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

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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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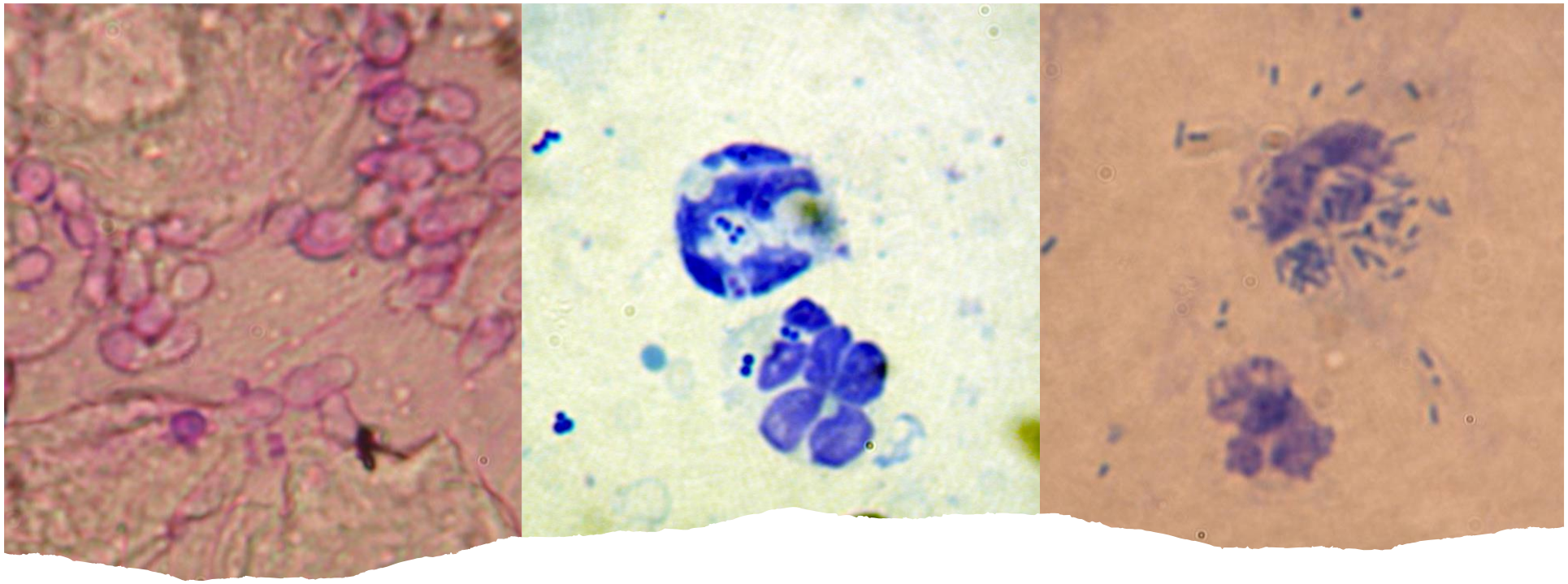
Otitis:

