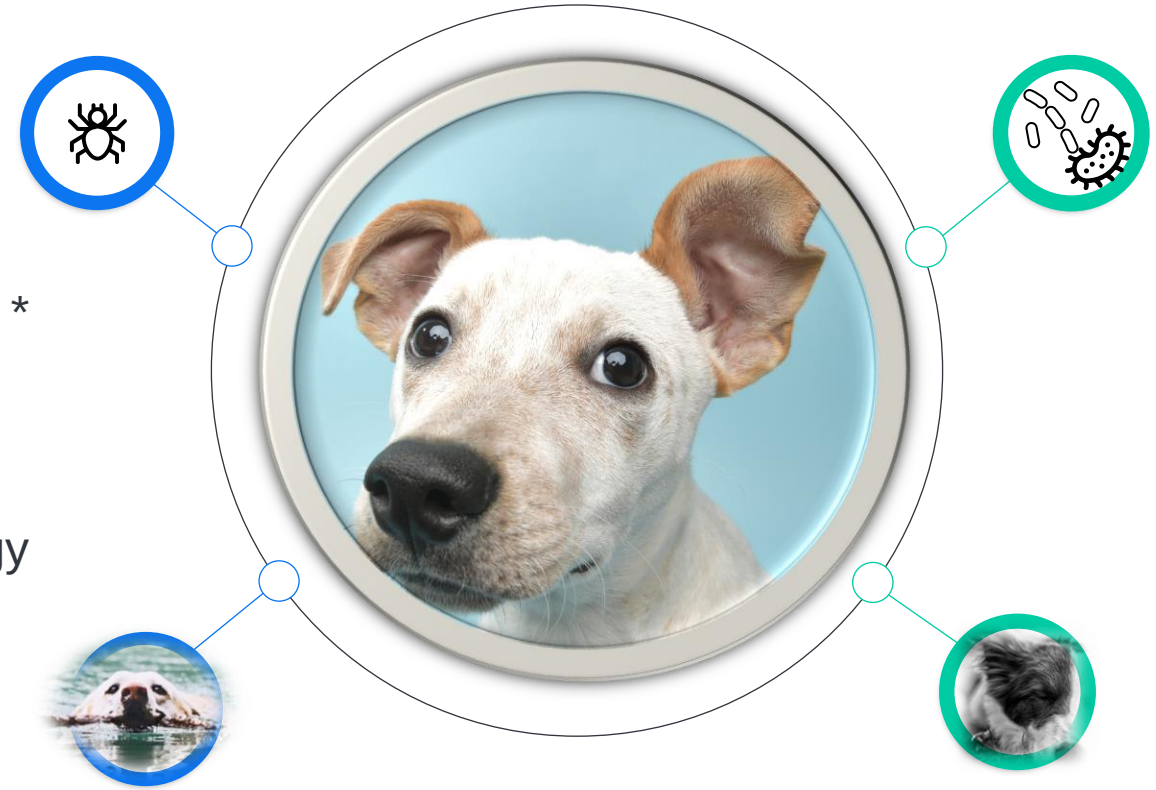

Drive the inflammation

Allergies common!

Otitis can be ONLY clinical sign

Food relative common

Need to identify & address to avoid relapse

Further tests needed

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Otitis externa is a multifactorial disease PSPP

Overgrowth only possible due to PPP

Often cocci (Staph pseudintermedius

+/- yeast (Malassezia spp)

Other also possible

Pseudomonas particularly difficult to manage

Identify by doing cytology

When rods seen → C&S

Biofilm!

Secondary Causes:

Infections (bacterial and fungal) are secondary and represent ***DYSBIOSIS***

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Otitis externa is a multifactorial disease PSPP

Predisposing factors:

- Anatomy and conformation
- Life style and management

Present prior to onset of otitis

Most cannot be changed (conformation)

Life-style changes (swimming) may be helpful

Stop inappropriate cleaners/cleaning

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Otitis externa is a multifactorial disease PSPP

Caused by chronic otitis

Cause self perpetuation

Anti-inflammatory meds often needed

Imaging if OM suspected

Perpetuating factors:

Chronic acquired changes that prevent resolution

- hyperplasia and thickening
- ear canal stenosis
- occlusion, fibrosis and mineralization
- otitis media
- cholesteatoma

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PSPP-why do we keep hearing about it?!?

Dysbiosis

NOT an infection!

Normal flora, inflammation → conditions for dysbiosis!

AB Stewardship

AB/AF Drops work but can‘t prevent relapse

Primary disease drives dysbiosis:

Dysbiosis, disease, drops

Dysbiosis, disease, drops

Dysbiosis, disease, drops

Compliance!

Why does otitis happen

Prevent instead of cure!

Communication

Again & again

Helps with compliance!

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So what’s the plan, Stan?

Common primary diseases

- Foreign bodies
  - Usually sudden onset & unilateral disease
- Ear mites
  - Younger or older patients
  - Smear unstained/InVue
- Allergy!
  - Most common factor
  - Food or environmental

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Determine primary disease

Elimination diet?

- How?
- How long?
- Novel protein & carbohydrate vs
- Hydrolysed

Environmental allergy testing

Blood tests

Parasiticidal diagnostic therapy

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‚Allergy testing‘ CAD

Not to diagnose!!!

1. ONLY once dignosis of CAD has been made
2. Favrot criteria..
3. Rule out other diseae
4. Want to do ASIT? → need to know which allergens!
5. ASIT for otic disease? YES!

Test-that-helps-me-to-pick-allergens-for-ASIT-in- a-dog-with-CAD-...

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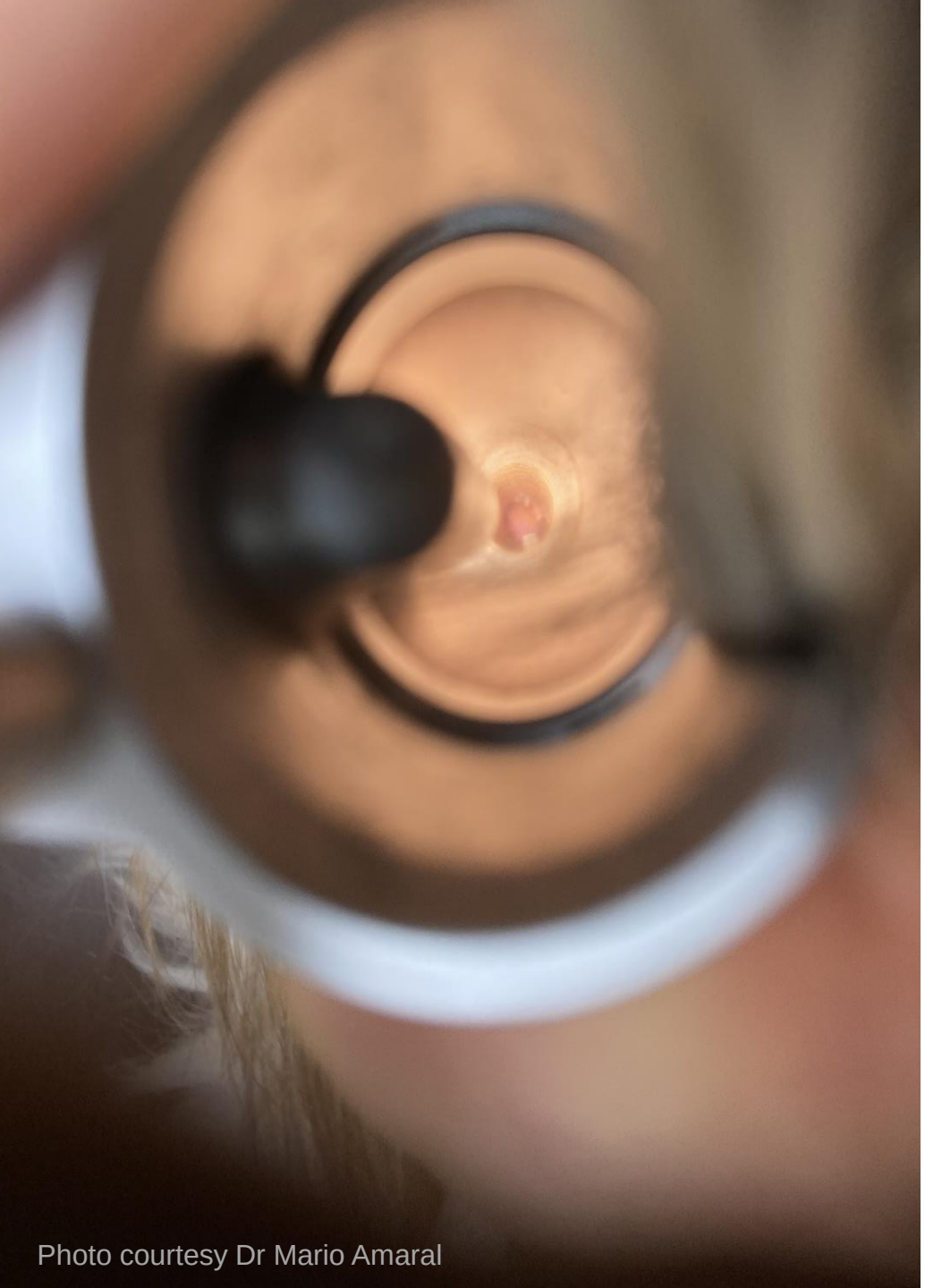

Photo courtesy Dr Mario Amaral

Clinical examination

- Evaluate for primary, predisposing and perpetuating factors;
- Evaluate the amount and type of exudate in the ear canals;
- Estimate the amount inflammation;
- Identify hyperplasia, masses, and foreign bodies;
- Determine the status of the tympanic membrane
- Get clues for S

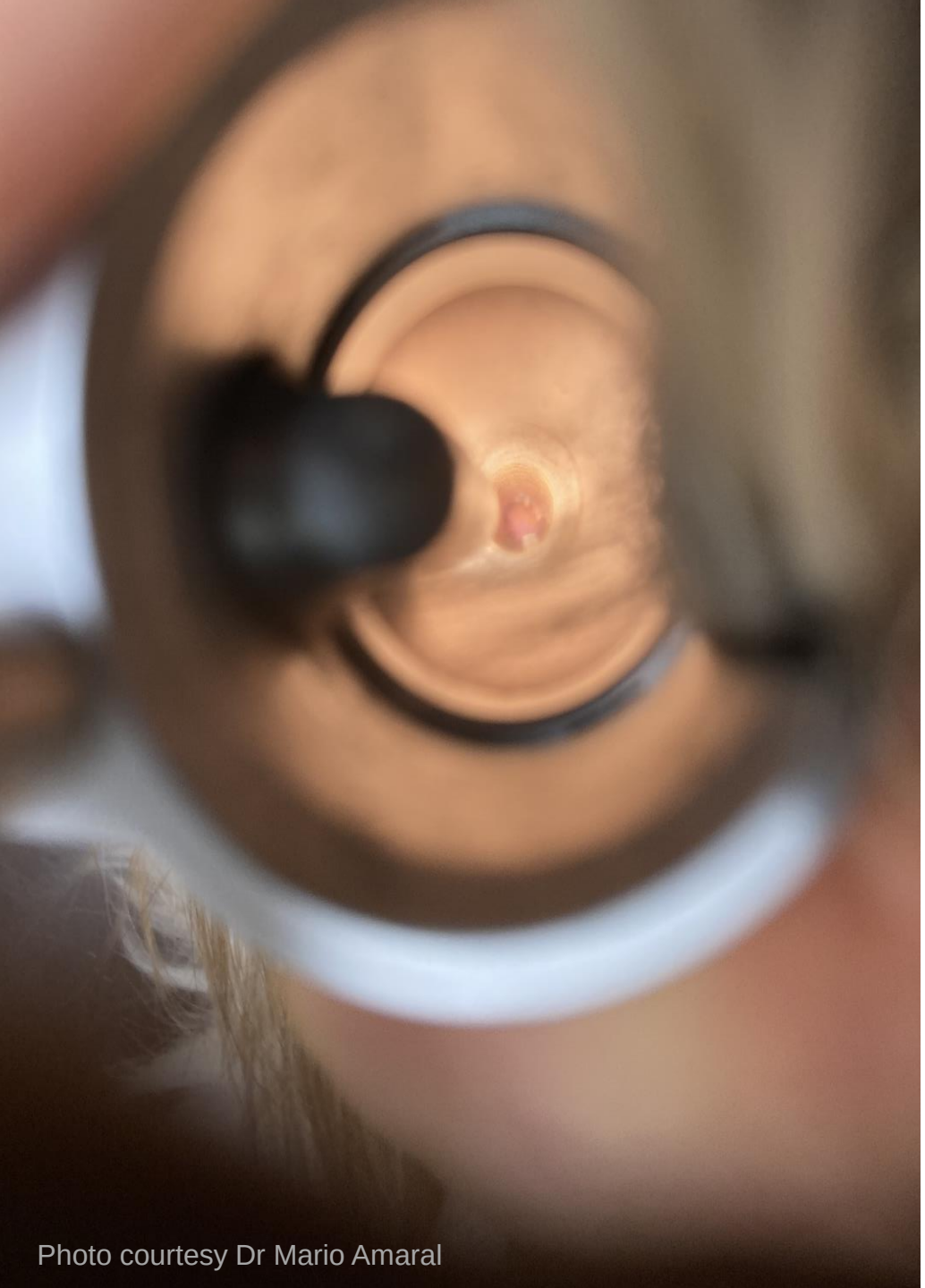

Photo courtesy Dr Mario Amaral

Ear exam: palpate, look, smell, look deeper…

- Palpate & evaluate for stenosis, hardening of ear canal
- Other signs of generalized & dermatological disease
- Get clues for possible Ps
- Otoscopy…head shy? Analgesia! Pred?
- Cytology!

→Get help formulating therapy (nature of otic discharge, status of TM, organisms, primary disease)

Dermatological Examination

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Palpate ear canal

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Otic discharge

- Brown coffee ground
  - Ear mites
- Pale yellow waxy
  - cocci, yeast, demodex
- Pale brown waxy
  - cocci, yeast
- Purulent maloderous
  - Pseudomonas
- Black watery or thick
  - Pseudomonas
- Thick chocolate colour
  - cornification defect/Malassezia & biofilm

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Otoscopy

- Important way to examine patients with otitis
- Ask owners to train dogs from puppyhood
- Use in conjunction with other techniques (cytology)

- Warm up cone
- Nose down, pinna up

- Might require analgesia/sedation/GA if painful

- Pre-treatment with GCS to “open up” if needed

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Ear cytology: **Most important test!**

- Provides information that can help guide treatment
- Quick
- Inexpensive
- EVERY otitis patient & BOTH ears: initial consult & follow up
- Sometimes allows identification of primary causes (e.g. parasitic) or rule out ceruminous otitis only
- Most will have variable numbers of :
  - Keratinaceous material
  - Yeast or bacterial organisms
  - Variable inflammation
- Quantification and monitoring of response to treatment

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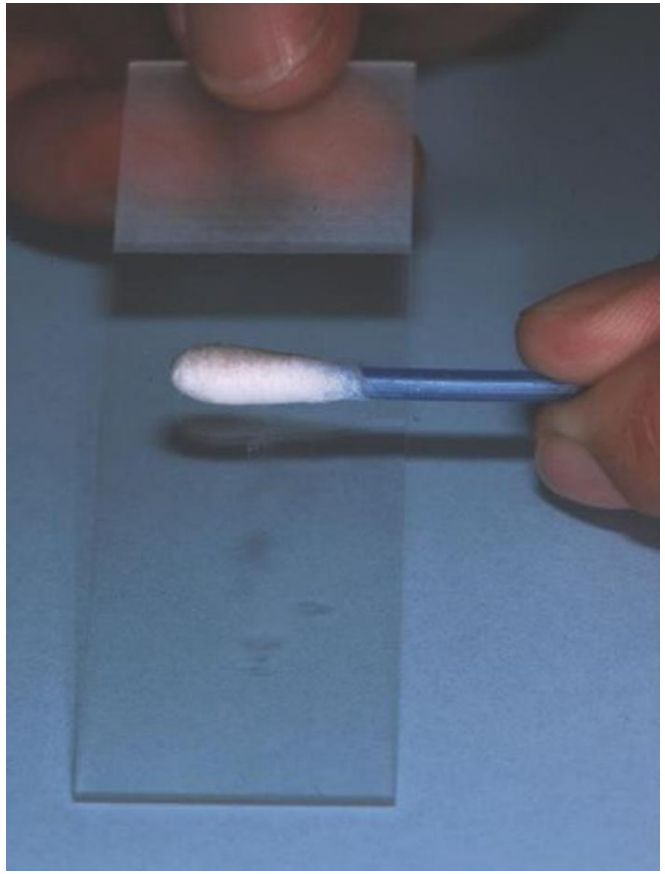
How?

Cotton bud/gloves

Role out/dab on



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Gloved finger

If patient head shy/fear aggressive

Massage ears

Distract

Slip finger in

Dab onto slide

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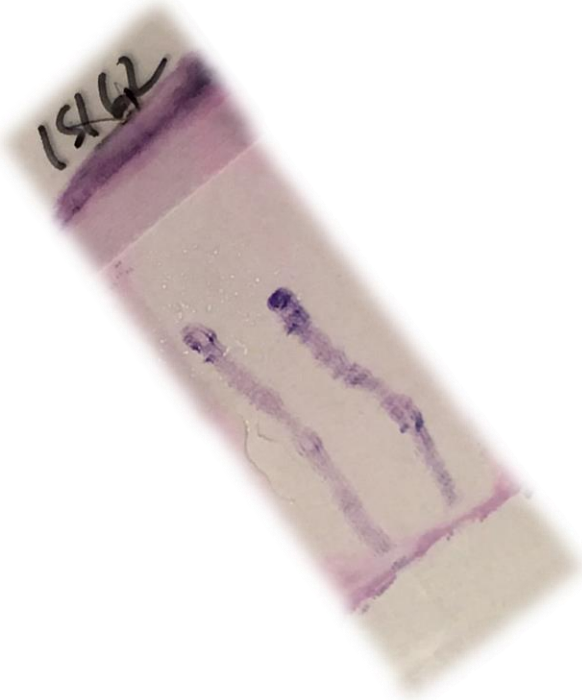
Sample processing

DiffQuick

How to...

