Lifelong Ear Partnership

Veterinary Guidance: Fundamentals for successful otitis externa treatment

Common Cytological Findings

This article will review a typical presentation of otitis externa in a Labrador, it will run through common findings on cytological examination. For background on how and why to perform cytology please view our previous articles.

Daisy is a 1 year 1 month old female neutered Labrador that presents to the clinic with an itchy red inflamed ear. Daisy is up to date with vaccinations and anti-parasitic treatment. After a thorough history, clinical exam and otoscopic exam, cytological evaluation of the ear is performed.

A low power review of a non-stained cytological sample does not show any presence of parasites.

The image in figure 1 is gained using a stained cytological sample and a dry high-power (x40) lens.

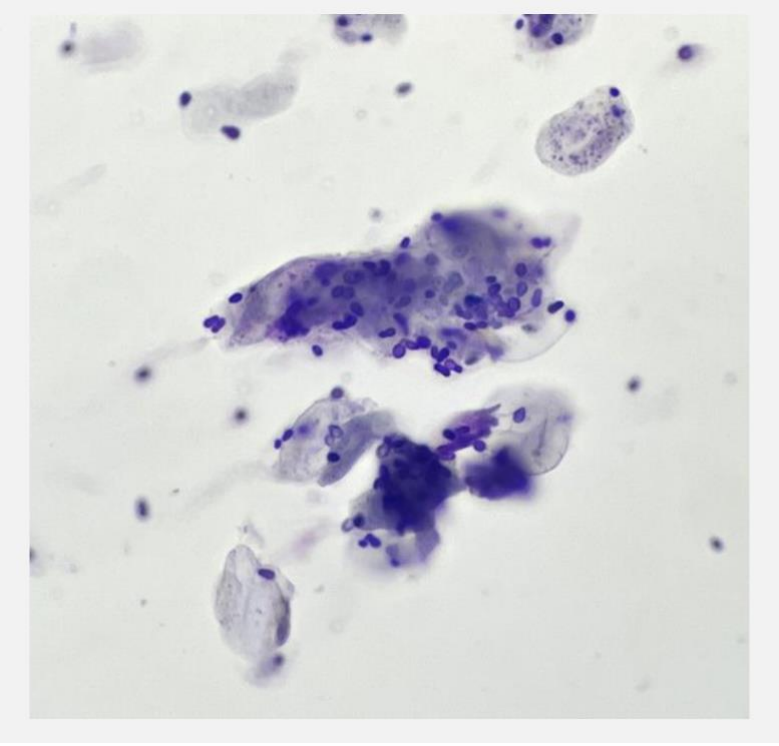

Figure 1

Question: Which organisms can you see in this image?

- Coccoid bacteria
- Rod shaped bacteria
- Malassezia yeast

Answer: This image shows high numbers of Malassezia within the ear canal. There is no bacterial overgrowth visible in this field.

Common cytological findings: Malasezzia

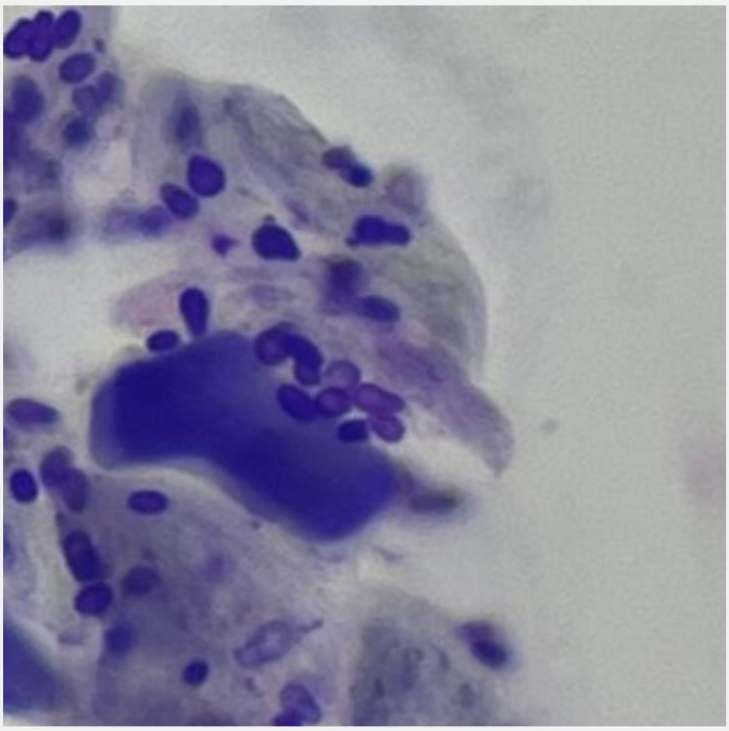

Figure 2

Malassezia are lipophilic yeasts which are a normal commensal of the canine ear. However, changes in the ear environmnet can mean this usually harmless commensal becomes an opportuistic pathogen generating an inflammatory response which presents as otitis externa.