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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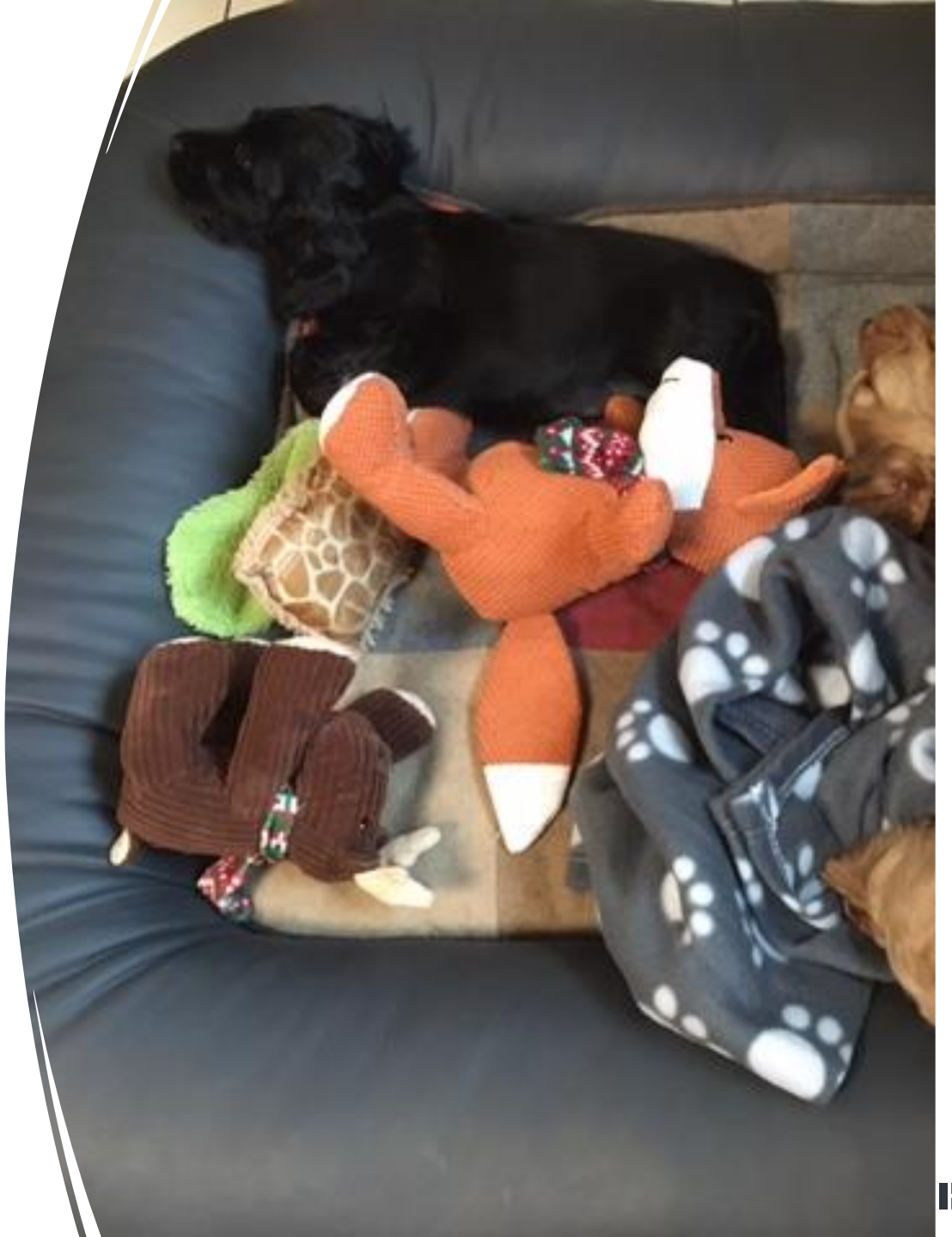
Analgesia

- 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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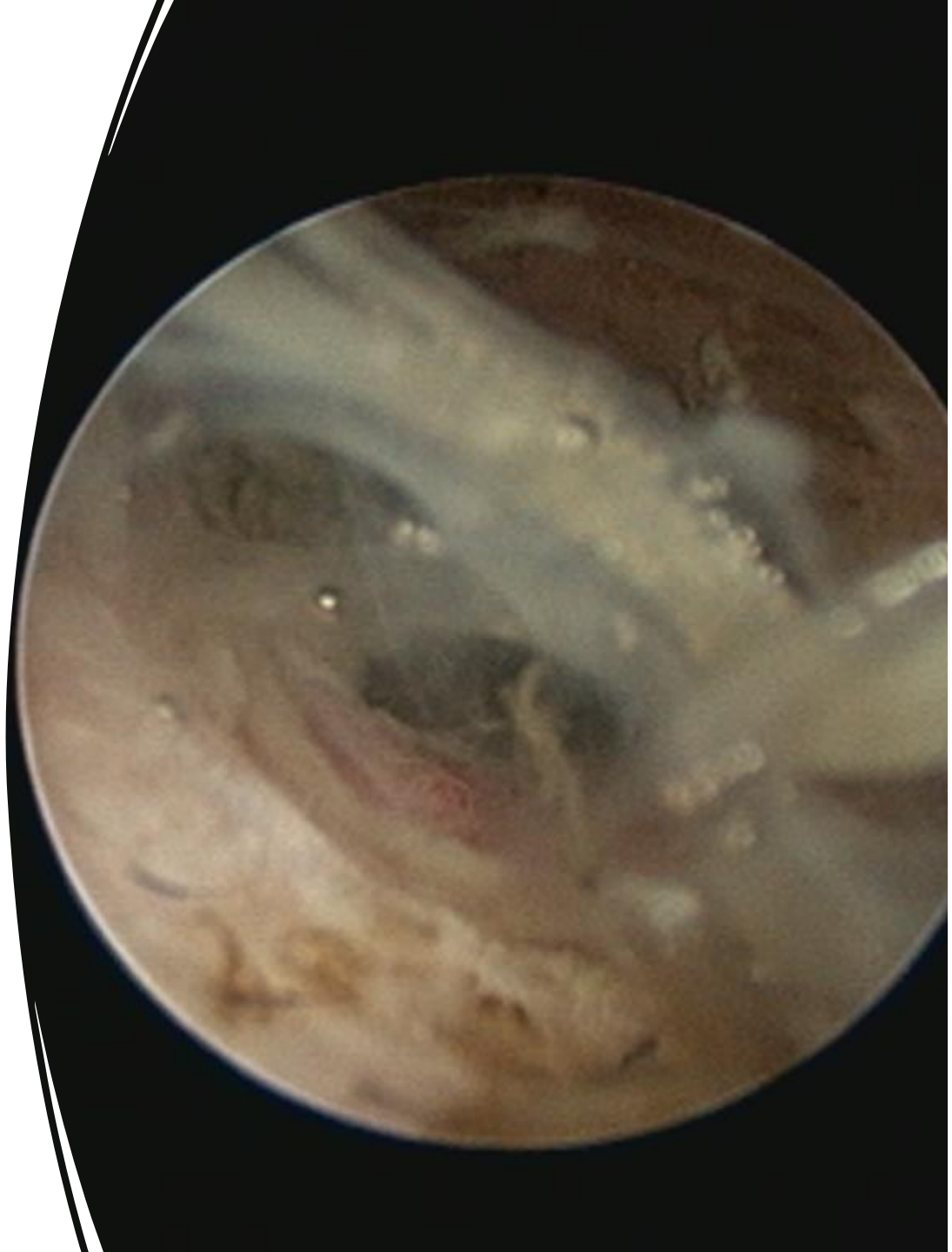
Analgesia