+ Fixation: heat? Solution 1?
+ Air dry
+ Eosin red?
+ Methylen blue!!!



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Cytology-Materials

Good quality microscope

Stain (Romanowsky-type, Methylene blue)

Immersion oil

Slides, cover slips

Cotton buds

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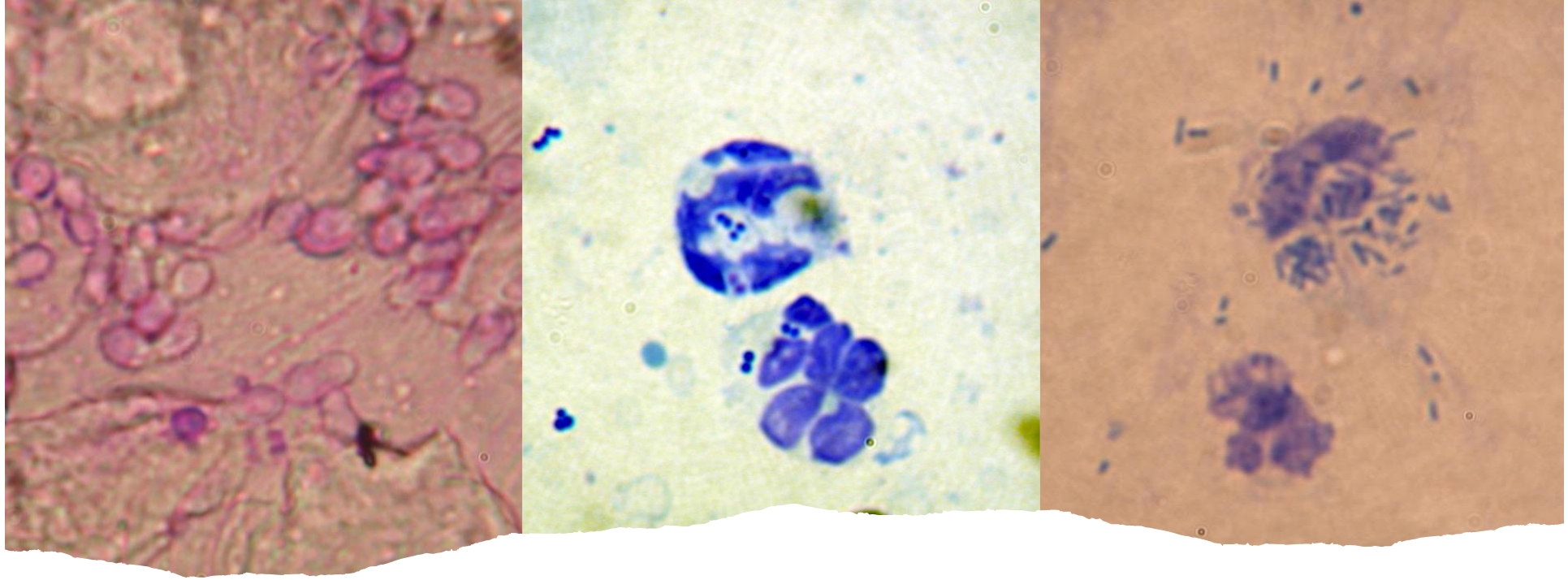

Organisms

Which type?

Bacteria/yeast?

Cocci/rods?

Normal numbers?

Infection/overgrowth?

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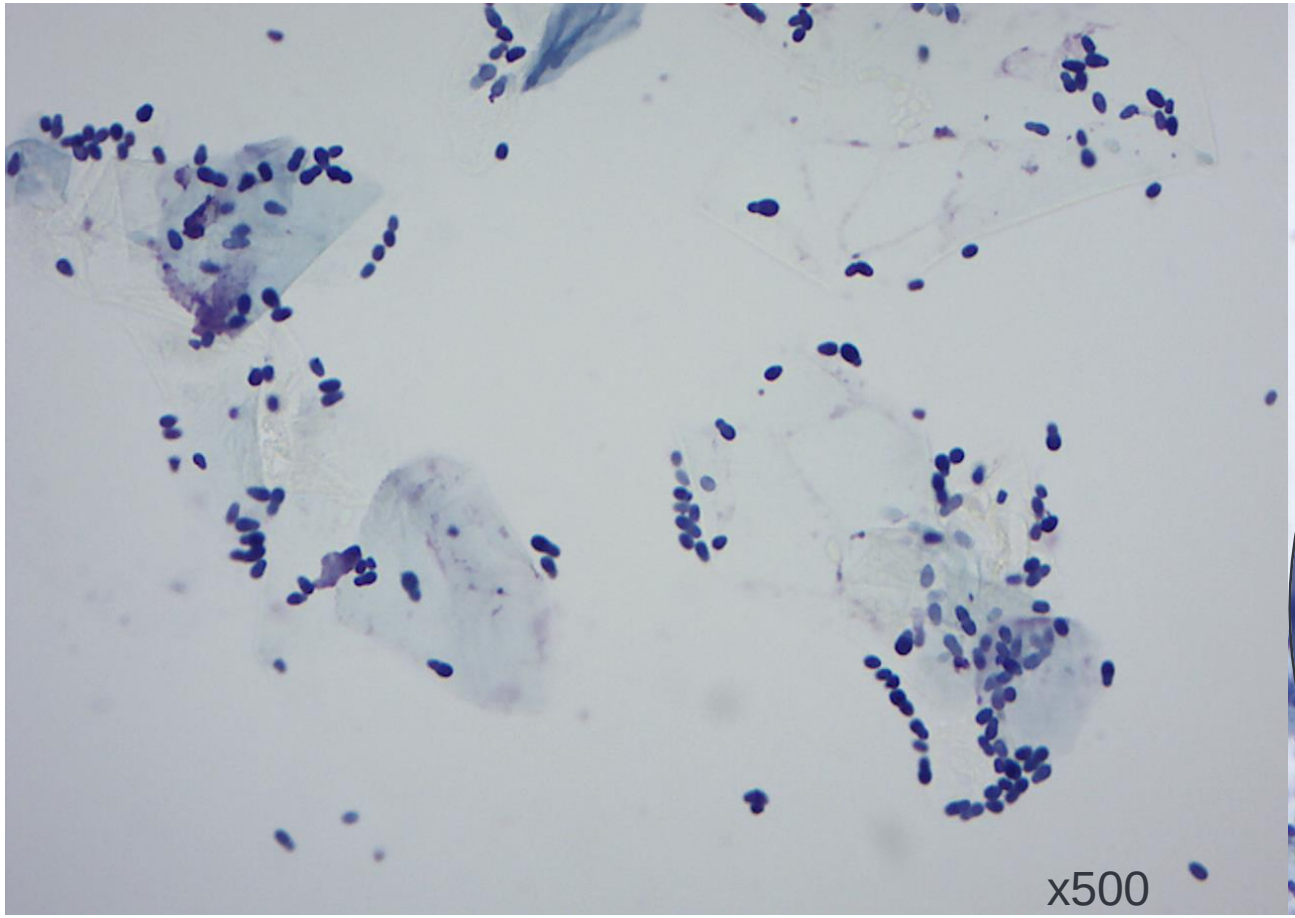
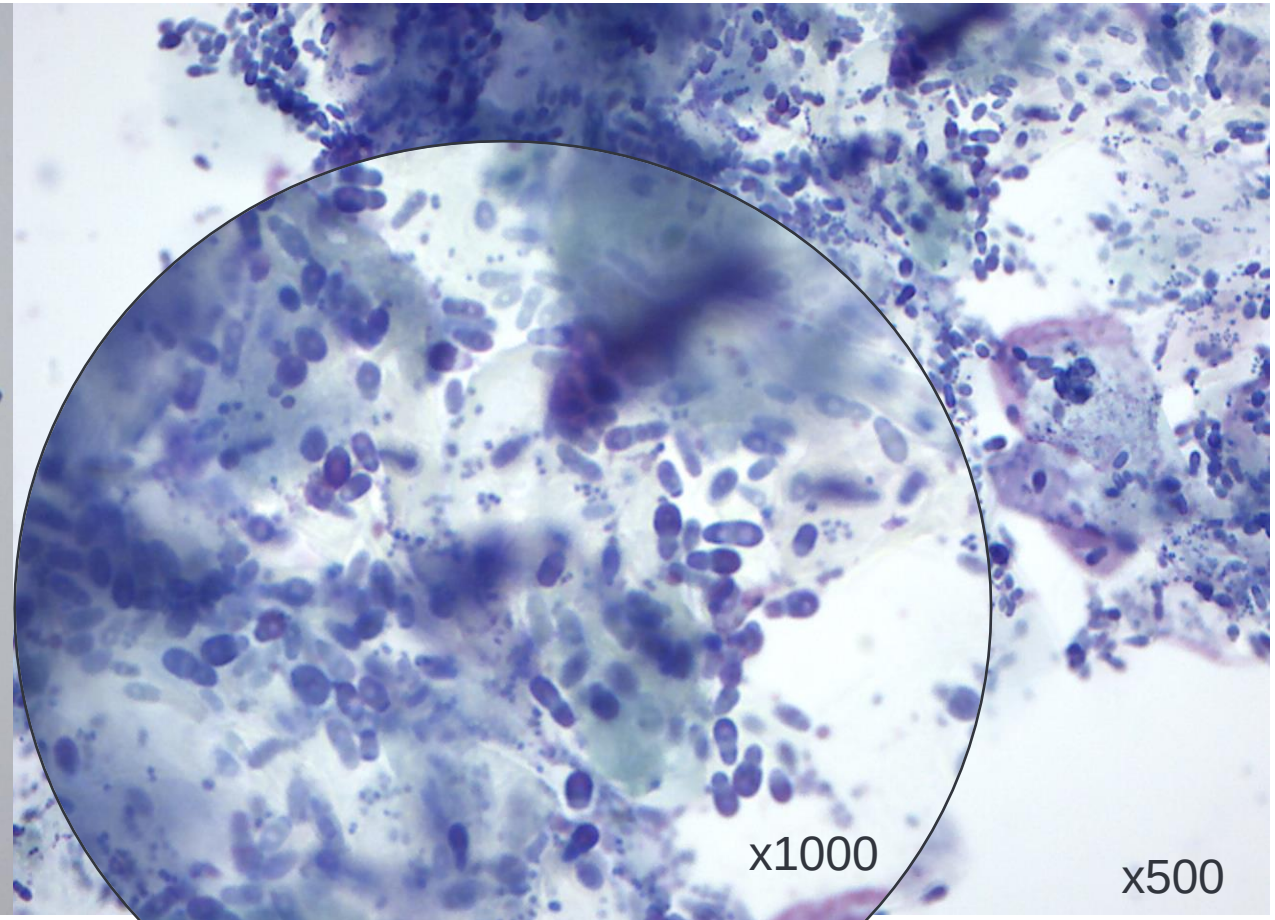
Different ears – different findings

Left ear – Malassezia only



Right ear – Malassezia and cocci



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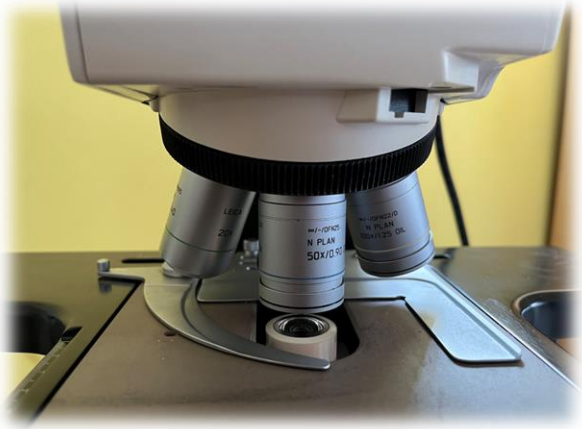
Start ASAP and often
– it gets easier

Examining the smear

- Start with low power
- Examine the whole smear with a “battle ship movement”
- Choose the most cellular / well spread/ well preserved areas
- Increase to higher power field for identification and quantification of organisms:
- Look for organisms: cocci, rods, yeast
- Look for inflammatory cells



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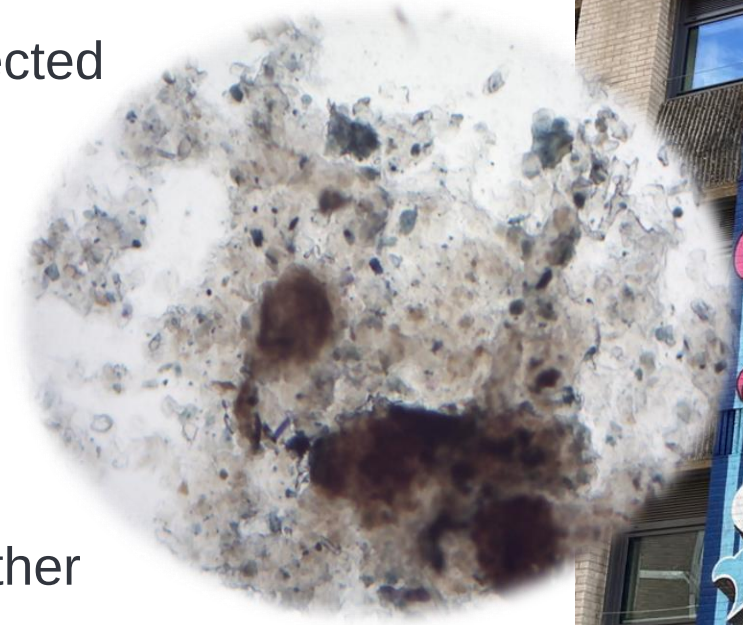
Ginel, P.J. et al (2002). A semiquantitative cytological evaluation of normal and pathological samples from the external ear canal of dogs and cats. Vet Dermatol 13: 151–156

Ceruminous Otitis

No/few microorganisms detected

- No parasites
- No/few bacteria
- No/few yeasts



Idiopathic seborrhoea and other keratinization disorders

The excess cerumen will predispose to bacterial and Malassezia overgrowth

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Otodectes cynotis

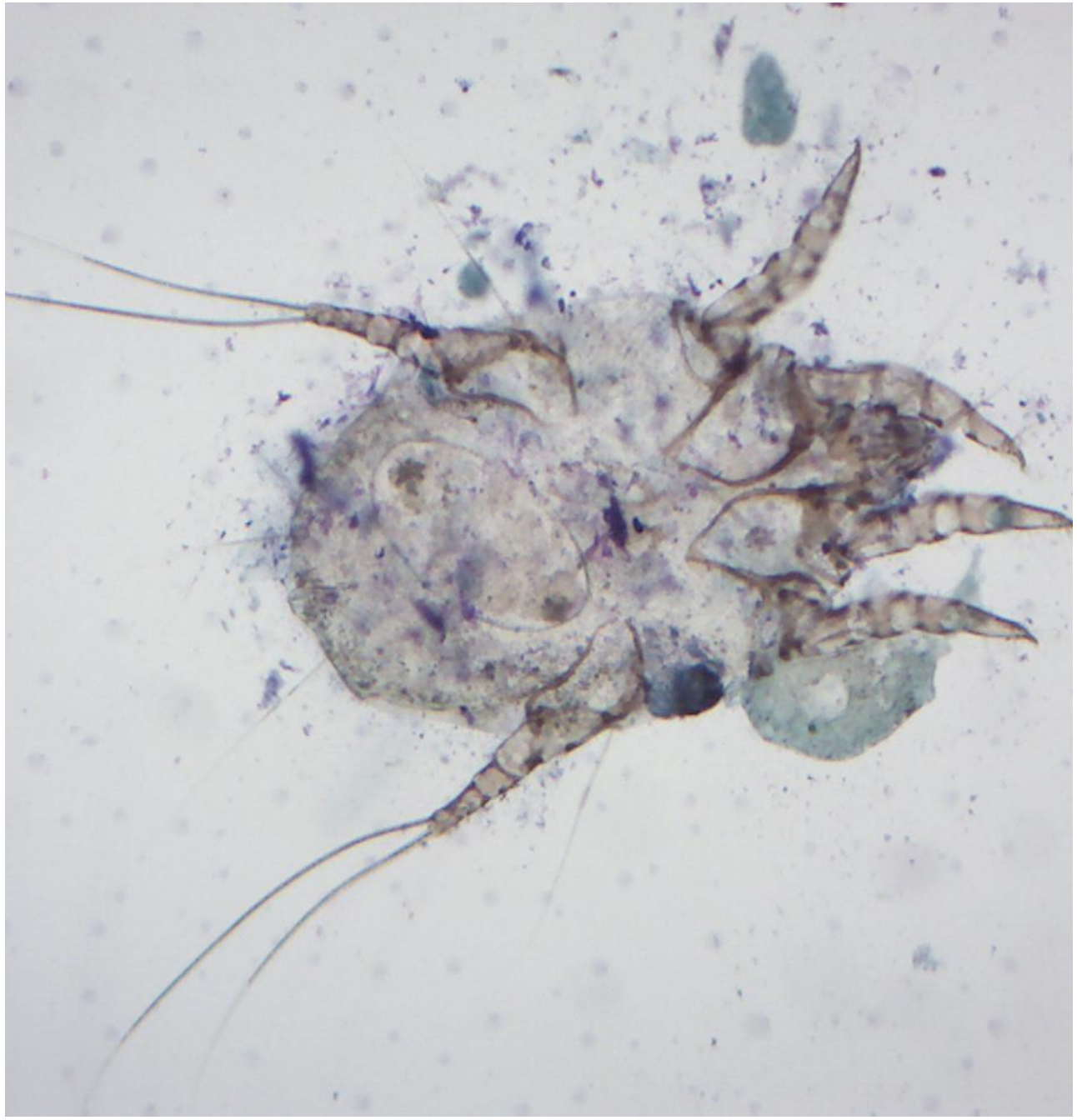
Parasites are primary cause of otitis

May have secondary bacterial overgrowth/infection

Best diagnosed in fresh smears

Up to 85% of feline otitis externa

Reinfestation can occur after treatment (specially from other pets)



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Site: LEFT EAR :