Different dogs can react differently with some formulating an imediate 'hypersensitivity' response. This may provide an explanation as to why some canine ears can present with clinically severe otitis externa, whereas cytology may only yield relatively low numbers of malassezia organisms (Bond *et al* 2020).

Cytologically Malassezia spp have a characteristic short rounded shape with unipolar budding. This means they are often described as being 'peanut', 'footprint' or 'snowman' shaped (see figure 2).

Common cytological findings: Bacteria

It is also common to find cocci bacteria on otic cytological samples. Clustered cocci are likely representative of *Staphylococcus pseudintermedius*. As *Staphylococcus pseudintermedius* is another commensal of the ear, cytology results **must always** be interpreted in view of the clinical picture. Cocci are seen less frequently than malasezzia in cases of otitis externa but more frequently than rod-like bacteria. Saridomichelakis *et al* identified 38% cocci in comparison to 66% malasezzia and 22% rod-like bacteria on cytological evaluation (Saridomichelakis *et al,* 2007). Cocci are easy to identify as small dark purple spheres. Figure 3 shows cocci infection.

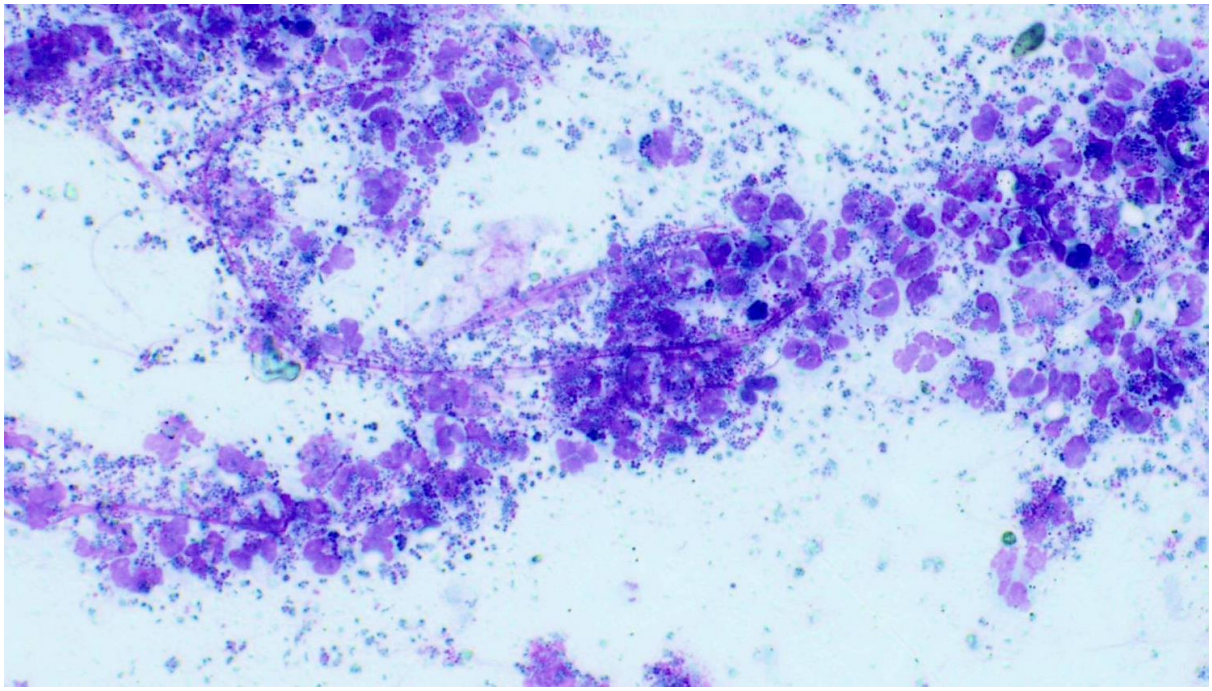

Figure 3

When rod shaped bacteria are seen on an ear cytology sample, there are many different species this could be, however, clinically, the main bacterial

species of concern is *Pseudomonas aeruginosa*. Unlike cocci and yeasts rod-shaped bacteria are not a normal finding on canine ear cytology, when rods are noted treatment is required (Pye *et al,* 2018). Unfortunately, management of cases of pseudomonas can be difficult, therefore early identification of pseudomonas infection via cytology is essential to facilitating its successful treatment.