- 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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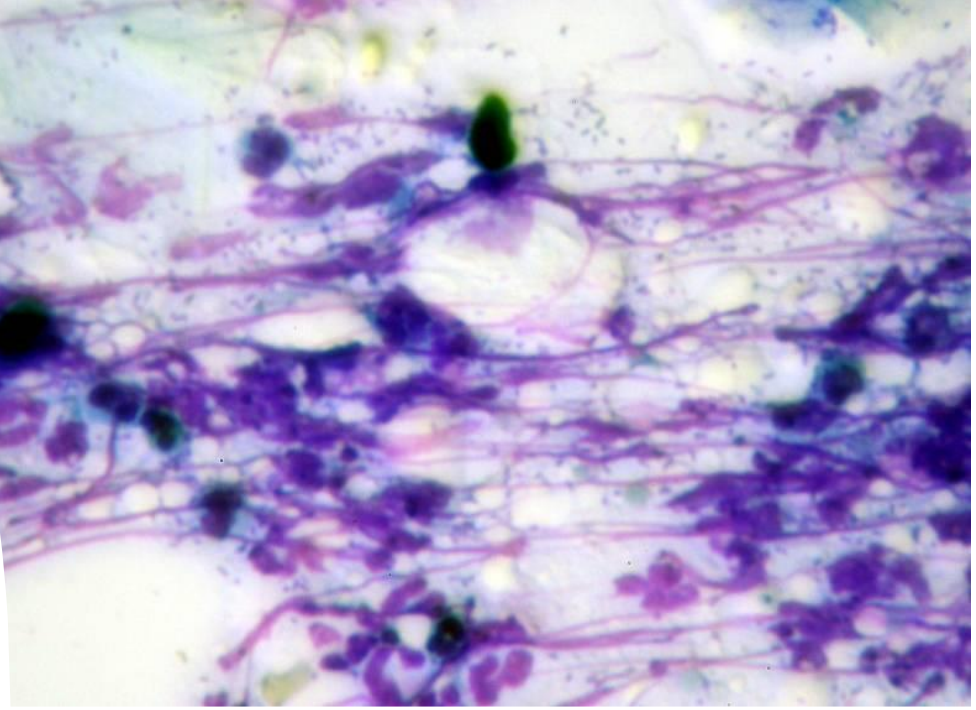
Cytology vs culture/sensitivity