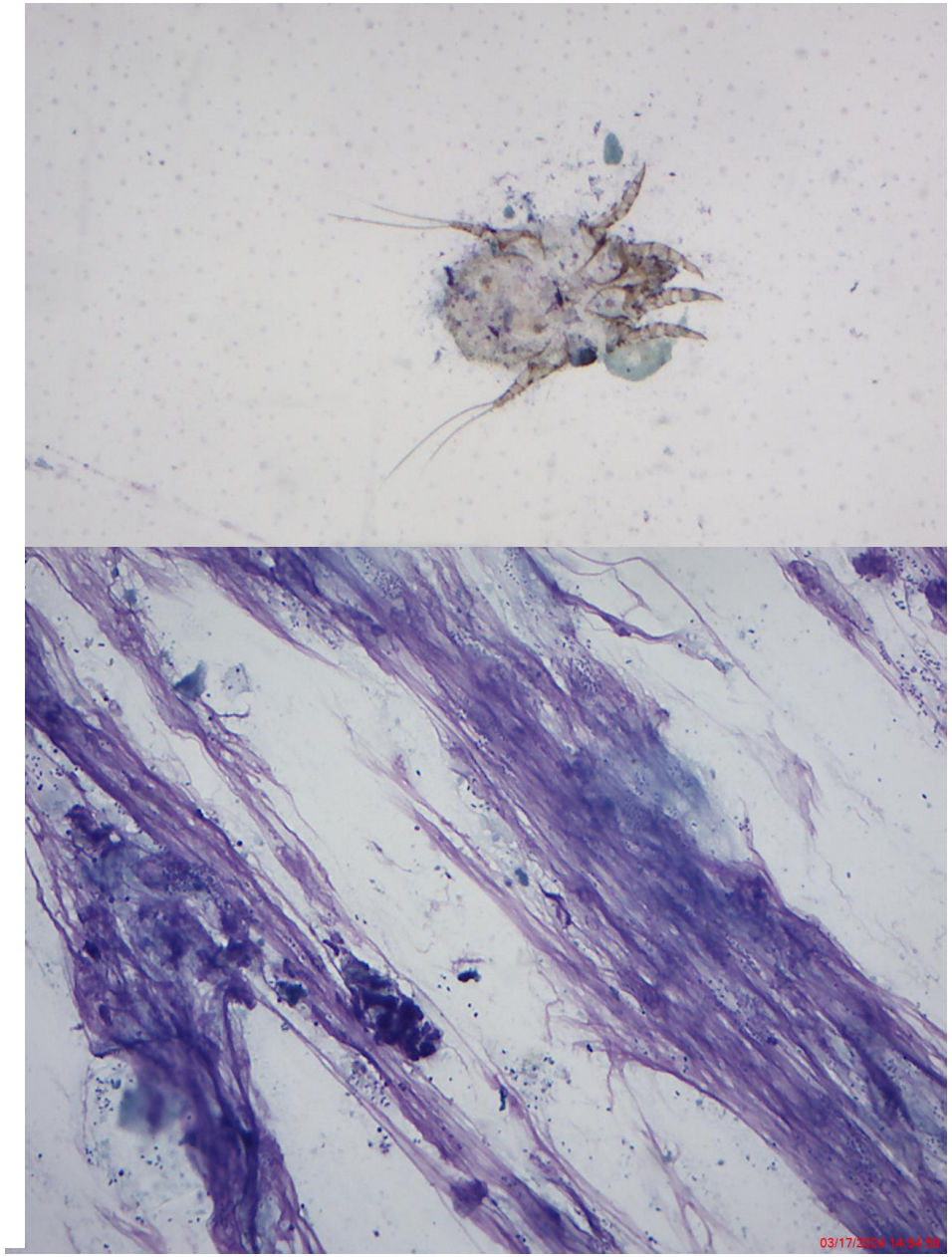
Aerobic Culture - Ear

Isolate 1 Profuse growth:Staphylococcus felis

Antibiotic	Result	MIC	Sensitivity Range		
Ampicillin (1)	Resistant				
Amoxicillin (1)	Resistant				
Amoxicillin-Clavulanic acid (1)	SENSITIVE				
Cloxacillin (1)	SENSITIVE				
Enrofloxacin (2)	SENSITIVE	<=0.5	0.5	Siir	4
Marbofloxacin (2)	SENSITIVE	<=0.5	0.5	Ssirr	8
Pradofloxacin (2)	SENSITIVE	<=0.12	0.12	Ssiirr	4
Neomycin (2)	SENSITIVE	<=2	2	Sssir	32
Chloramphenicol (1)	SENSITIVE	<=4	4	Ssirr	64
Ofloxacin (2)	SENSITIVE				
Fusidic acid (2)	SENSITIVE	<=0.5	0.5	Ssrrrrr	32
Minocycline (1)	SENSITIVE	<=0.5	0.5	Ssssir	16
Cephalexin (1)	SENSITIVE				
Gentamicin (2)	SENSITIVE	<=0.5	0.5	Ssssir	16
Ciprofloxacin (2)	SENSITIVE				
Florfenicol (1)	SENSITIVE	<=4	4	Ssrr	32

Organism identified by MALDI-TOF as Staphylococcus felis (coagulase-negative), which is regarded as a primary pathogen when recovered from urine. It is potentially pathogenic when recovered from skin, wounds, ears, abscess or conjunctiva.

Note:
Standardised susceptibility tests do not reflect in vivo activity of topical antibiotics due to the high levels achieved in the target site with topical administration. Generic antibiotics quoted. The choice of antibiotic and knowledge of any contraindications is the Veterinary Surgeons responsibility. MIC units expressed in ug/ml. Antibiotics without a MIC have been predicted using international guidelines. For more information on interpretation of MICs visit idexx.co.uk/MIC



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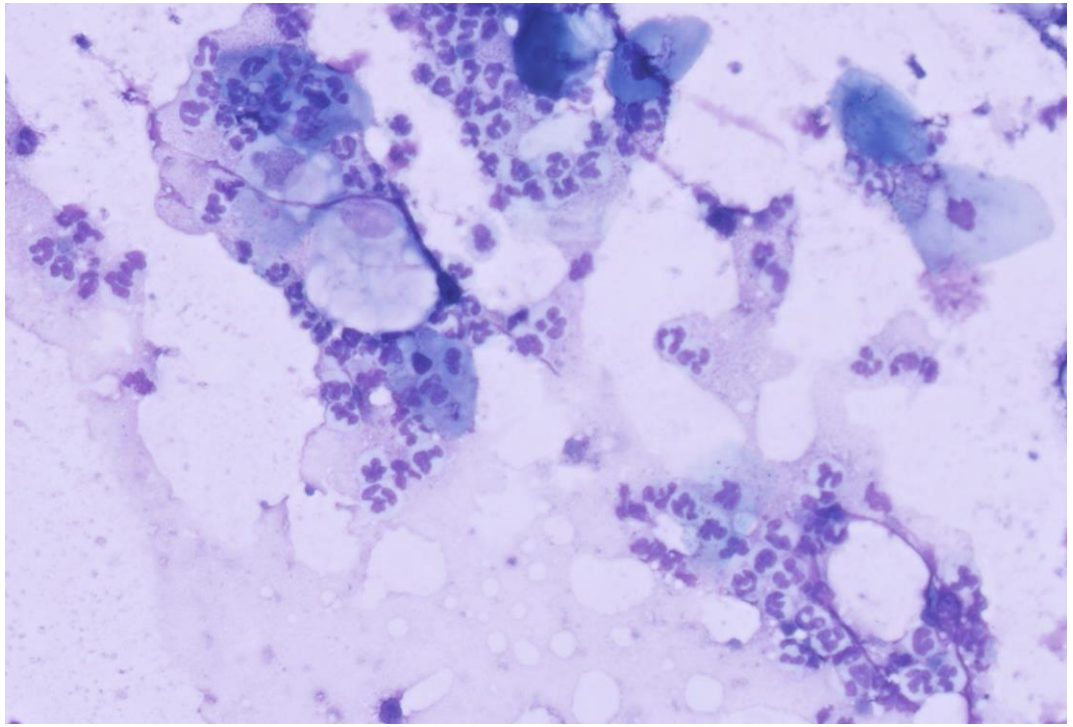
Neutrophils only

- Inflammation is not infection!
- Remember allergies and foreign bodies!



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The ear is not sterile…

- Just because we see/grow bacteria does not implicate bacterial otitis

- Consider ***DYSBIOSIS***

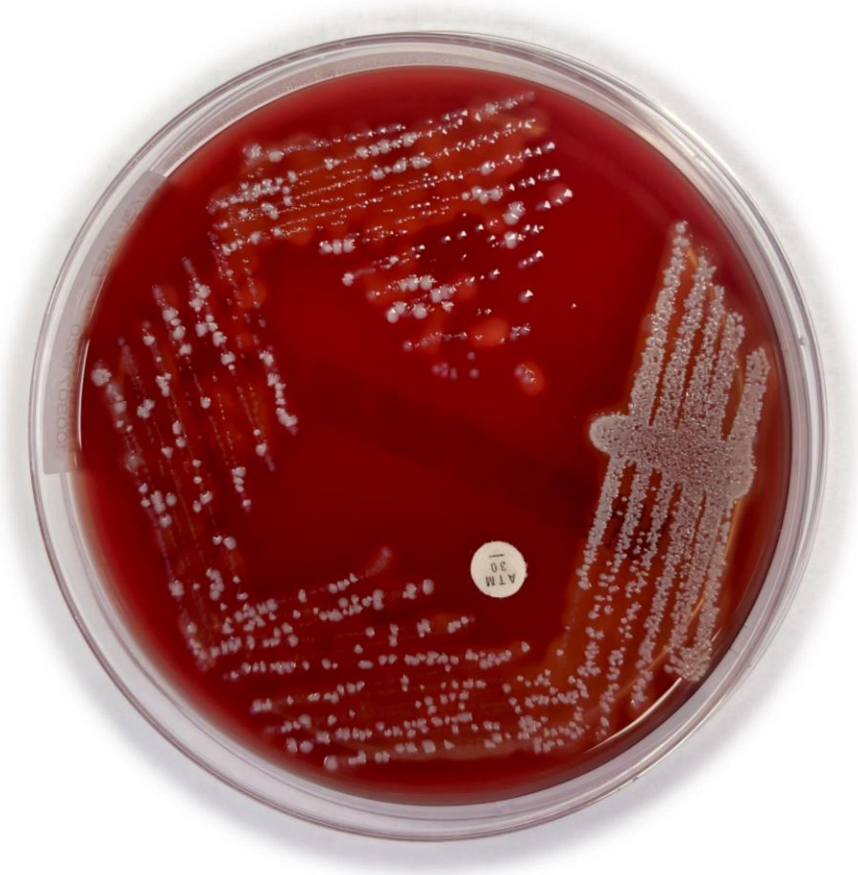
- High numbers of organisms – overgrowth and/or infection

- Phagocytosis and intracellular bacteria – ongoing active infection

- If reporting number of organisms present:
    - average of 10 oil immersion (x1000) microscopy fields:

DEBATABLE!

- use semiquantitative assessment



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Common organisms found in normal ears and in otitis

Normal ears

- *Malassezia pachydermatis, other Malassezia spp. and other yeasts*
- *Staphylococcus pseudintermedius*
- *Staphylococcus schleiferi* subsp. *coagulans*
- Coagulase-negative staphylococci
- *Corynebacterium* spp.
- *Streptococcus* spp.
- Other species
  - Actinobacteria, Proteobacteria, Firmicutes, and Bacteroidetes

Ears with otitis externa

- Malassezia spp.
- Staphylococcus pseudintermedius and other staphylococci
- Pseudomonas aeruginosa
- Proteus mirabilis
- Beta-haemolytic streptococci (e.g. S. canis)
- Corynebacterium spp.
- Enterococcus spp.
- Escherichia coli

Otitis media: Also consider anaerobes

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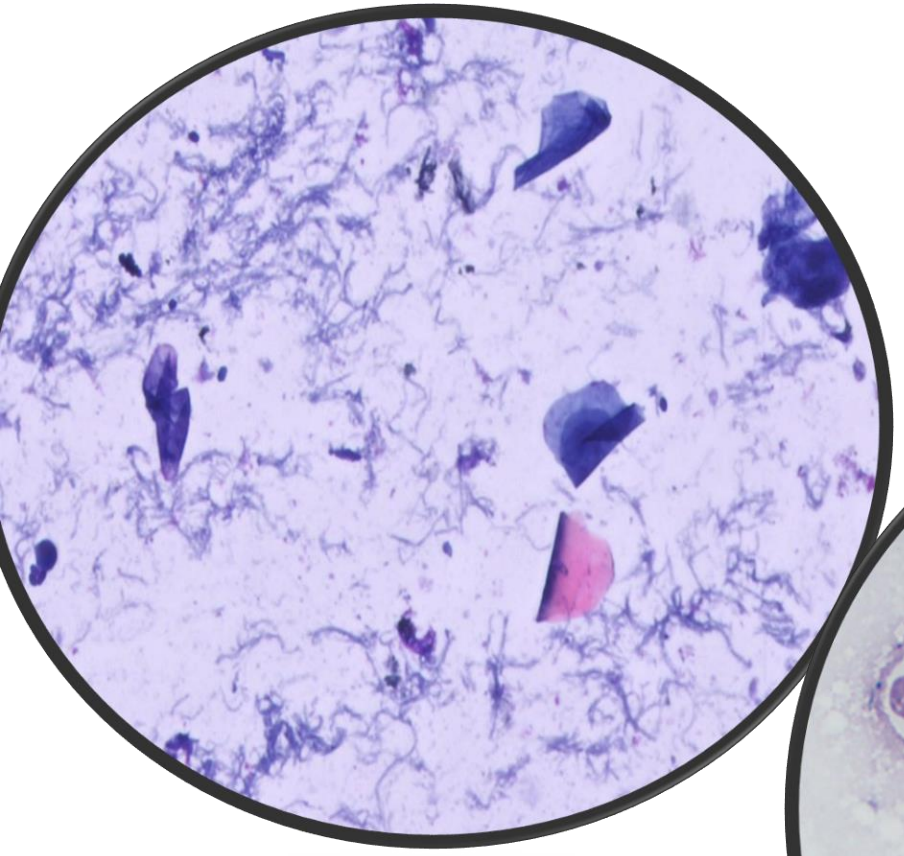
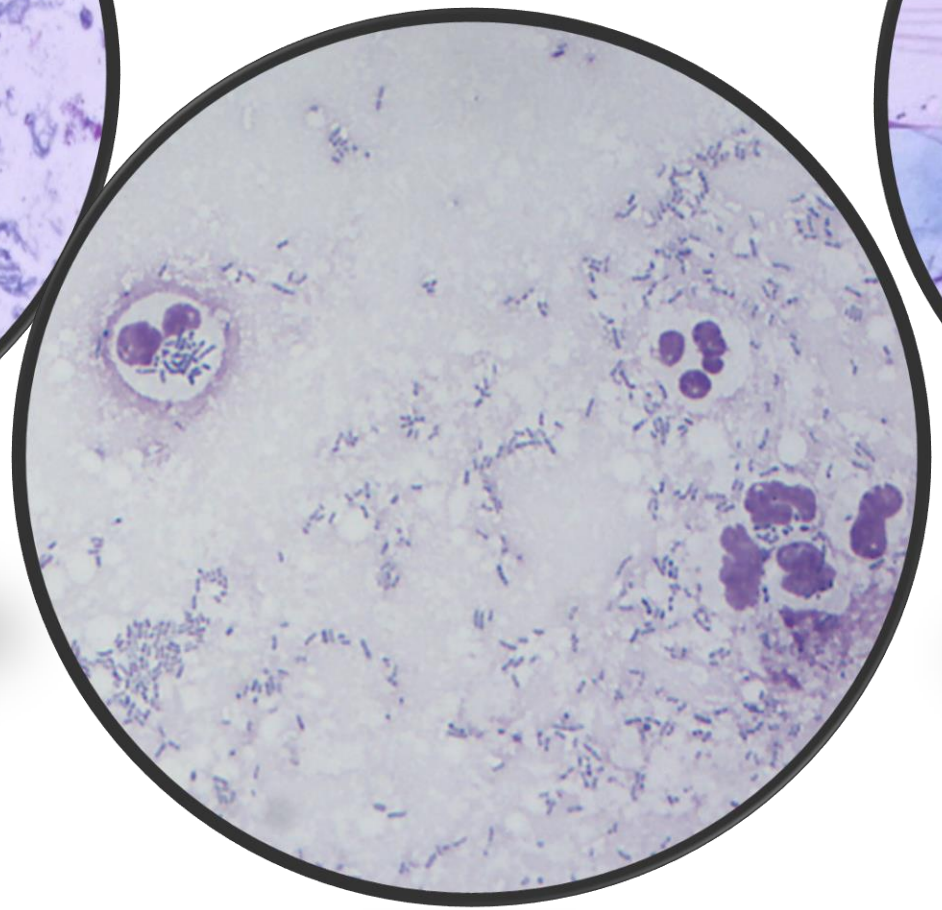
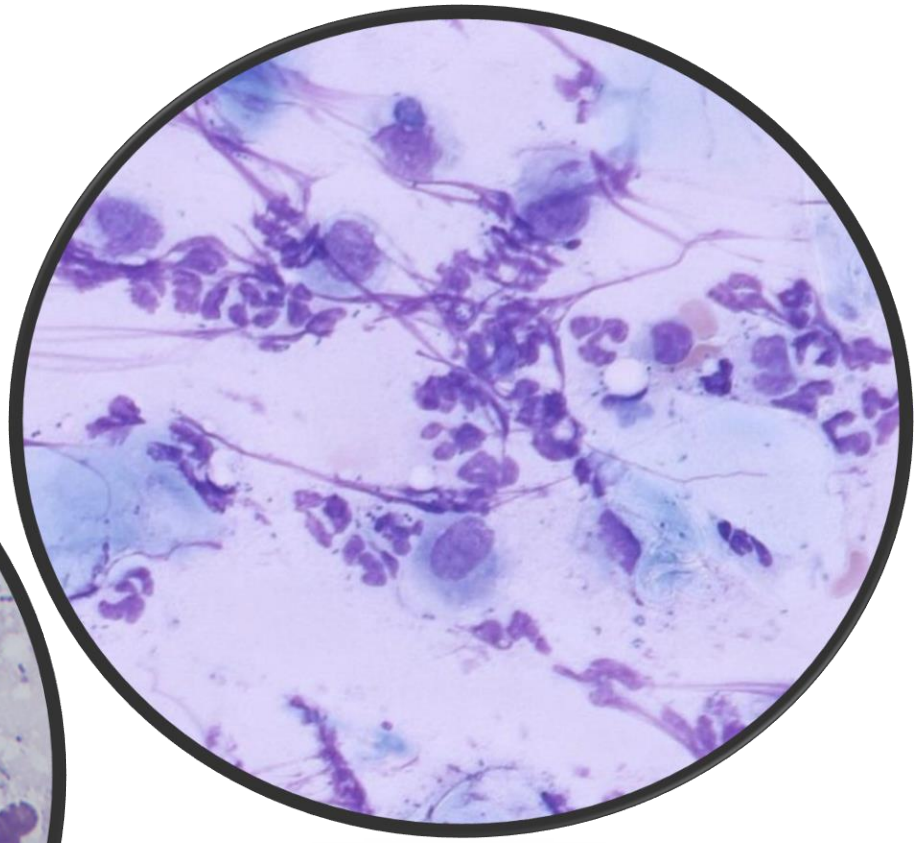
Bacterial Otitis