Common cytological findings: Mixed yeast and bacteria

It is important to remember that these organisms do not exist in isolation. Although in Daisy's sample the predominant organism seen is Malassezia, it is not uncommon to see overgrowth or infections with both yeast and bacteria at the same time (see figure 4). Equally, microorganisms can vary between the left and the right ears, highlighting the importance of evaluating cytological specimens from both ears.

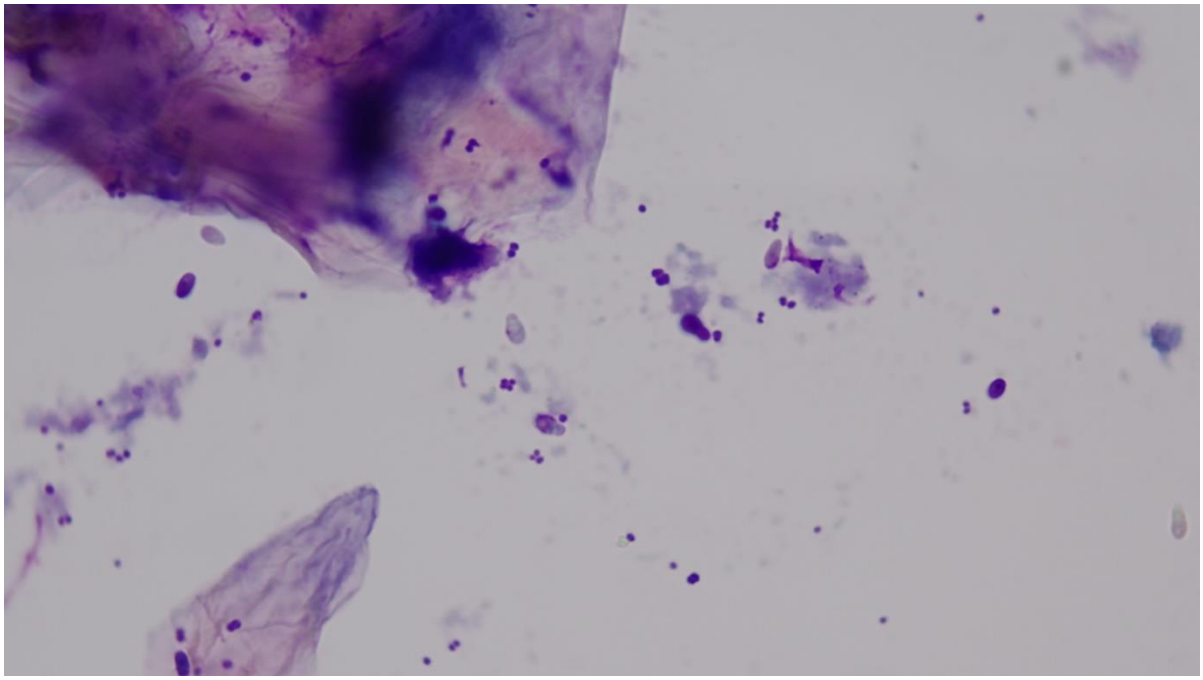

Figure 4

Figure 4 shows both yeast and cocci bacteria present in the same sample when examined under high power field (100x magnification).

Cytological findings: When does normal become overgrowth?

Given that both Malassezia and coccoid bacteria can be normal inhabitants of healthy skin, it can be difficult to determine the significance of the presence of these organisms on a cytological sample. To try to help with this there are publications which define normal vs abnormal populations.

In 2002 Ginel *et al* compared otic samples from 24 dogs with OE and 37 healthy counterparts. They concluded that mean Malassezia counts per high power dry field of ≥ 5 and mean bacterial counts per high power dry field of ≥25 should be considered abnormal.

Based on these principles, for the following figures decide which is the main organism present and whether it is normal or overgrown. Answers can be found below.