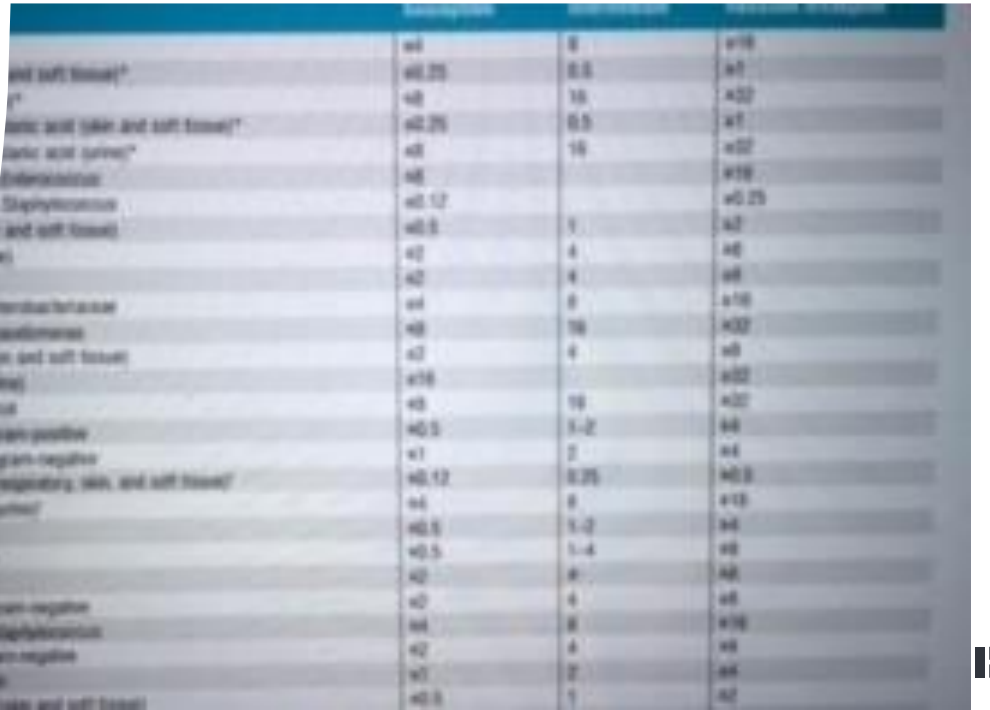


Cytology: for (almost) every case

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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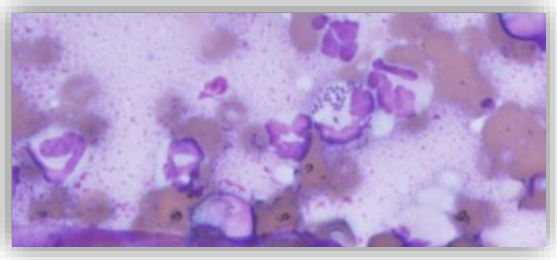
We can have discordant results …