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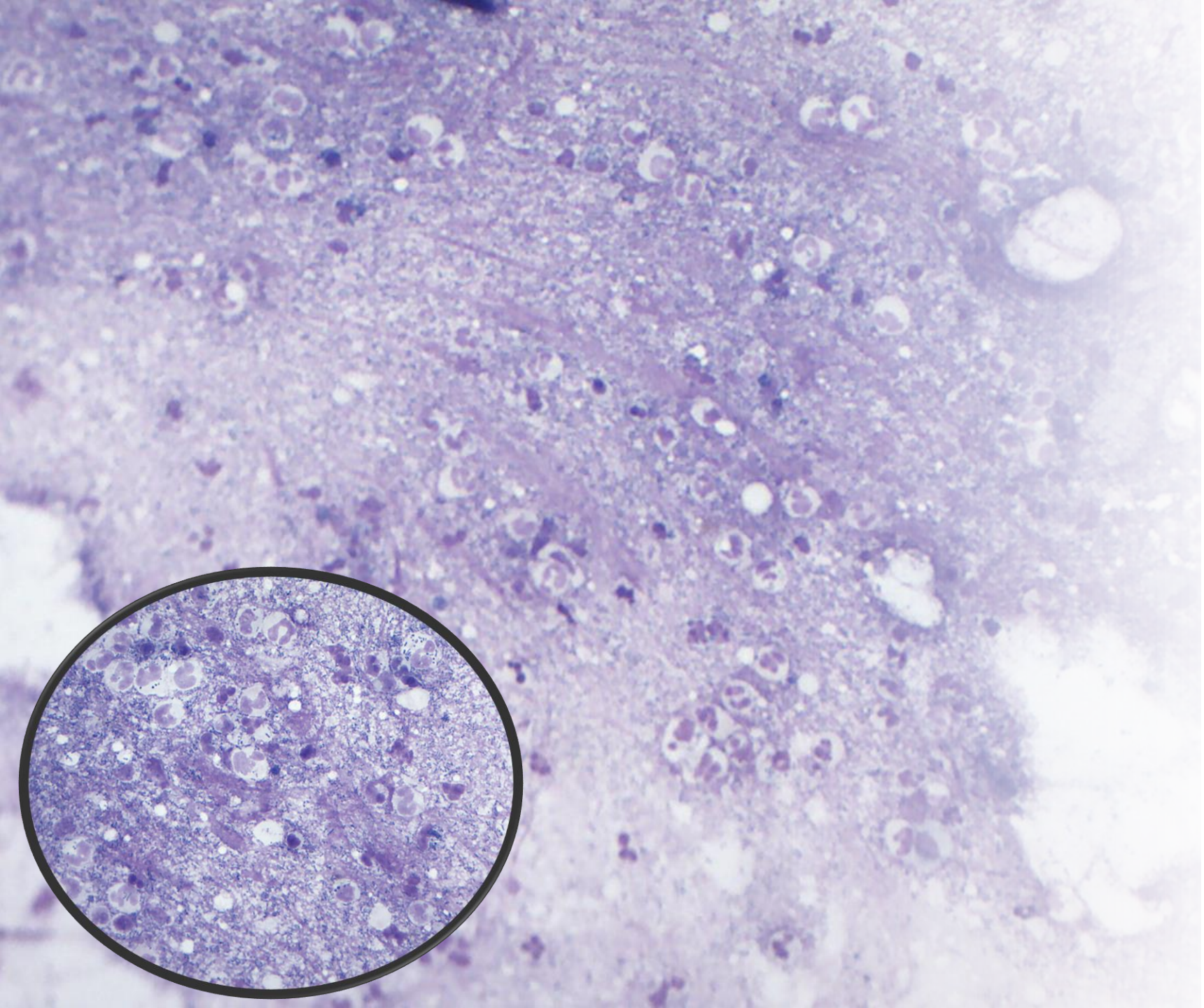

Septic Neutrophilic Inflammation Bacterial Otitis

Biofilm can complicate the picture

Biofilm and Bacilli consider Pseudomonas

Isolate 1 Profuse growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC	Sensitivity Range		
Ampicillin (1)	Resistant	N/A		(Intrinsic R)	
Amoxicillin-Clavulanic acid (1)	Resistant	N/A		(Intrinsic R)	
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Gentamicin (2)	SENSITIVE	<=1	1	Sssir	16
Clindamycin (1)	Resistant	N/A		(Intrinsic R)	
Amikacin (2)	SENSITIVE	<=2	2	Ssssir	64
Tobramycin (2)	SENSITIVE				
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Marbofloxacin (2)	SENSITIVE	1	0.5	sSir	4
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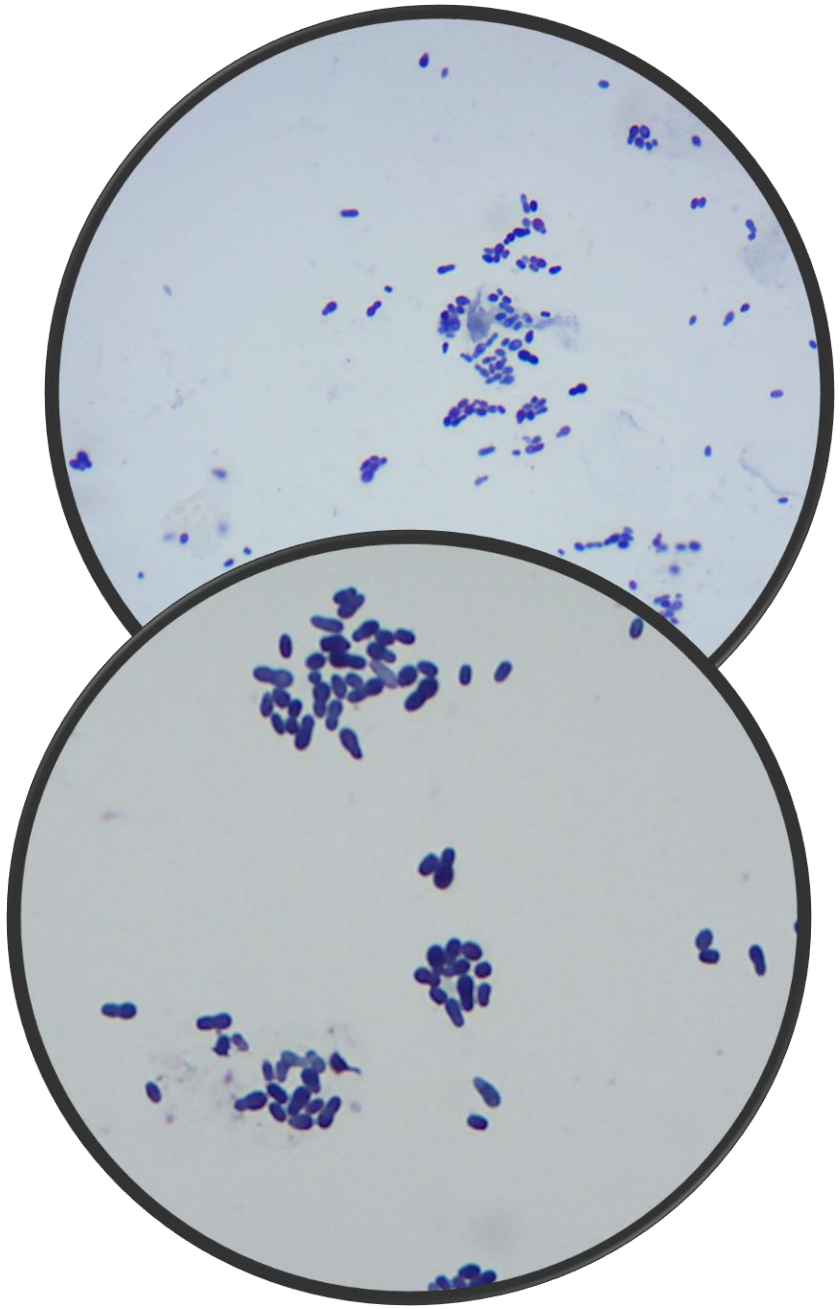
Pseudomonas aeruginosa may develop resistance during prolonged therapy with all antimicrobial agents. Therefore, isolates that are initially susceptible may become resistant within three or four days after initiation of therapy. Testing of repeat isolates may be warranted.

in mixed bacterial growth.

Note:
Standardised susceptibility tests do not reflect in vivo activity of topical antibiotics due to the high levels achieved in the target site with topical administration. Generic antibiotics quoted. The choice of antibiotic and knowledge of any contraindications is the Veterinary Surgeons responsibility. MIC units expressed in ug/ml. Antibiotics without a MIC have been predicted using international guidelines. For more information on interpretation of MICs visit idexx.co.uk/MIC



Malassezia Otitis

Semi quantitative assessment:
Varies with studies
- dry hpf (40x)
- mean *yeasts*/hpf ≥ 1 – 5 - 10 abnormal

However:

- overlap in yeast densities in skin samples from healthy and diseased dogs
- relatively small numbers of organisms may lead to skin disease in sensitised individuals

“Factors such as important variations in anatomical site, breed, sampling method and host immune status commonly thwart the interpretation of the clinical significance of an observed population (“XX yeasts in YY fields”); trial therapy is routinely required to establish this.”

Bond R, et al Biology, diagnosis and treatment of Malassezia dermatitis in dogs and cats: Clinical Consensus Guidelines of the World Association for Veterinary Dermatology. Vet Dermatol. 2020 Feb;31(1):75. doi: 10.1111/vde.12834. PMID: 31957203.

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Is Culture Beneficial?

- May have limited benefit in otitis externa
- Allows to identify if only mixed flora
- Most cases of infection are due to :
  - *Malassezia* spp
  - *Staphylococus* spp (cocci)
  - *Pseudomonas* (bacilli)
- More useful in recurrent cases or with organisms with unusual morphology
  - e.g., coryneform, cocci-bacilli, filaments, yeasts, hyphae, etc
- Direct microscopy findings aid in the determination of clinical significance of isolates e.g., bacterial morphology associated with inflammation and phagocytosis.
  - **Always do Cytology before and when doing culture**

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Is Culture Beneficial?

IDEXX SERVICES: **CANA, EARSW**
SAMPLES RECEIVED: **Pink cap e-swab**

MICROBIOLOGY

*Anaerobic Culture [a]	Moderate growth mixed anaerobes
*Site:	BOTH EARS :

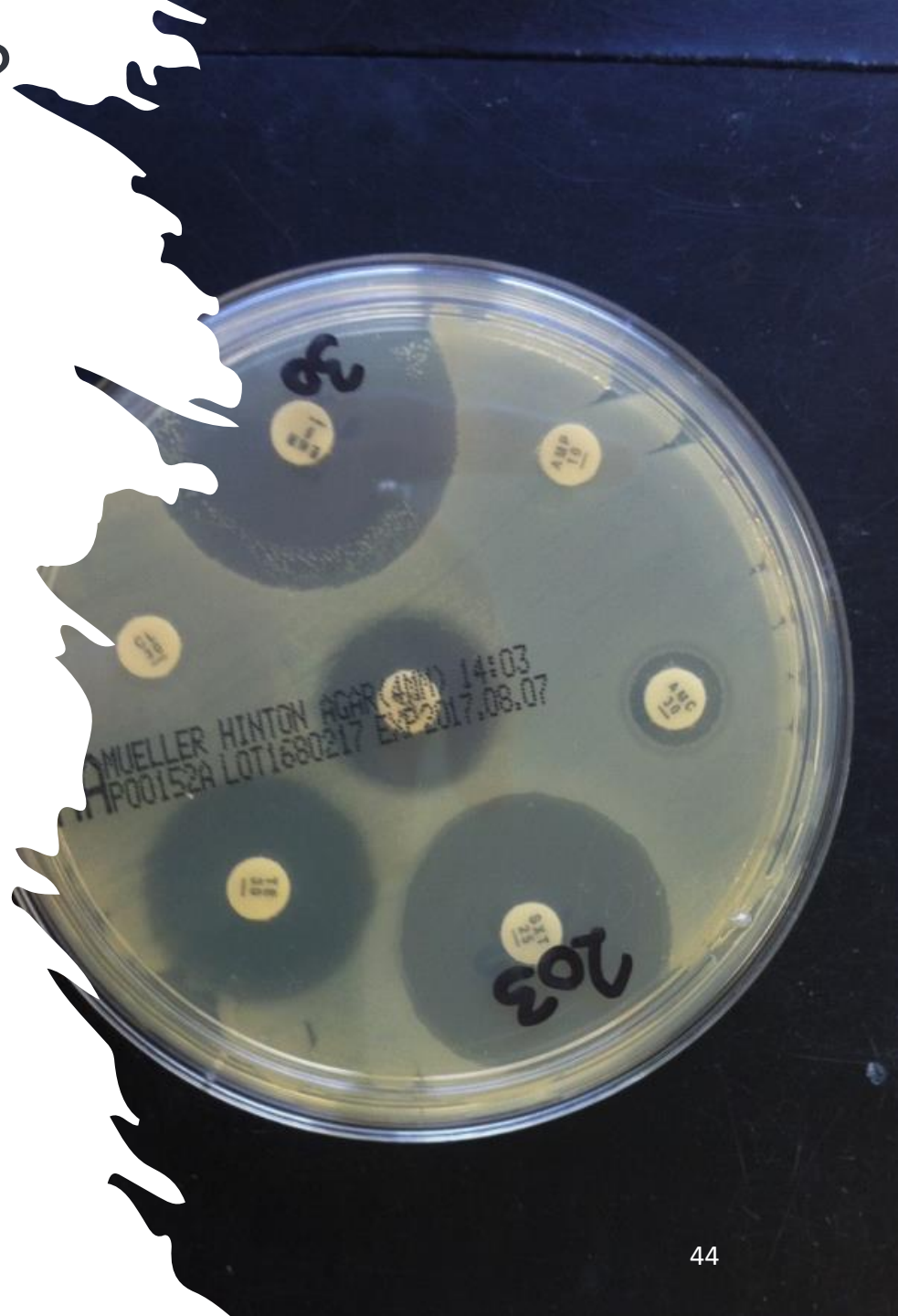
Aerobic Culture - Ear

Isolate 1 — Profuse growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC	Sensitivity Range		
*Amikacin	SENSITIVE	<=2	2	Ssssir	64
*Gentamicin	SENSITIVE	<=1	1	Sssir	16
*Ciprofloxacin	SENSITIVE	0.25	0.06	ssSssir	4
*Enrofloxacin	Intermediate	1	0.12	ssslir	4
*Marbofloxacin	SENSITIVE	<=0.5	0.5	Ssir	4
*Polymixin B	SENSITIVE	1	0.25	ssSsrrr	16
*Ofloxacin	SENSITIVE				

in mixed bacterial growth.