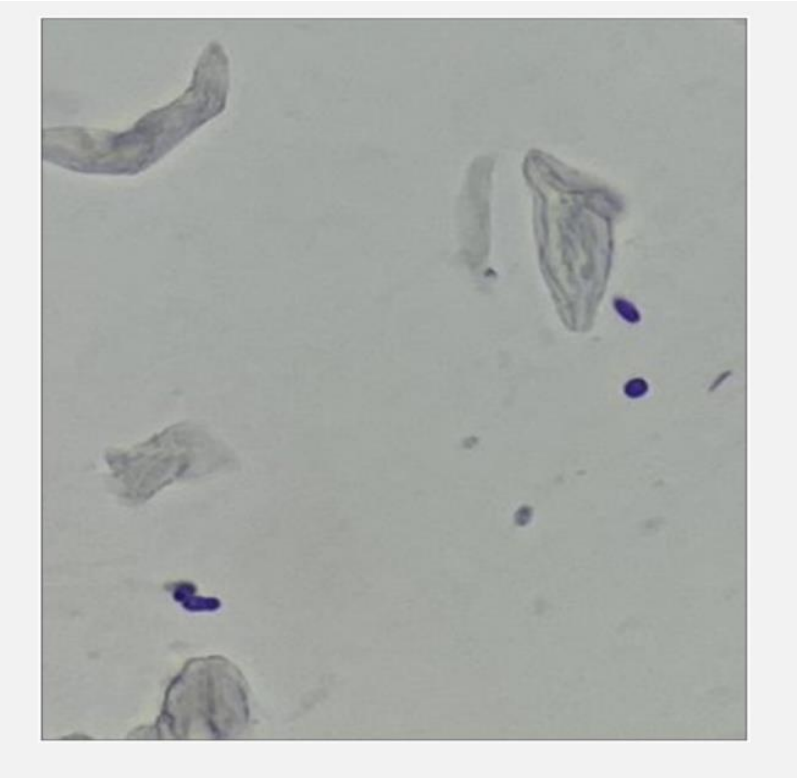

Figure 5

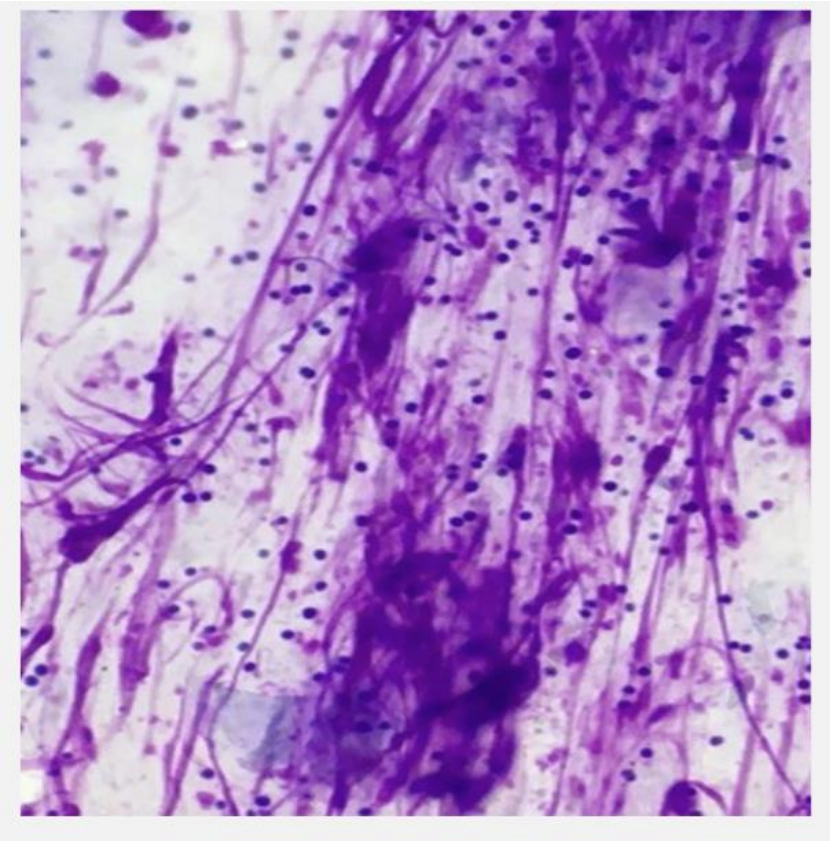

Figure 6

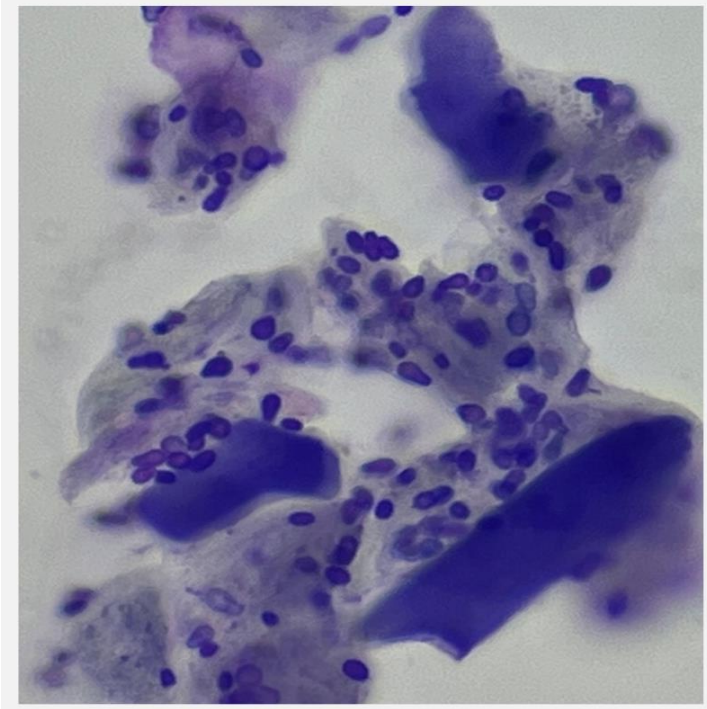

Figure 7

Answers:

Figure 5 = Malassezia normal

Figure 6 = Cocci Overgrown

Figure 7 = Malassezia Overgrown

Alternative Quantification methods

A limitation of using set cut off values for sample interpretation is that factors such as sampling technique, breed and immune status of the individual patient can all impact on whether a particular number of organisms is significant.

Score	Description
0	No bacteria, yeast, or inflammatory cells seen
1+	Occasional yeast present, but only with detailed scanning of the entire slide
2+	Yeast present in low numbers, but easily detected
3+	Yeast present in larger numbers and both quickly and easily detected
4+	Massive amounts of yeast present and both quickly and easily detected

Figure 8: Quantitative method of describing organisms on an ear cytology sample

An alternative method for quantifying organisms within a cytology sample, which has shown to be repeatable amongst differing veterinary professionals, is the use of a semi-quantitative method such as the one in figure 8 adapted from Budach and Mueller, 2012.

If possible, a standardised approach within the clinic should be developed, to facilitate this, members of the team can share scores for the same cytological samples and a practice protocol should be developed to ensure consistency.