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

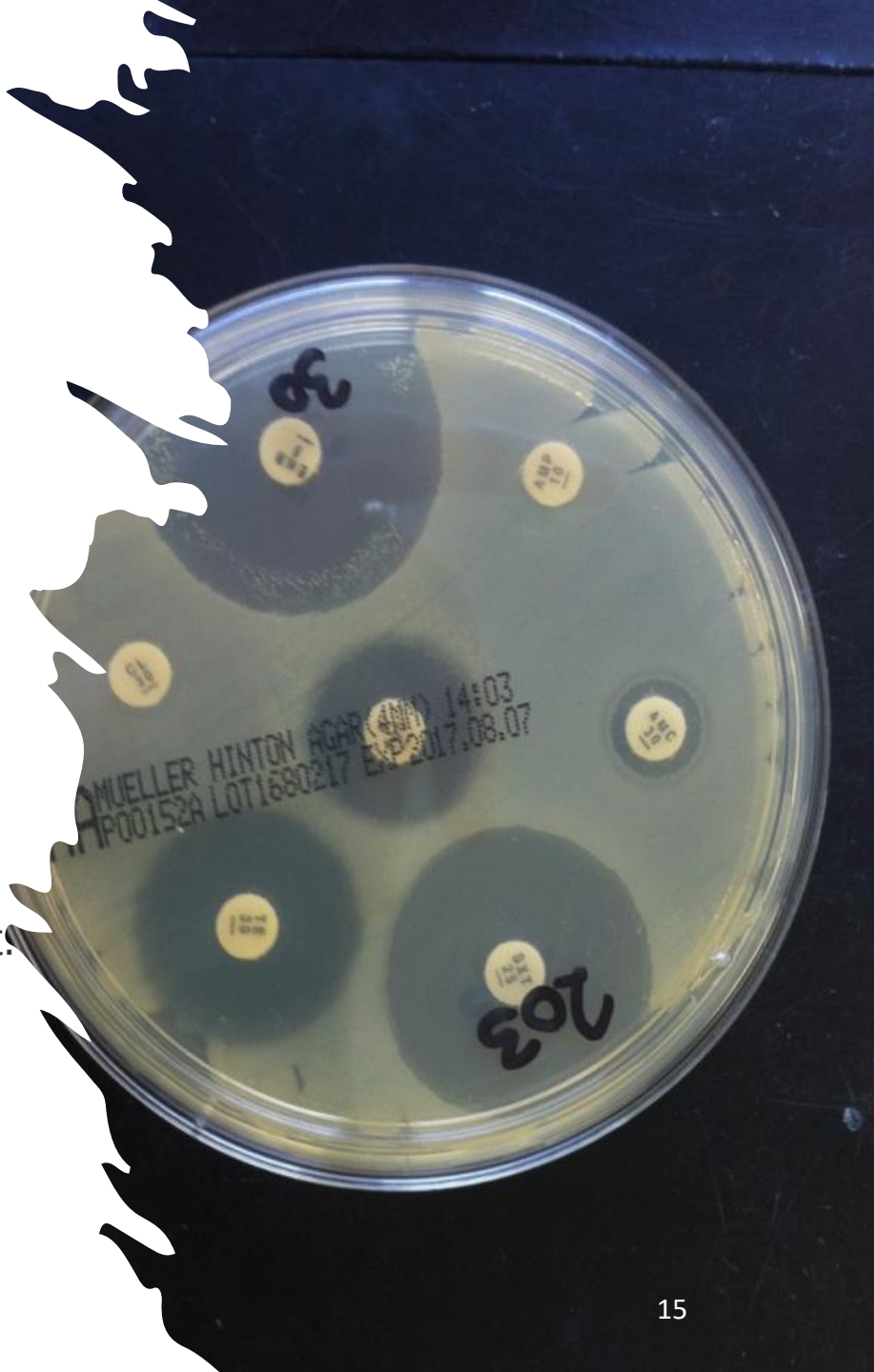
*Anaerobic Culture [a] — Moderate growth mixed anaerobes
*Site: — BOTH EARS :

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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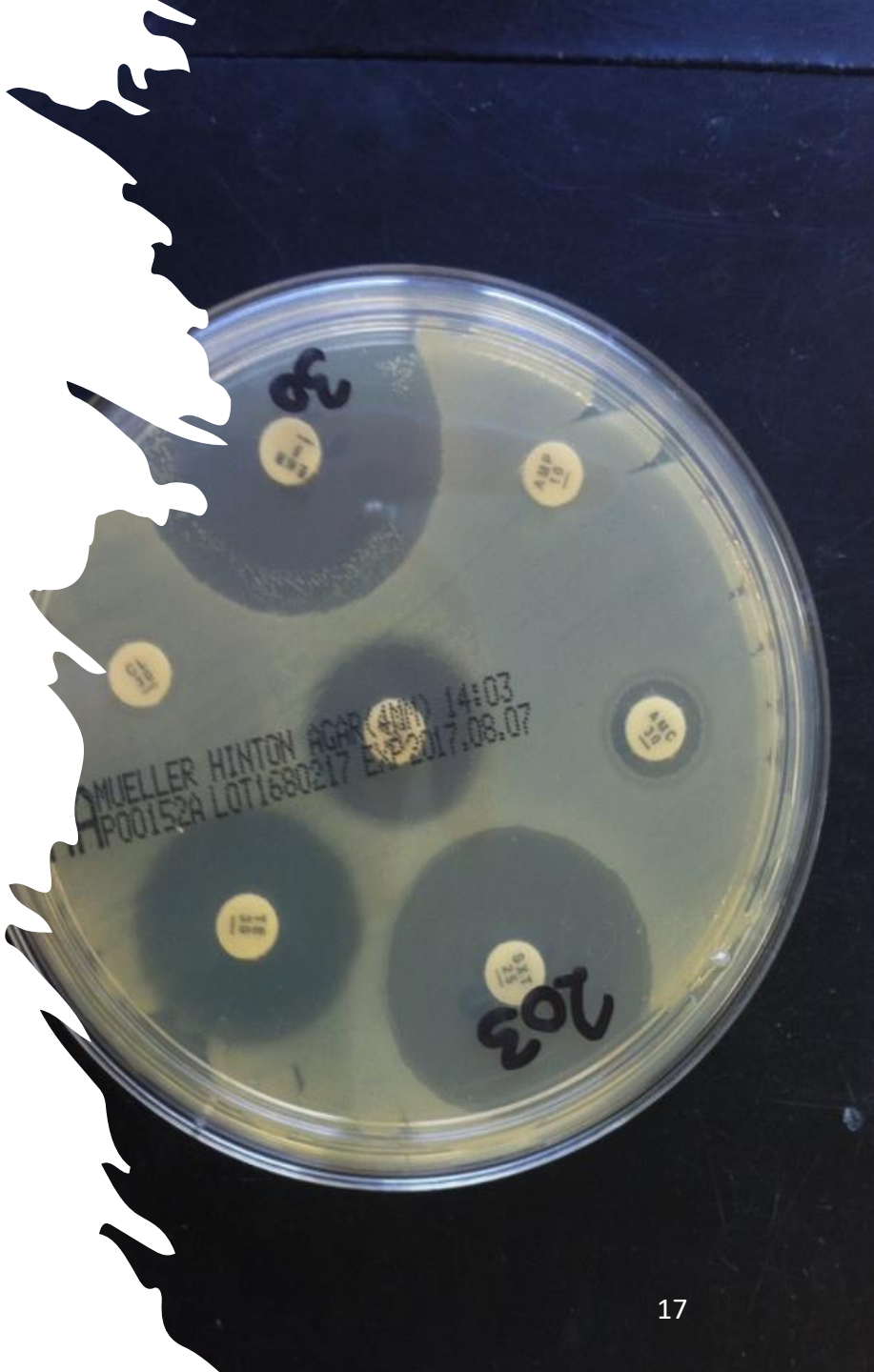
Is Culture Beneficial?