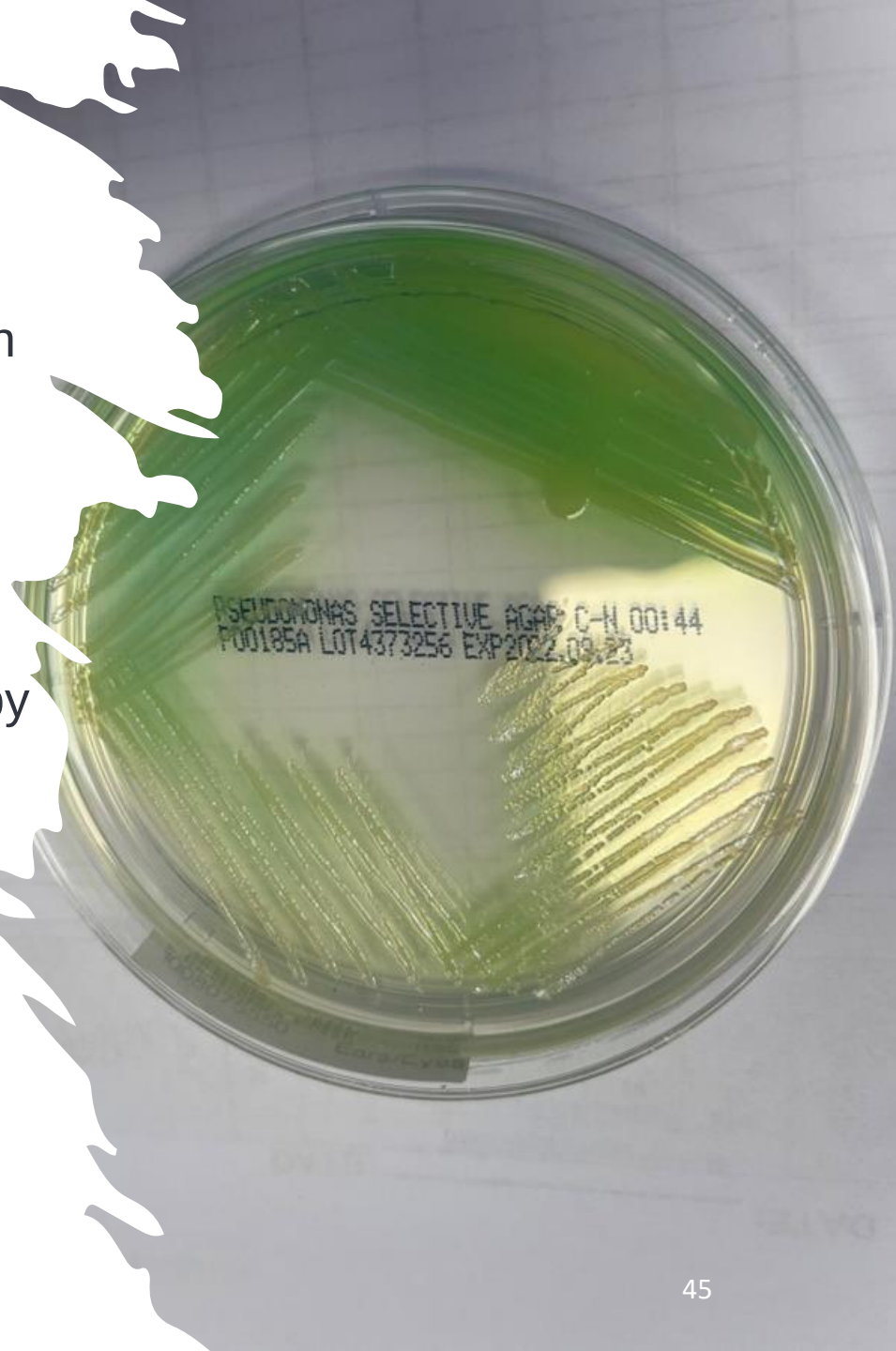
- ASTs are based on systemic breakpoints
- The results can be poorly predictive of the response to topical treatment.
  - If R on AST may respond in vivo due to high concentration that can be achieved on site
  - If S on AST may not respond in vivo due to local factors (e.g. inflammation, biofilm, ear stenosis, etc)
- May be useful with bacilli infection (e.g. Pseudomonas vs Enterobacterales vs Corynebacteria)



Is Culture Beneficial?

Typical indications for Culture include the following:

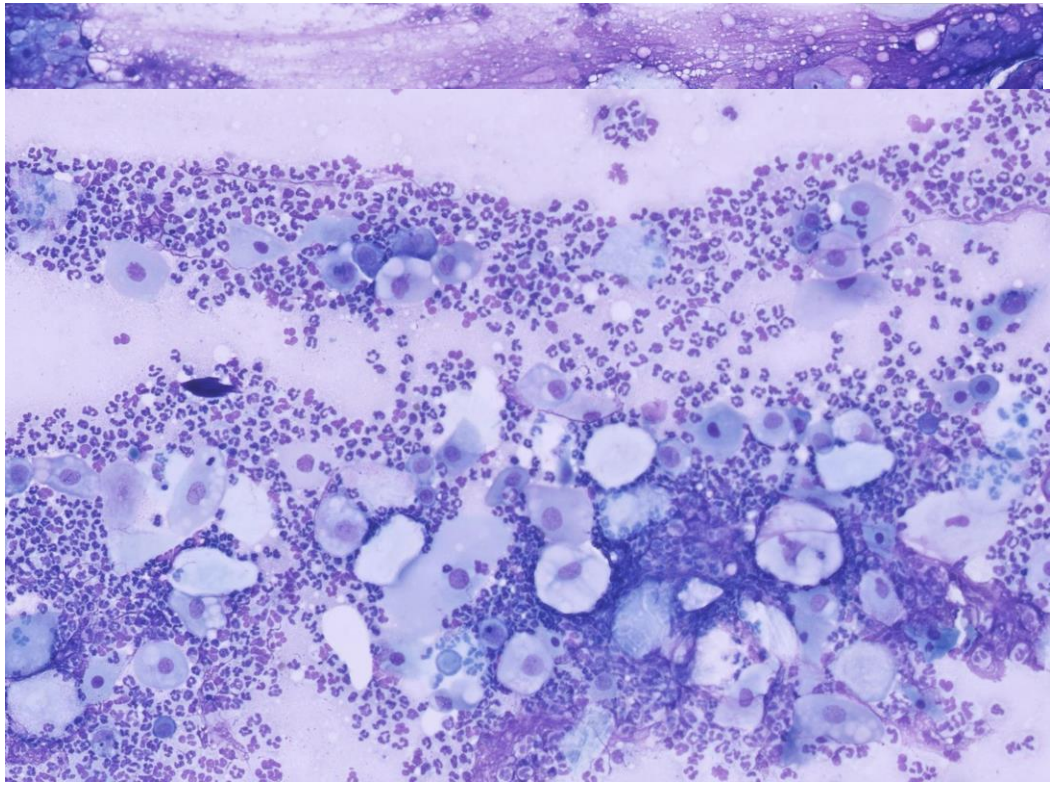
- Chronic otitis associated with bacteria (cocci and/or rods) seen on cytology
- Rods (bacilli) seen on cytology
- Organisms with unusual morphology
- Suspected or confirmed cases of otitis media (systemic therapy may be indicated)
- History of multidrug-resistant bacteria
- ~~Hi~~story of long-term oral or topical antibiotic therapy (including for other conditions
- ~~Ba~~cteria persisting on cytology despite apparently appropriate therapy



Is Culture Beneficial?

SPECIES	AGE		
Canine	9y 9m (03/06/2014)		
BREED	SEX	NEUTERED	ENTIRE
Basset Hound	F	X	

Please provide history to allow for interpretation (please indicate Differential Diagnosis / Disease Suspected / Specific questions you would like answered)
DOG HAS BEEN ON GENTAMICIN TOPICALLY FOR 4-6 WEEKS.



Ear Aerobic Culture

Isolate 1
Profuse growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC	Sensitivity Range
Ampicillin (1)	Resistant	N/A	(Intrinsic R)
Amoxicillin-Clavulanic acid (1)	Resistant	N/A	(Intrinsic R)
Enrofloxacin (2)	Intermediate	1	0.12 sssIir 4
Gentamicin (2)	Resistant	>=16	1 sssiR 16
Clindamycin (1)	Resistant	N/A	(Intrinsic R)
Amikacin (2)	Resistant	>=64	2 ssssiR 64
Tobramycin (2)	Resistant		
Polymyxin B (3)	Intermediate	1	0.25 iiIirrr 16
Ofloxacin (2)	SENSITIVE		
Cephalexin (1)	Resistant	N/A	(Intrinsic R)
Marbofloxacin (2)	SENSITIVE	1	0.5 sSir 4
Cefovecin (2)	Resistant	N/A	(Intrinsic R)
Ciprofloxacin (2)	SENSITIVE	0.5	0.06 sssSirr 4

Pseudomonas aeruginosa may develop resistance during prolonged therapy with all antimicrobial agents. Therefore, isolates that are initially susceptible may become resistant within three or four days after initiation of therapy. Testing of repeat isolates may be warranted.

Standardised susceptibility tests do not reflect in vivo activity of topical antibiotics due to the high levels achieved in the target site with topical administration. Please note that topical treatment with the antimicrobials listed as intermediate (e.g. Polymyxin B) may be effective in this case given the high concentrations achieved at the site.

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Take Home MSG

- Physical exam and looking for primary causes essential

- Cytology will provide essential information on initial consult…
- …and at every subsequent visit until cure is achieved

- Recurrent cases need addressing underlying causes

- Culture may be useful in identifying which organisms are present
  - Overgrowth of normal flora
  - Dysbiosis
  - Infection

  - AST provides limited but valuable information

Traditional ear cytology can be challenging

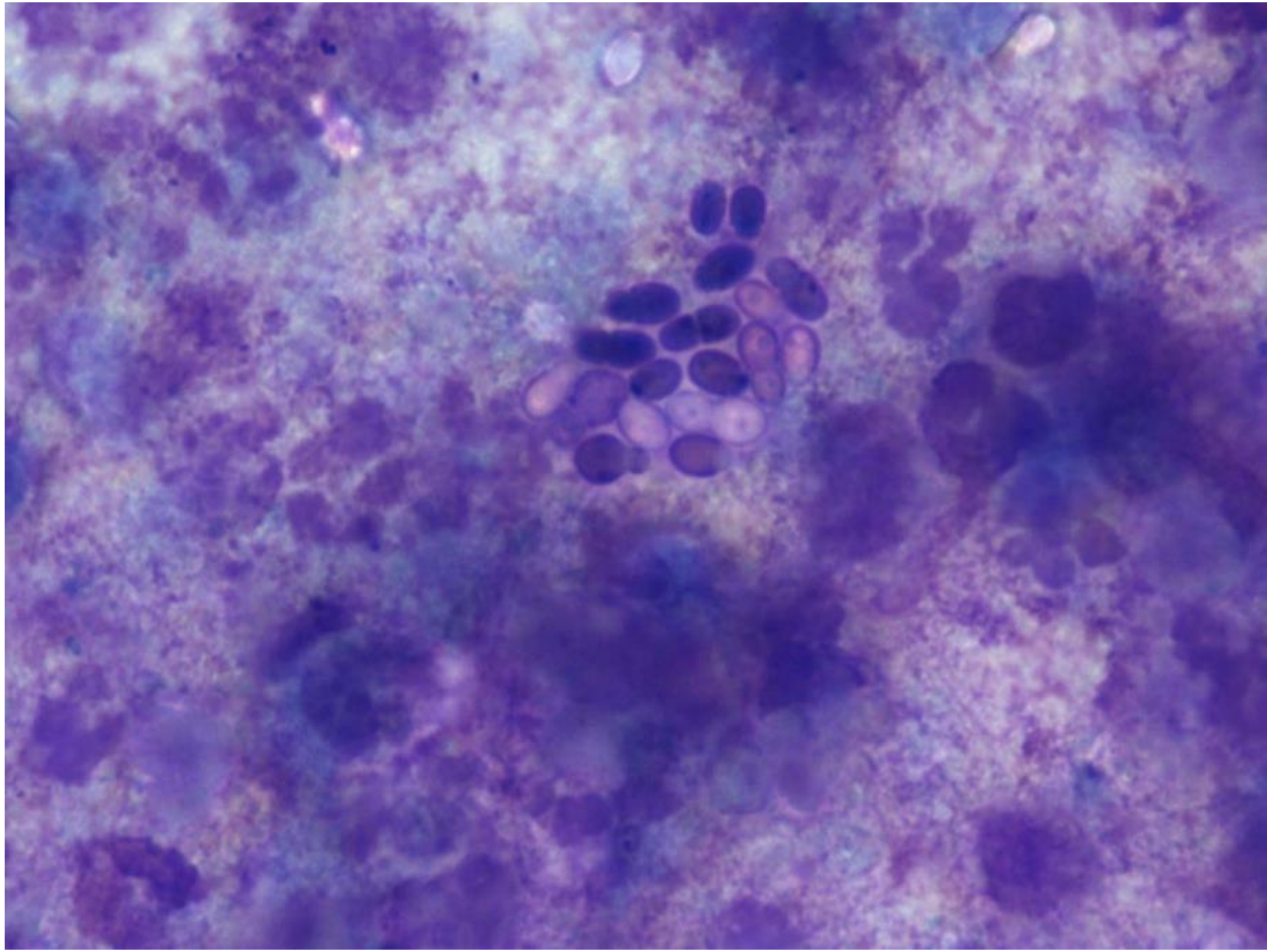
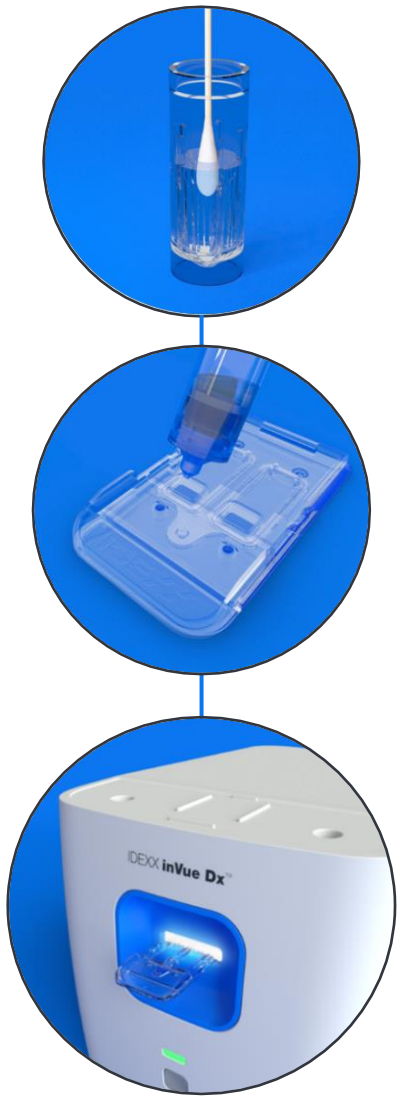


Photo courtesy of Dr. Elizabeth Layne

IDEXX inVue Dx™ analyzer: ear cytology workflow



1. **Put sample in the reagent.**
2. **Drop sample into cartridge.**
3. **Insert and press the Start button.**

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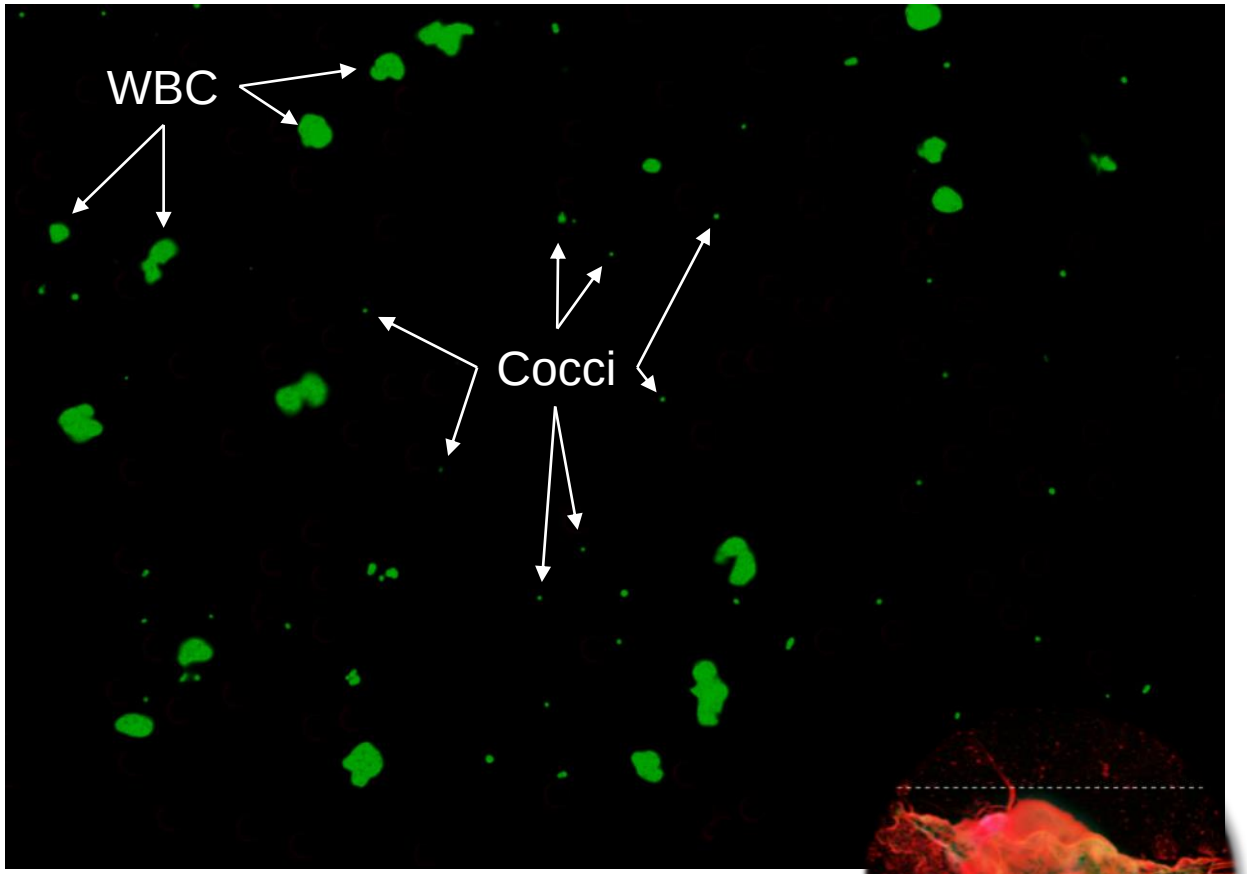
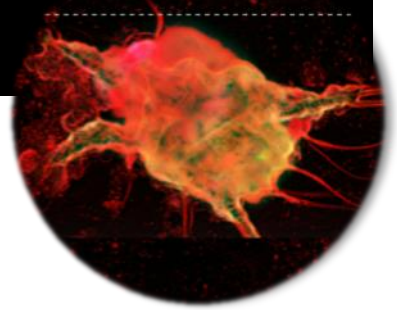
IDEXX inVue Dx™ analyzer: Ear cytology





IDEXX VetLab Station 9:30 AM

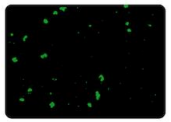
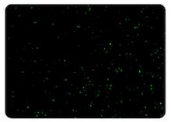
SADIE 123456
Canine | Poodle | Female | 4 y | Profile

Back | Add Test

2024 | Jan 10

Result Details | Transfer Results

Cytology 1/10/24 8:02 AM

Left Ear		
Bacteria, Cocci	**3-4+**	**Numerous coccoid-shaped bacteria present**
Bacteria, Rods	0-1+	Consistent with normal flora
Yeast	0-1+	Consistent with normal flora
WBC	**Present**	
Mites	Absent	
Diagnostic Considerations	Bacterial otitis with coccoid-shaped bacteria. The finding of numerous coccoid-shaped bacteria is 95% specific for the presence of bacterial otitis. Consider underlying causes of otitis externa, Typically these patients require longer duration of treatment or more intensive diagnostics/therapies (otic irrigation, advanced imaging to investigate potential for tumor or otitis media, foreign body presence).	
Images		
Right Ear		
Bacteria, Cocci	**3-4+**	**Numerous coccoid-shaped bacteria present**
Bacteria, Rods	0-1+	Consistent with normal flora
Yeast	0-1+	Numerous yeast present
WBC	**Present**	
Mites	Absent	
Diagnostic Considerations	Bacterial otitis with coccoid-shaped bacteria. The finding of numerous coccoid-shaped bacteria is 95% specific for the presence of bacterial otitis. Consider underlying causes of otitis externa, Typically these patients require longer duration of treatment or more intensive diagnostics/therapies (otic irrigation, advanced imaging to investigate potential for tumor or otitis media, foreign body presence).	
Images		

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Thank you all for your attention! Questions?