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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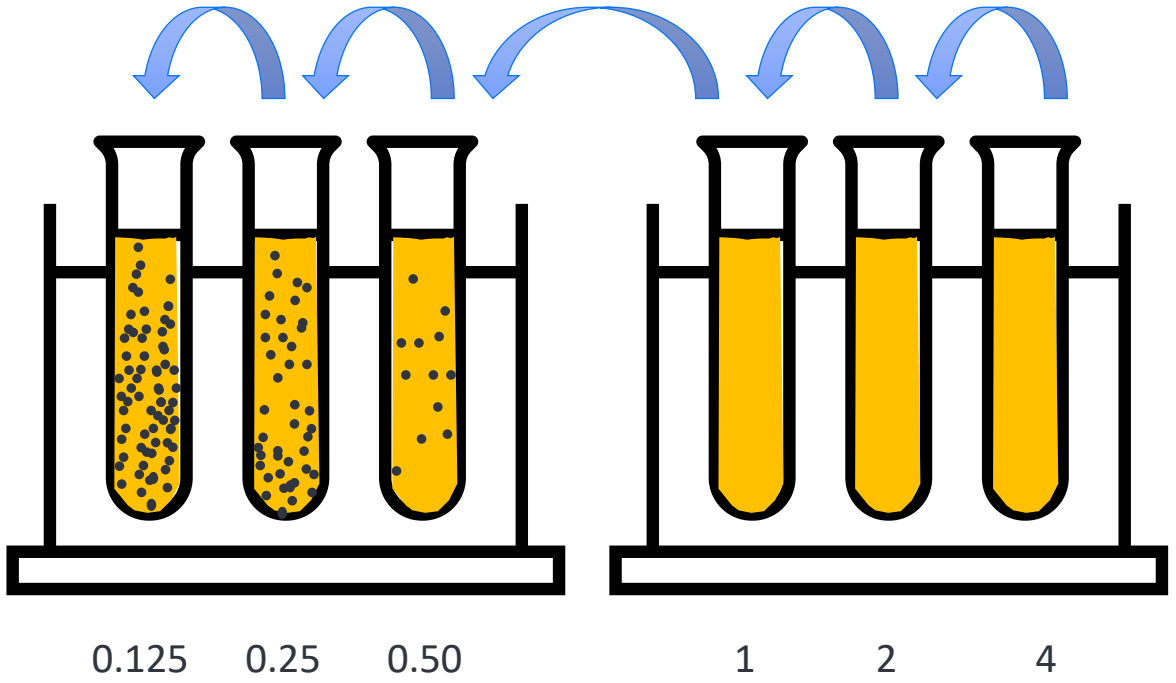
WHAT IS A MIC?