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Uh oh otitis! Antibiotics or not? Which one? When?

Ariane Neuber Watts

DrMedVet CertVD DECVD, MRCVS

EBVS & RCVS Specialist VD

Marta Costa

DVM, MSc, FRCPath, DipECVCP

November 2025

IDEXX

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ILOs

- Recognise the role of analgesia and anti-inflammatories in the management of ear disease

- Understand what information is provided in the microbiology report and how it can be used in treatment of otitis. Explore the difference when facing otitis externa and otitis media

- Develop management approaches for each individual patient

- Discuss alternative emerging therapies

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Otitis:

What drops do I use?

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Otitis:

What drops do I use?

MIKROBIOLOGIE 24.09.25 07:10

Keim	Candida parapsilosis Bei Rindern wird C. parapsilosis im Zusammenhang mit Mastitiden isoliert. In der Regel sind prädisponierende Faktoren (z.B. Immunsuppression, Parasitenbefall oder Langzeitantibiose) für den Ausbruch einer Erkrankung notwendig. (In hoher Keimzahl)
Keim	Malassezia pachydermatis Malassezia pachydermatis besiedelt als Kommensale Haut und Ohren von Hunden, Katzen und anderen Tieren. Bei primärer Vorschädigung durch andere Erreger, immunsuppressiven Einflüssen u.a. kann es zu einer Vermehrung der Hefen und zu ihrer Beteiligung an pathogenen Veränderungen kommen. Malassezia ist i.d.R. empfindlich gegenüber gängigen Antimykotika (z.B. Nystatin, Clotrimazol, Miconazol). (In hoher Keimzahl)

Ear Aerobic Culture

Isolate 1
Moderate growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC	Sensitivity Range
Ampicillin (1)	Resistant	N/A	(Intrinsic R)
Amoxicillin-Clavulanic acid (1)	Resistant	N/A	(Intrinsic R)
Enrofloxacin (2)	Resistant	>=4	0.12 sssiR 4
Gentamicin (2)	SENSITIVE	<=1	1 Sssir 16
Clindamycin (1)	Resistant	N/A	(Intrinsic R)
Amikacin (2)	SENSITIVE	<=2	2 Ssssir 64
Tobramycin (2)	SENSITIVE		
Polymyxin B (3)	Intermediate	1	0.25 iiIirrr 16
Ofloxacin (2)	Intermediate		
Cephalexin (1)	Resistant	N/A	(Intrinsic R)
Marbofloxacin (2)	Intermediate	2	0.5 ssIr 4
Cefovecin (2)	Resistant	N/A	(Intrinsic R)
Ciprofloxacin (2)	Intermediate	1	0.06 ssssIrr 4

Pseudomonas aeruginosa may develop resistance during prolonged therapy with all antimicrobial agents. Therefore, isolates that are initially susceptible may become resistant within three or four days after initiation of therapy. Testing of repeat isolates may be warranted.
in mixed bacterial growth.
Note:
Standardised susceptibility tests do not reflect in vivo activity of topical antibiotics due to the high levels achieved in the target site with topical administration. Generic antibiotics quoted. The choice of antibiotic and knowledge of any contraindications is the Veterinary Surgeons responsibility. MIC units expressed in ug/ml. Antibiotics without a MIC have been predicted using international guidelines. For more information on interpretation of MICs visit idexx.co.uk/MIC

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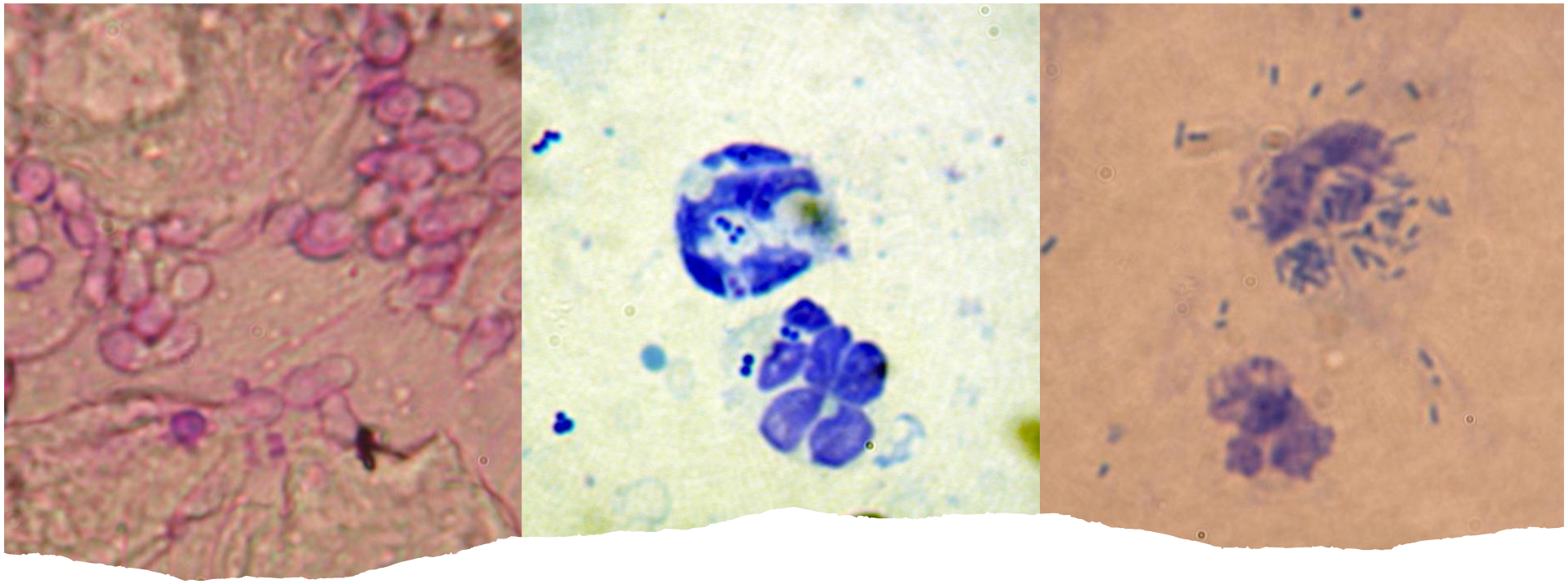
Otitis:

What drops do I use?



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Wrong question!

Look at the patient!

Look at the discharge, ears & TM (if otoscopy is possible)

Look at the cytology!

Choose cleaner/drops

Consider analgesia

GA flush?

PSPP

Further tests?

--> long term plan if needed

Multi-factorial disease

Not a B/W situation

Look at all the aspects & choose accordingly

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Otitis

Very common clinical presentation

Common reason to change practice

Acute vs chronic

Unilateral vs bilateral

Can be extremely painful !

→ fear aggression/avoidance common!

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Otitis clinical signs

Head shaking
Smell
Scratching ear
Acute moist dermatitis behind ear
Head tilt
Rubbing ear
Increased discharge

Pain
Fear aggression
Behavioural changes
→ Get it right first time!

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Goals of therapy

- Treat infection
- Remove discharge
- Analgesia
- Reduce chronic & perpetuating changes
- Avoid relapse
- Identify primary disease
- Avoid side effects

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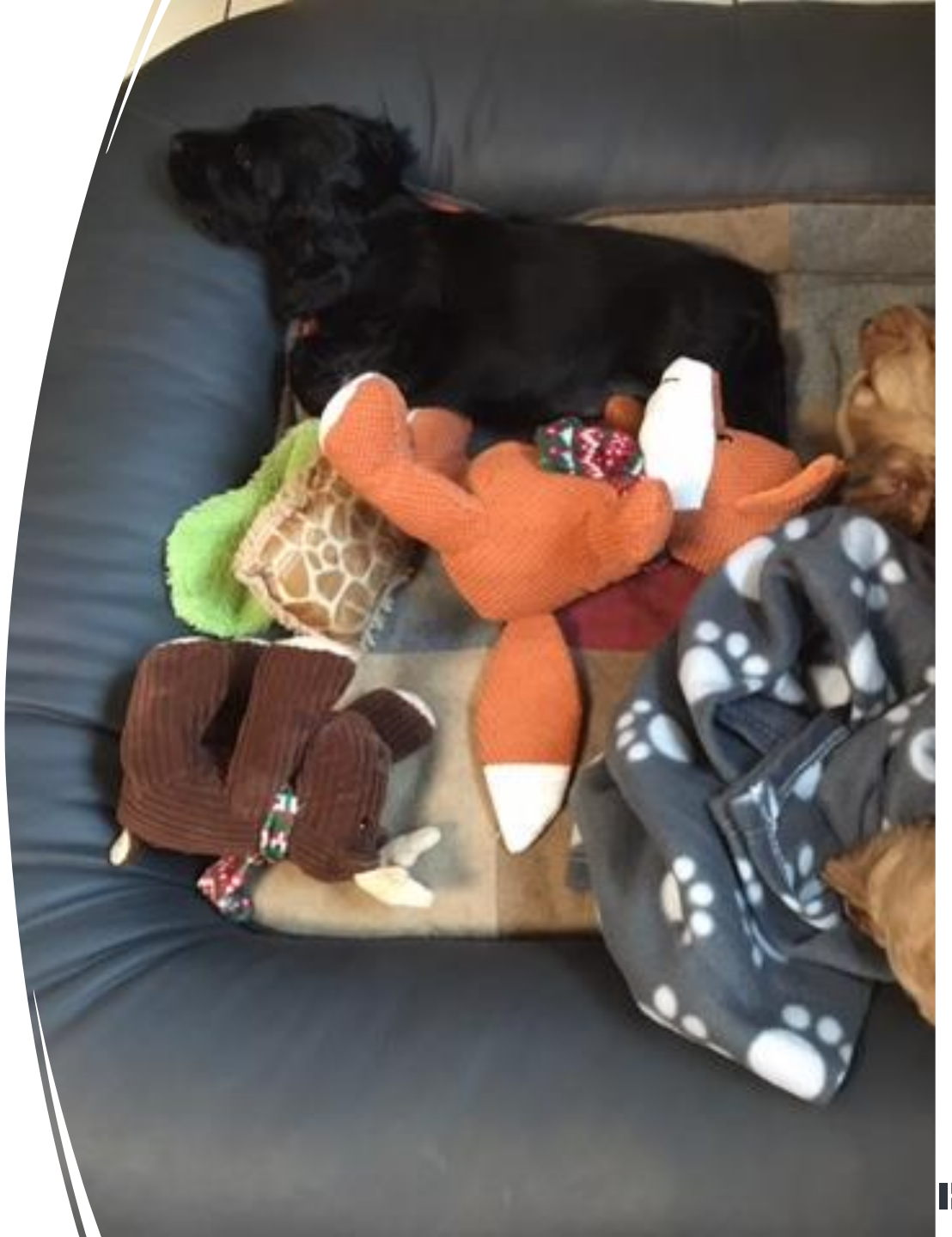
Analgesia

- Is important!
- Avoids future issues
- Avoids behavioural problems
- Increases compliance, particularly future compliance
- E.g. Gabapentin off label

- Long-acting medications



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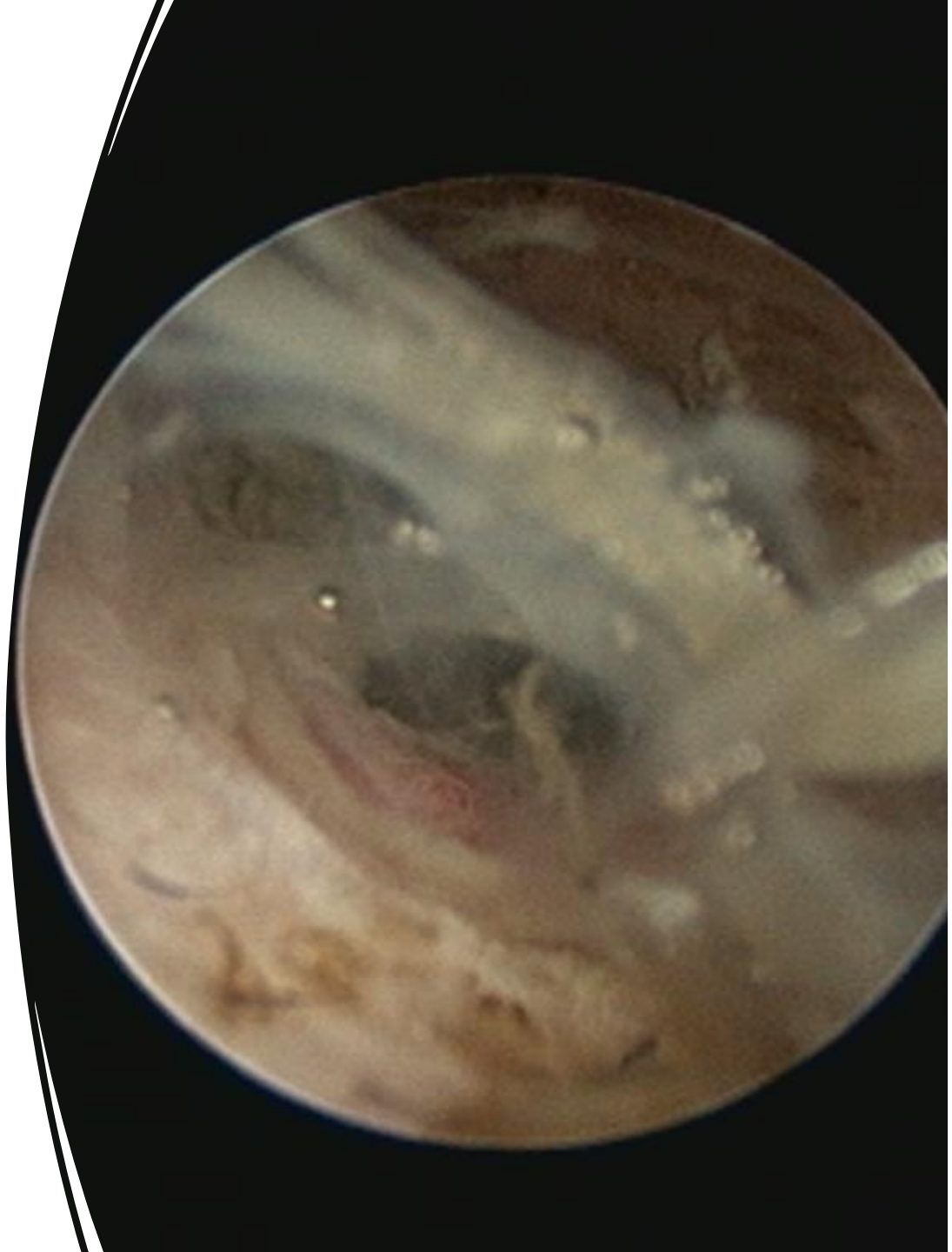
Analgesia

- Prednisolone:
  - not analgesia
  - Good anti-inflammatory!
  - Decreases stenosis
- Gabapentin
  - Post-flush
  - Pre-medicate
  - Pre-exam & Tx
- NSAI
  - Not alonside pred of course...
- Trazodone
  - If head shy...
- Paracetamol
  - Additional analgesia



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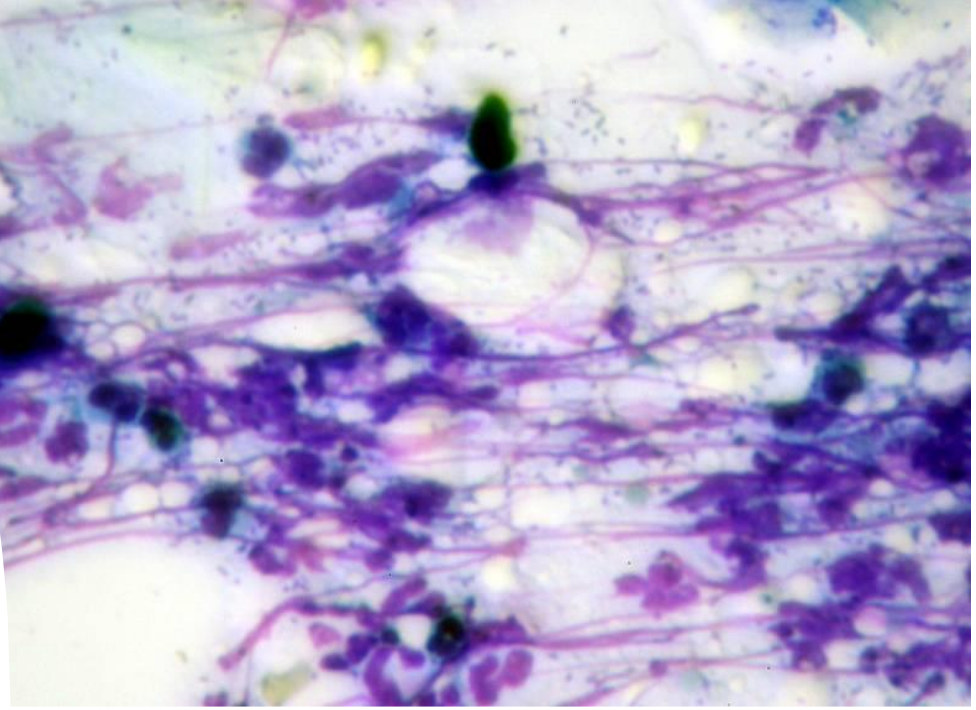
Cytology vs culture/sensitivity