+ 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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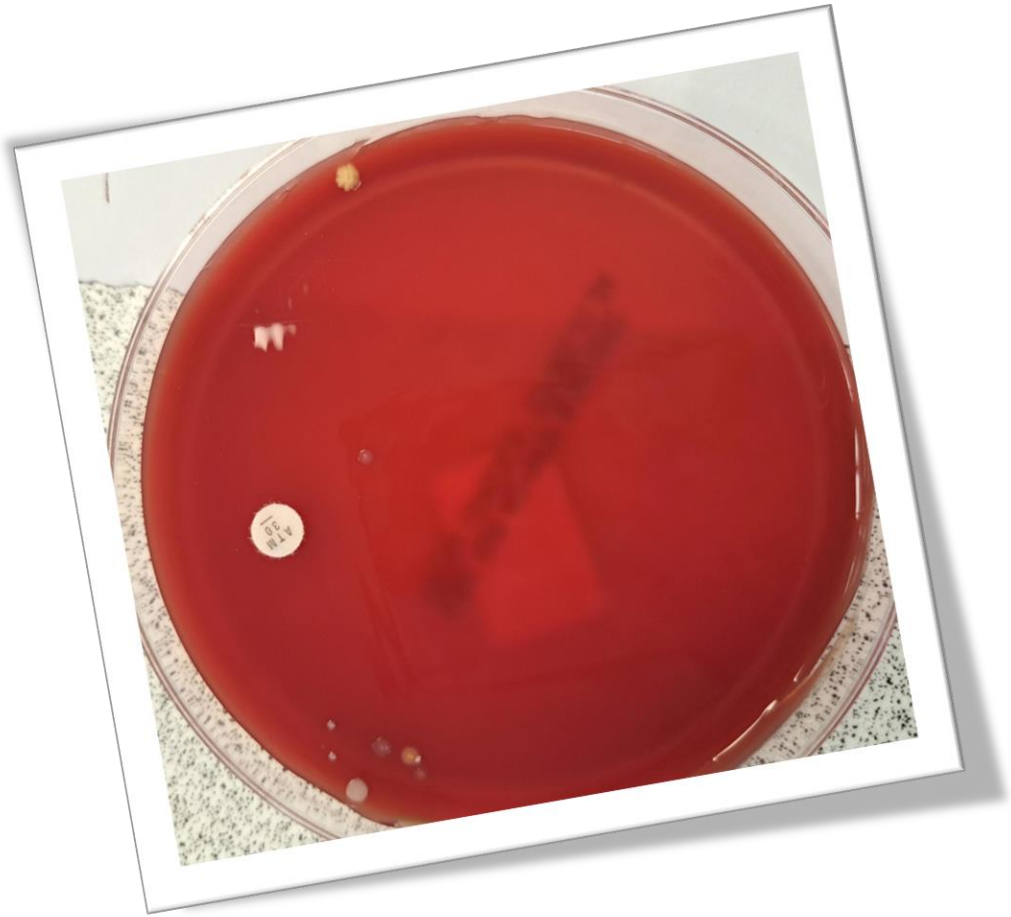
So now we can ID more bacteria

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



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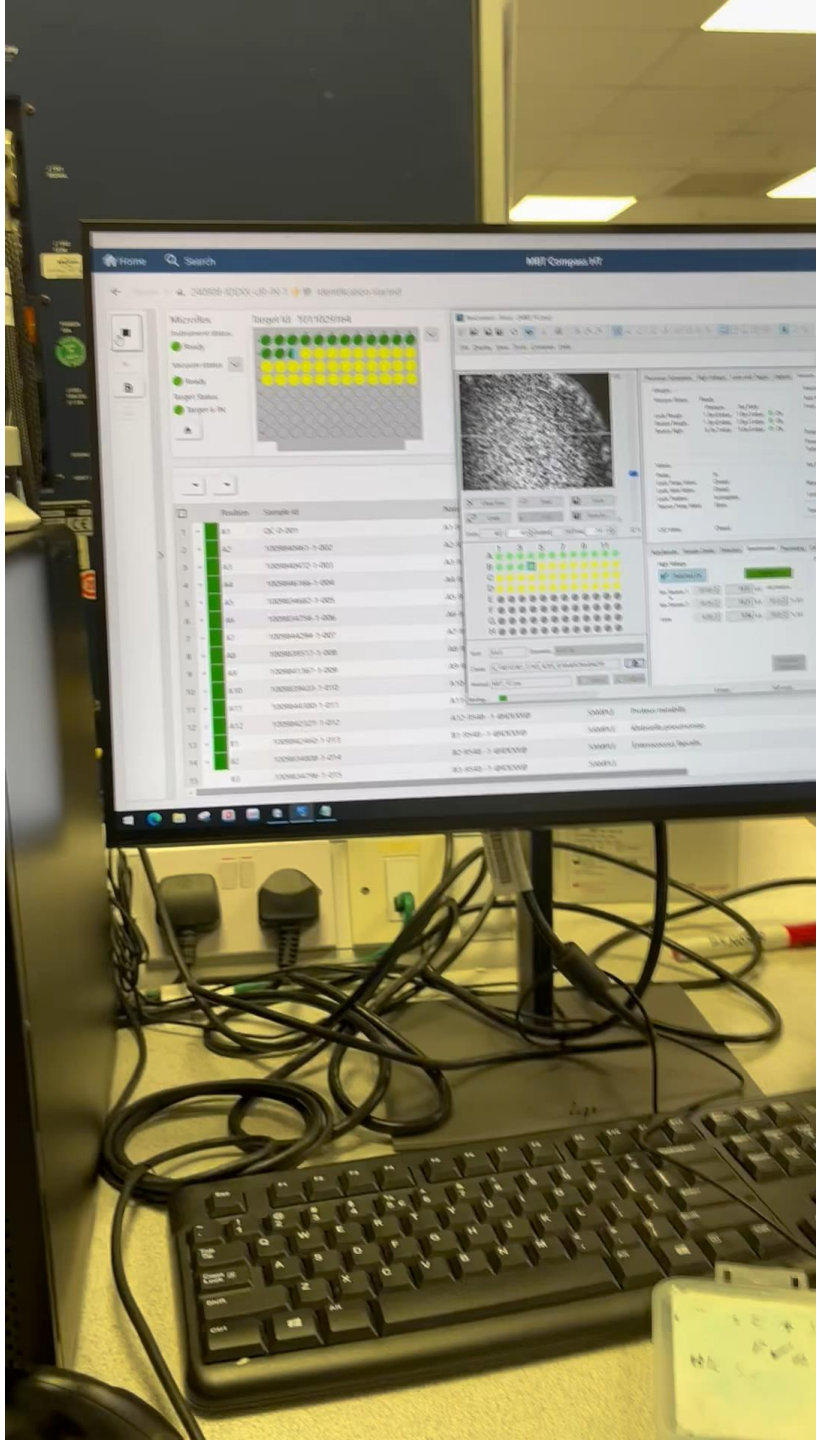
So now we can ID more bacteria

…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

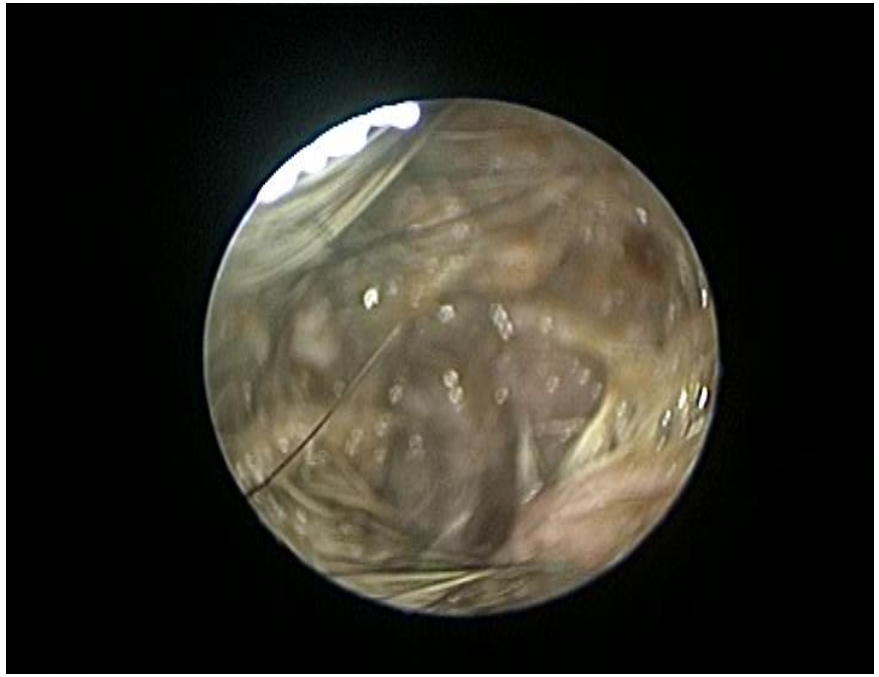
Cleaning at home → most cases

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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