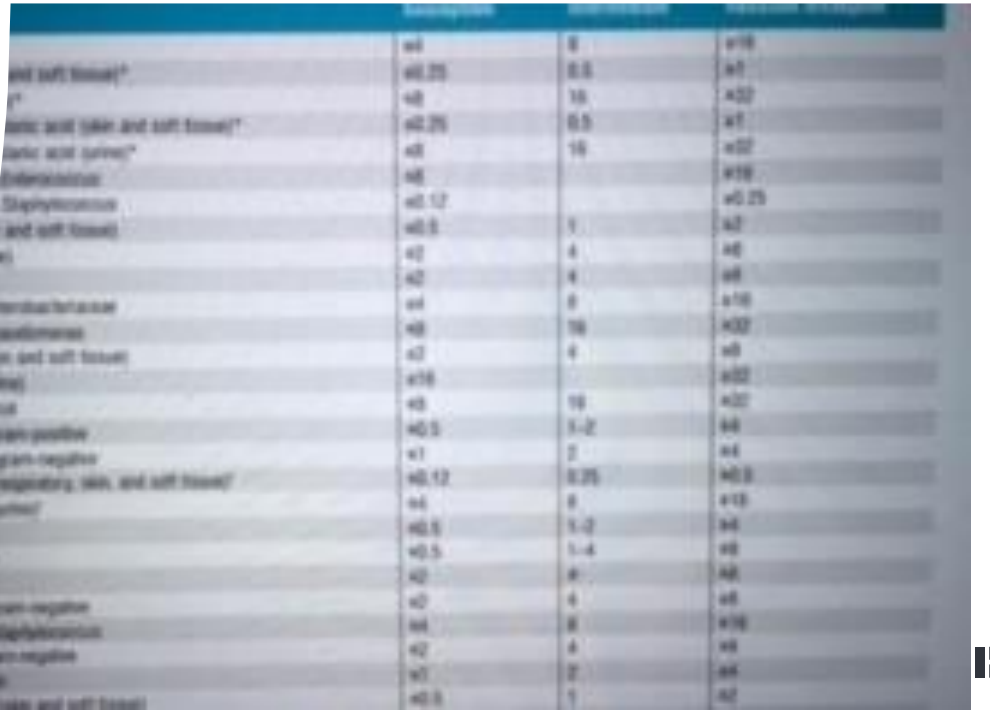


Cytology: for (almost) every case

C&S:

- when rods are seen
- when Tx not effective
- When middle ear disease present (systemic AB)
- With unusual organism morphology

C&S cannot replace cytology



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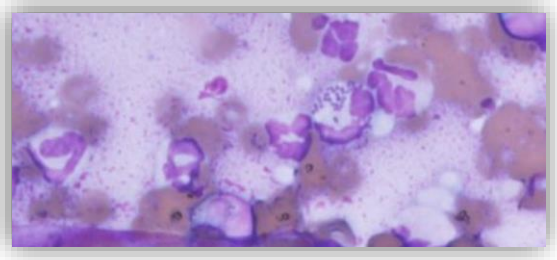
We can have discordant results …

Bacteria +/ WBC+ Culture negative

- Other causes of inflammation
- Bacteria nonviable
  - AM use
  - Extreme conditions (e.g. Temp; pH)
  - Lack of growth media
  - WBC inhibition
- "Pseudobacteria"
- Contaminated reagents
- Non-significant growth



Bacteria - / WBC- Culture positive

- Low bacterial numbers on cytology
- Lack of inflammation/reduced WBC migration
- Bacteria obscured by debris
- Growth of contaminants/ commensal flora
- Culture is more sensitive

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Is Culture Beneficial?

IDEXX SERVICES: **CANA, EARSW**
SAMPLES RECEIVED: **Pink cap e-swab**

MICROBIOLOGY

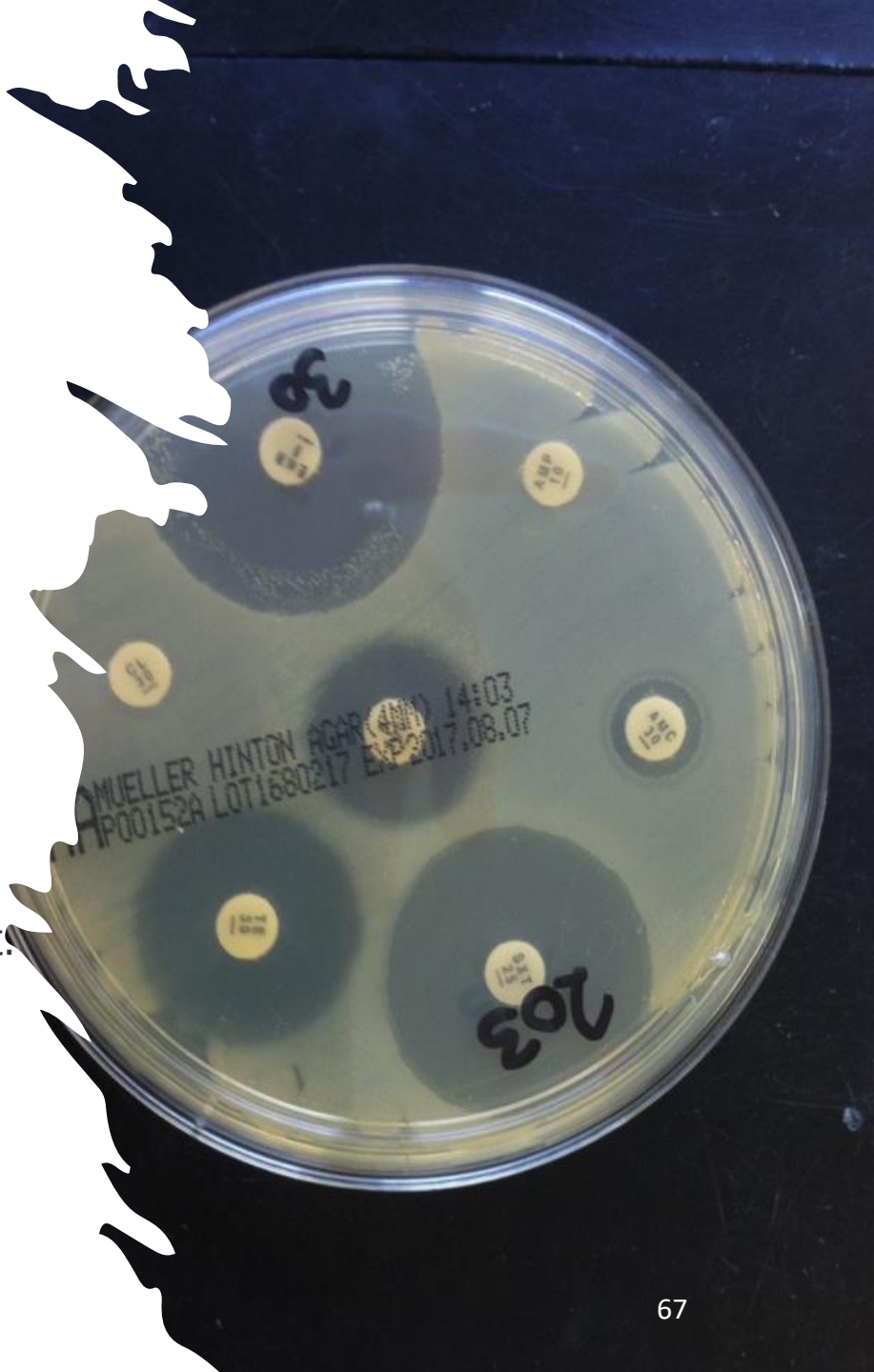
*Anaerobic Culture [a]	Moderate growth mixed anaerobes
*Site:	BOTH EARS :

Aerobic Culture - Ear

Isolate 1 — Profuse growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC	Sensitivity Range		
*Amikacin	SENSITIVE	<=2	2	Ssssir	64
*Gentamicin	SENSITIVE	<=1	1	Sssir	16
*Ciprofloxacin	SENSITIVE	0.25	0.06	ssSssir	4
*Enrofloxacin	Intermediate	1	0.12	ssslir	4
*Marbofloxacin	SENSITIVE	<=0.5	0.5	Ssir	4
*Polymixin B	SENSITIVE	1	0.25	ssSsrrr	16
*Ofloxacin	SENSITIVE				

in mixed bacterial growth.



- ASTs are based on systemic breakpoints
- The results can be poorly predictive of the response to topical treatment:
  - If R on AST may respond in vivo due to high concentration that can be achieved on site
  - If S on AST may not respond in vivo due to local factors (e.g. inflammation, biofilm, ear stenosis, etc)
- May be useful with bacilli infection (e.g. Pseudomonas vs Enterobacterales vs Corynebacteria)

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Antimicrobial Susceptibility Testing

- Why do we do it?
  - To predict outcome of therapy
  - But often we already started therapy – “why is it not working?”
    - Two types of resistance
      - Intrinsic/innate/inherent – PSEUDOMONAS have many….
      - Acquired
  - Because we know AMR is increasing

- Disclaimer
  - Testing is still only a guideline to treatment
  - Not all organs/systems behave the same
  - Not all patients have the same AM distribution/metabolism
  - Patient response ultimately confirms adequacy of treatment

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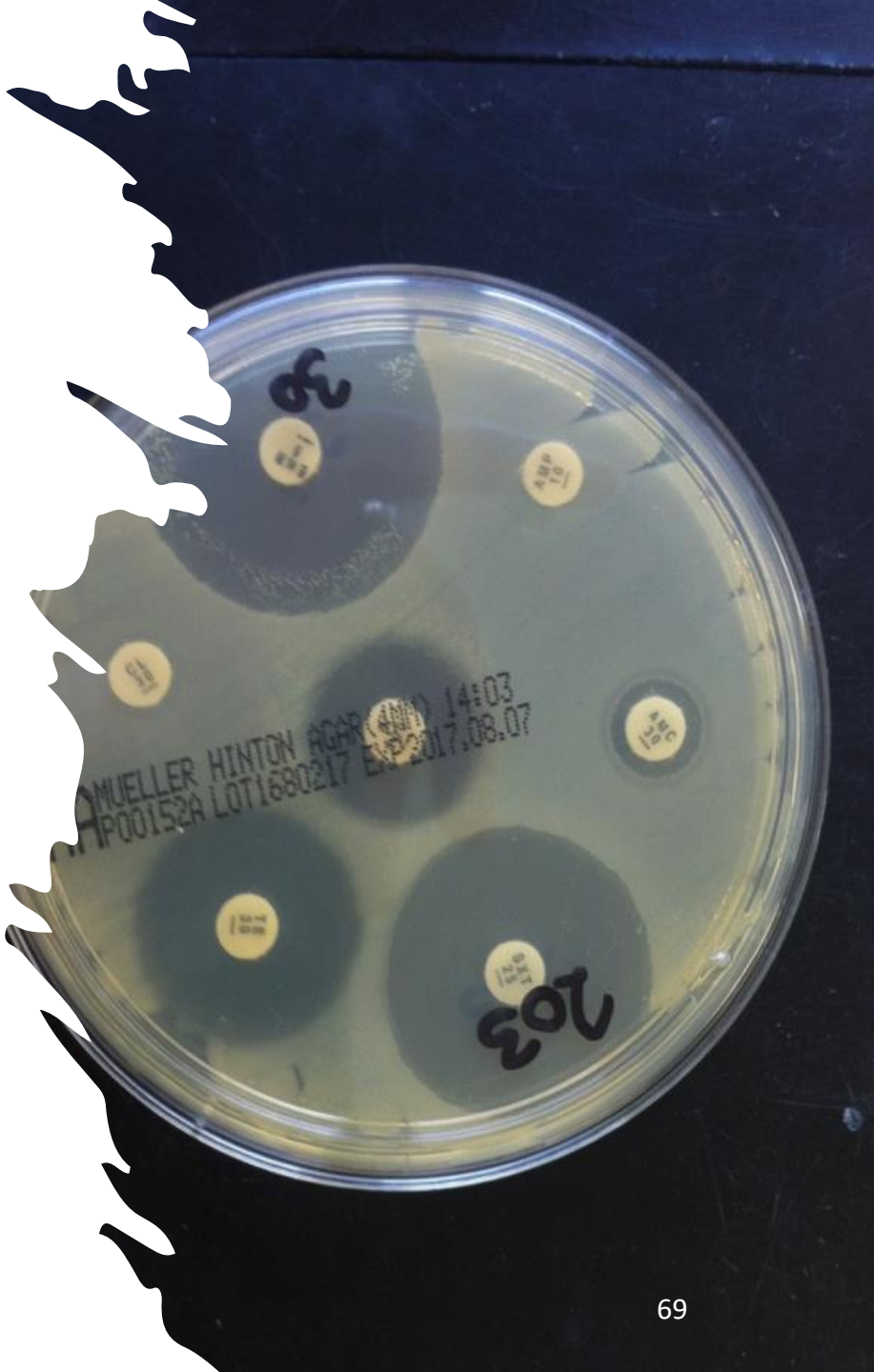
Is Culture Beneficial?

Ear Aerobic Culture

Isolate 1
Profuse growth:Pseudomonas aeruginosa

Antibiotic	Result	MIC
Ampicillin (1)	Resistant	N/A
Amoxicillin-Clavulanic acid (1)	Resistant	N/A
Enrofloxacin (2)	Intermediate	1
Gentamicin (2)	Resistant	>=16
Clindamycin (1)	Resistant	N/A
Amikacin (2)	Resistant	>=64
Tobramycin (2)	Resistant	
Polymyxin B (3)	Intermediate	1
Ofloxacin (2)	SENSITIVE	
Cephalexin (1)	Resistant	N/A
Marbofloxacin (2)	SENSITIVE	1
Cefovecin (2)	Resistant	N/A
Ciprofloxacin (2)	SENSITIVE	0.5



Standardised susceptibility tests do not reflect in vivo activity of topical antibiotics due to the high levels achieved in the target site with topical administration. Please note that topical treatment with the antimicrobials listed as intermediate (e.g. Polymyxin B) may be effective in this case given the high concentrations achieved at the site.

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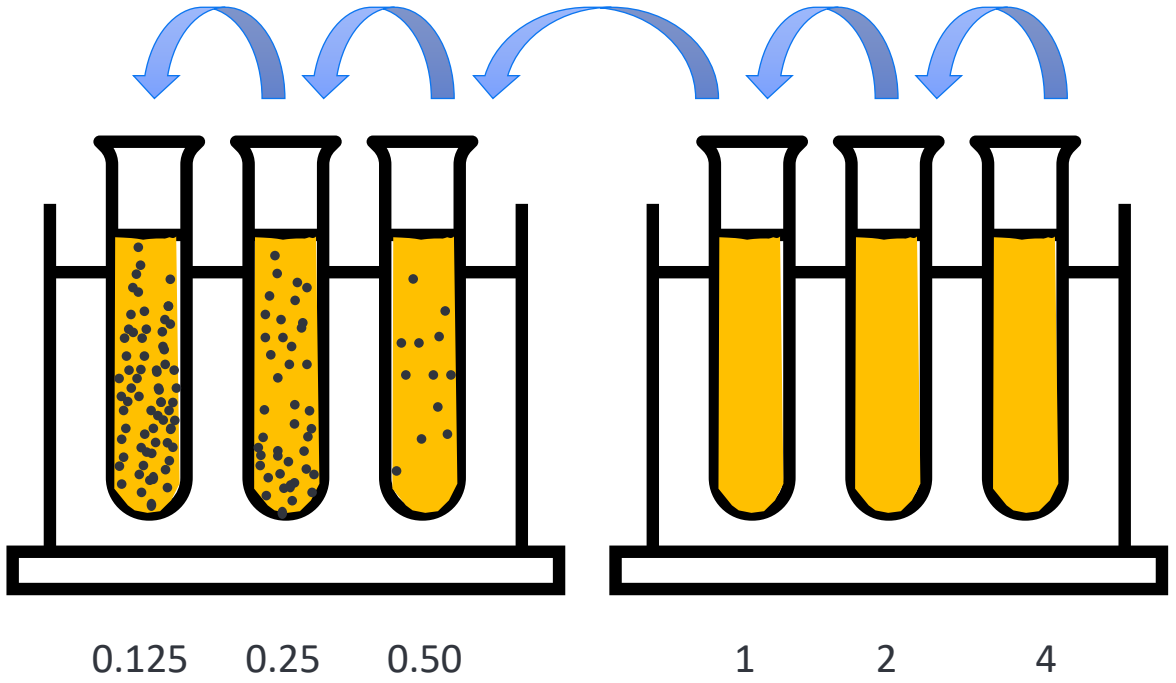
WHAT IS A MIC?

+ Minimum Inhibitory Concentration
+ is the lowest concentration (in µg/ml) of an antibiotic that inhibits the growth of a given strain of bacteria.



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WHAT ARE BREAKPOINTS?

- Cut off between two different populations
  - Wild type and non-wild type
  - Susceptible and Resistant isolates
- Different types
  - ECOFFs
  - Clinical breakpoints

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What about topical breakpoints?

+ Still not available in Veterinary Medicine

+ EUCAST Guidelines

In the absence of clinical data on outcome related to MIC of infecting organisms, EUCAST has not been able to determine relevant clinical breakpoints for topical use of antimicrobial agents. Laboratories are advised to either use the regular breakpoints or the cut-off values listed below to distinguish between organisms without and with acquired resistance mechanisms.

Organisms	Screening cut-off values for the detection and reporting of phenotypic resistance. Report resistant (R) for isolates with MIC above the cut-off value. Otherwise report susceptible (S).		Gentamicin	Tobramycin	Ciprofloxacin	Levofloxacin	Ofloxacin	Chloramphenicol	Colistin (for polymyxin B)	Neomycin (framycetin)
P. aeruginosa	Topical EUCAST	(mg/L)	8	2	0.5	2	2	ND	4	ND
P. aeruginosa	ECOFF EUCAST	(mg/L)	8	2	0.5	2	4	ND	4	ND
	CLSI VET01S-Ed7 S	(mg/L)	≤ 2	≤ 1	NA	≤ 1	NA	NA	NA	NA
	CLSI VET01S-Ed7 R	(mg/L)	≥ 8	≥ 4	NA	≥ 4	NA	NA	NA	NA

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Pseudomonas spp in Canine otitis

+ Not part of the normal flora and not an obligate pathogen
+ Prior dysbiosis may predispose to ear infections

+ Biofilm formation in >40% of cases
+ MDR reported in 13-35% of isolates

+ Rates of resistance vary across countries and change across time

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Secker B, Shaw S, Atterbury RJ. *Pseudomonas* spp. in Canine Otitis Externa. *Microorganisms*. 2023; 11(11):2650. https://doi.org/10.3390/microorganisms11112650

Normal flora in the ear

Traditional culture methods

+ *Staphylococcus pseudointermedius*
+ *Bacillus* spp.
+ *Coag-neg Staphylococcus* spp.
+ *Micrococcus* spp.
+ *Malassezia* spp.
+ *Corynebacterium* spp.
+ Gram negative rods
+ *Candida* spp.

Genomic methods

+ Much more complex normal flora
+ metagenomic studies - up to 866 different species of bacteria found in heathy canine ears

The middle ear microbiota of healthy dogs is similar to the external ear canal with genomic methods

Leonard, C.; Picavet, P.P.; Fontaine, J.; Clercx, C.; Taminiau, B.; Daube, G.; Claeys, S. The Middle Ear Microbiota in Healthy Dogs Is Similar to That of the External Ear Canal. Vet. Sci. 2023, 10, 216
Ngo, J.; Taminiau, B.; Fall, P.A.; Daube, G.; Fontaine, J. Ear Canal Microbiota—A Comparison between Healthy Dogs and Atopic Dogs without Clinical Signs of Otitis Externa. Vet. Dermatol. 2018, 29, 425

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Bacterial meningitis secondary to otogenic infection
Otitis media with Intracraneal Extension (OMIE)
Otogenic Meningitis/Menigoencephalitis

- One 2023 study with 10 bull dogs – acute vestibular signs and/or oral/cervical pain; no pyrexia
  - 5/10 concurrent gross OE
  - CSF: 8/8 dogs pleocytosis; 3/8 dogs bacteria on cyto; 2/8 dogs culture positive (neg cyto)
  - Possible anatomic explanation for predisposition- larger facial canal and oval window relative to CKCS
- One 2025 study 30 dogs
  - 96% were brachycephalic breeds
  - 33% accuracy of localization to CNS with neuro exam only
  - MRI did not show intracranial extension in 20% of cases despite inflammatory CSF
  - Also demonstrated intracranial extension of otogenic infection without CNS signs
  - If OM is diagnosed (recurrent/chronic/brachycephalic/older patients cases) consider CSF+MRI for possible CNS involvement even if only PVS signs

Butterfield, S., Whittaker, D., Tabanez, J., Carrete, J. C., Pitchford, C., Mattias, C. R. J., Crawford, A., & Rusbridge, C. (2023). Bacterial meningitis secondary to otogenic infection in 10 French bulldogs: A retrospective case series. *Veterinary record open*, *10*(1), e263. https://doi.org/10.1002/vro2.63

Moral, M., Blanco, C., & Lorenzo, V. (2025). Otogenic Meningitis or Meningoencephalitis in 30 Dogs: Association Between Neurological Signs, Magnetic Resonance Imaging Findings, and Outcome. *Veterinary sciences*, *12*(5), 456. https://doi.org/10.3390/vetsci12050456

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Normal flora varies

Healthy

+ No big differences between different body sites of non-allergic GSDs
+ High variability between individuals
+ Household environment has impact on microbiota

Atopy/allergy

+ Samples from axilla of allergic GSD had lower microbiota richness than non-allergic dogs
+ Difference in microbiota in allergic vs non allergic dogs
+ Generally lower diversity
+ Microbiota in atopic ears shows different microbiota even in asymptomatic dogs
+ Difficult to pinpoint when dysbiosis becomes clinically relevant

Rodrigues Hoffmann, A.; Patterson, A.P.; Diesel, A.; Lawhon, S.D.; Ly, H.J.; Stephenson, C.E.; Mansell, J.; Steiner, J.M.; Dowd, S.E.; Olivry, T.; et al. The Skin Microbiome in Healthy and Allergic Dogs. PLoS ONE **2014**, 9, e83197

Tang, S.; Prem, A.; Tjokrosurjo, J.; Sary, M.; Van Bel, M.A.; Rodrigues-Hoffmann, A.; Kavanagh, M.; Wu, G.; Van Eden, M.E.; Krumbeck, J.A. The Canine Skin and Ear Microbiome: A Comprehensive Survey of Pathogens Implicated in Canine Skin and Ear Infections Using a Novel next-Generation-Sequencing-Based Assay. Vet. Microbiol. 2020, 247, 108764

Ngo, J.; Taminiau, B.; Fall, P.A.; Daube, G.; Fontaine, J. Ear Canal Microbiota—A Comparison between Healthy Dogs and Atopic Dogs without Clinical Signs of Otitis Externa. Vet. Dermatol. 2018, 29, 425

Apostolopoulos N, Glaeser SP, Bagwe R, Janssen S, Mayer U, Ewers C, et al. (2021) Description and comparison of the skin and ear canal microbiota of non-allergic and allergic German shepherd dogs using next generation sequencing. PLoS ONE 16(5): e0250695. https://doi.org/10.1371/journal.pone.0250695

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Effects of drugs

Ceruminolytics

- 2 to 17 bacterial genera (median = 8)
- 1to 9 fungal genera (media= 3)
- But 23 different fungal genera ID
- *Malassezia* spp. most common (70%)
- cerumenolytic ear cleanser D, EOD, or 2x/week
- At D14
  - Malassezia still the most common, but
  - Increased diversity of flora
  - Significant decrease in proportion of Malassezia
  - Positive fungal culture (*Malassezia pachydermatis*) 34/57 D0. All fungal cultures negative at D14
  - There was no change in bacterial composition

Briand, A., Bensignor, E., Dropsy, H., Crosaz, O., Humeau, L., Cheval, J., Demontant, V., Debi, M. N., Fantini, O., Dal, H., Guillot, J., & Faivre, N. C. (2025). Effect of a ceruminolytic ear cleaner on clinical, microbiological and ear canal microbiome evolution in canine erythemato-ceruminous otitis externa associated with proliferation of Malassezia yeasts. *Veterinary dermatology*, *36*(5), 668–678. https://doi.org/10.1111/vde.13352

Steroids, cyclosporin, oclacitinib

Limitations – small studies

- Tx with cyclosporine or corticosteroids did not affect the cutaneous microbiota in dogs, during, or after treatment (6 time points over 7 months)
- Bacterial composition of allergic dogs with and without oclacitinib did not show any significant differences

Widmer, G., Ferrer, L., Favrot, C. et al. Glucocorticosteroids and ciclosporin do not significantly impact canine cutaneous microbiota. BMC Vet Res 14, 51 (2018). https://doi.org/10.1186/s12917-018-1370-y
Apostolopoulos N, Glaeser SP, Bagwe R, Janssen S, Mayer U, Ewers C, et al. (2021) Description and comparison of the skin and ear canal microbiota of non-allergic and allergic German shepherd dogs using next generation sequencing. PLoS ONE 16(5): e0250695. https://doi.org/10.1371/journal.pone.0250695

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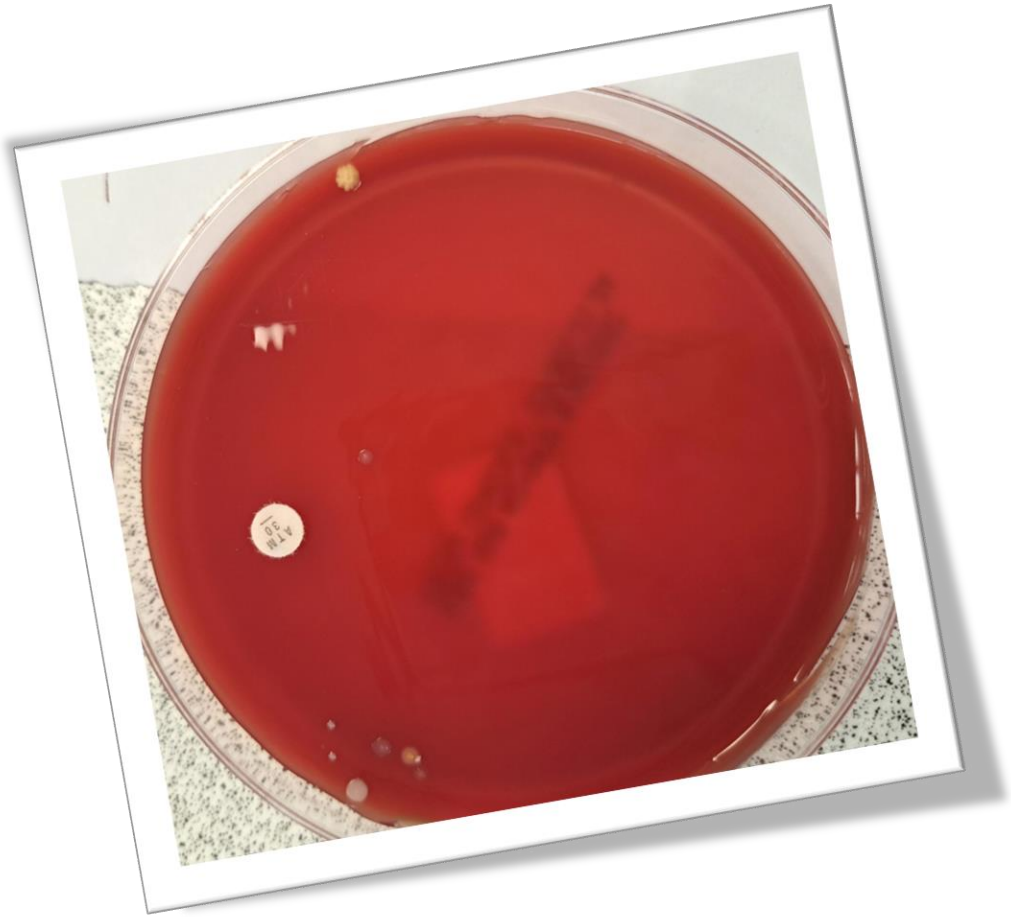
So now we can ID more bacteria

…but, if we give an organism a name, **do we automatically assume greater significance?**



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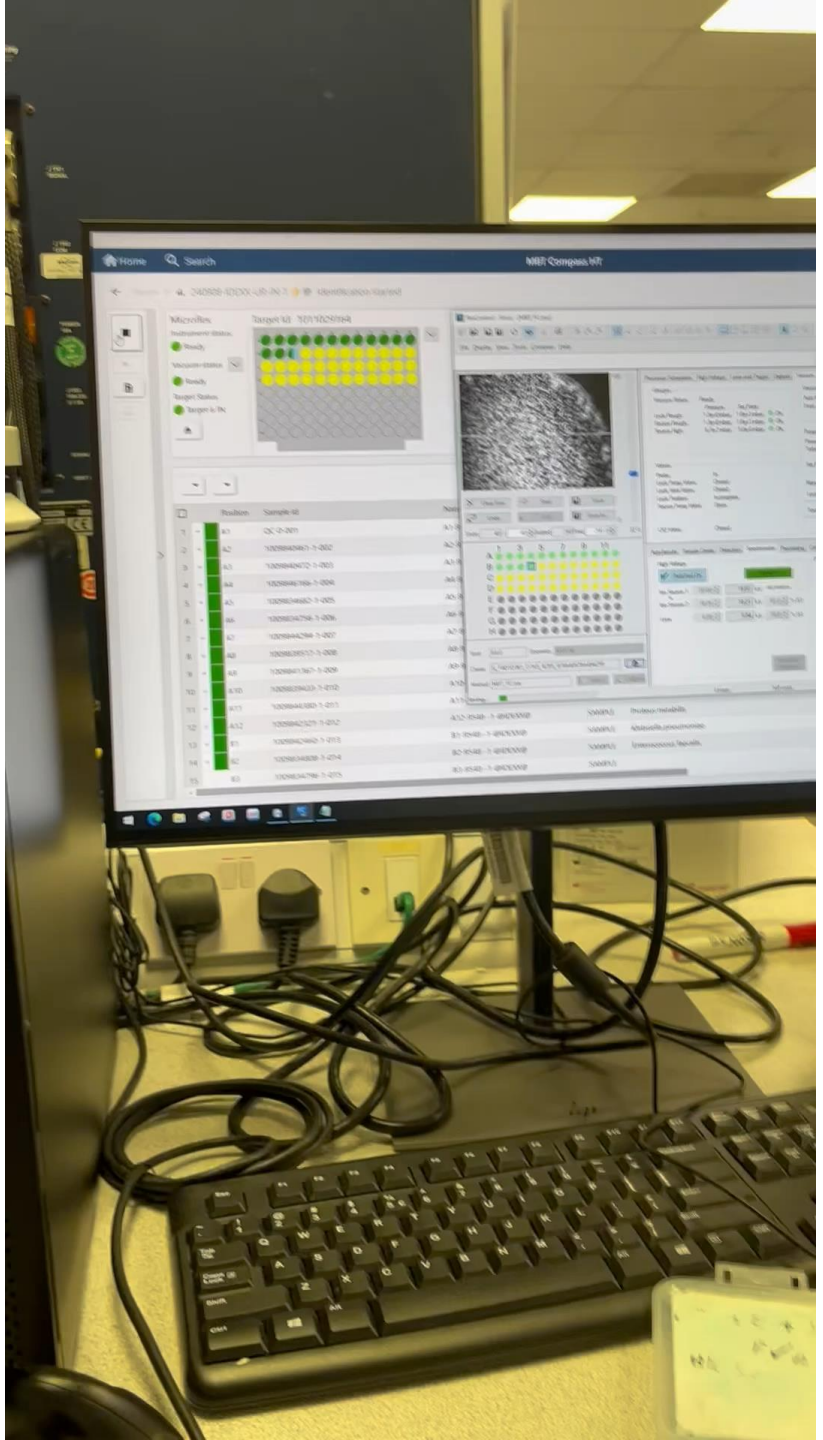
So now we can ID more bacteria

…but, if we give an organism a name, **do we automatically assume greater significance?**

Susceptibility testing should be done only on clinically significant isolates, not necessarily on all microorganisms recovered in culture.

Do not request the laboratory to report everything that grows.

+ Whole Genome Sequencing (WGS)
  - Will pick up everything
  - "…currently, for most bacterial species there is **insufficient evidence** to support the use of WGS-inferred AST to guide clinical decision-making…"



https://www.eucast.org/organization/subcommittees/wgs-and-phenotypic-testing
Cole SD, Paul NC, Hendrix K, et al. Collaboration with the clinical microbiology laboratory optimizes diagnosis of dog and cat infections: recommendations from the American College of Veterinary Microbiologists. Journal of the American Veterinary Medical Association. 2025;263(S1):S88-S97. doi:10.2460/javma.24.12.0776

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So in these cases should we consider non-antibiotic therapy?

+ Source control ?

+ Anti-inflammatory and cleaning/antiseptics ?

+ Management of microbiota? Probiotics ? Biofilm disruption?

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Ear flush/remove debris

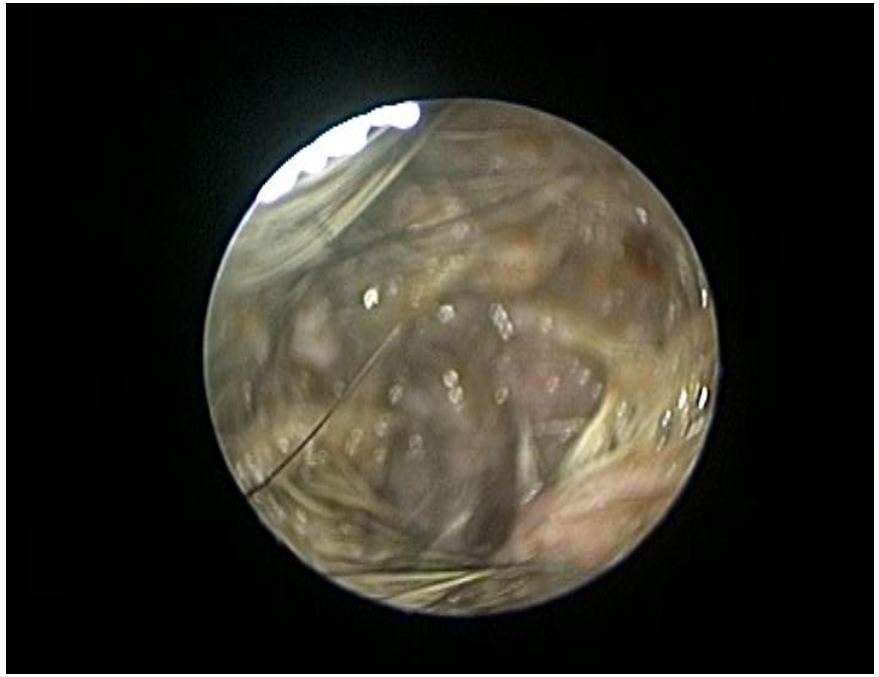
Cleaning at home → most cases

GA flush →

- + if severe disease
- + copious discharge
- + ?TM intact?
- + Biofilm
- + Ceruminolyth

Aim:

- + Remove debris
- + Examine TM
- + Flush middle ear if necessary
- + Diagnostic & therapeutic



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Client education/follow up

- Crucial!
- Show how to clean
- Written instructions

→Increases compliance

- Set expectations
- Allergy: life long diseases
- Treatment duration

- Quality of life!
- Follow up visits depending on severity
- Maintenance therapy
- Long term topical steroids
- Warn about intermittant use of AB drops → resistance/AB stewardship

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Alternative emerging Treatments

- Steroids alone, systemic and/or topical
- Essential oils
- Disinfectants
- Probiotics
- Long term topical steroids/calcineurin inhibitors(/JAKis)
- Bacteriophages
- Cold plasma/fluorescense light energy/low level laser therapy

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Thank you all for your attention! Questions?

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