Review figure 1 and select which score you would assign to Daisy's cytology sample. Discuss with your colleagues to see if you agree with each other.

Most importantly it is key to remember that quantification methods should be used as a practical aid in combination with the clinical picture when developing a treatment plan.

Overgrowth vs Infection

True infection can only be diagnosed where there is evidence of active phagocytosis of yeast/bacteria by white blood cells. This can be seen in figure 9. Bacteria will require 100x magnification to identify the morphological features and to identify phagocytosis by neutrophils.

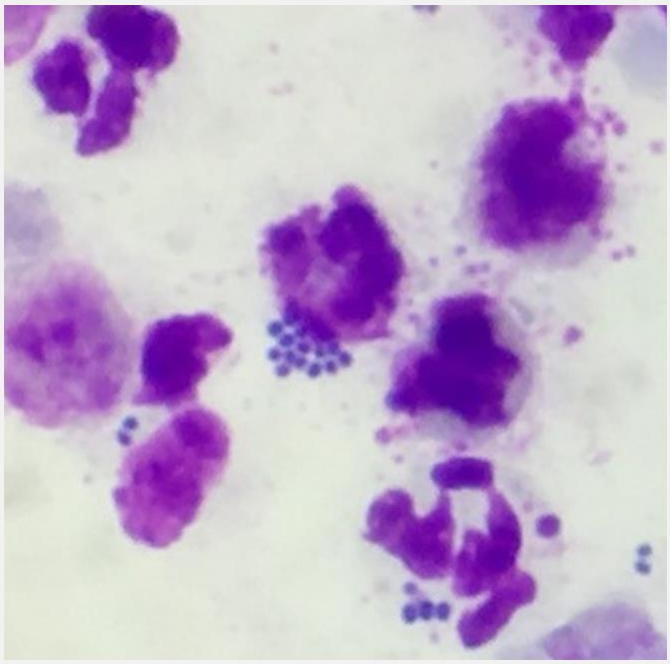

Figure 9 Image courtesy of Debbie Simpson

Inflammatory signs on ear cytology

Alongside detection of causative organisms, evidence of an inflammatory response can also be seen when evaluating cytology of otitis cases.

When the skin of the ear canal becomes inflamed, inflammatory cells undergo exocytosis and move from the blood vessels to the skin surface meaning they are detected cytologically.

Those that are most commonly seen on inflammatory cytology are neutrophils, eosinophils, and macrophages.

However, it is often the case that clinical signs of inflammation are detected in advance of cytological changes. Therefore, a lack of inflammatory changes in a cytological sample should not prevent clinical management of physical signs of inflammation displayed by your patient.

The next article will review common challenges in the interpretation of ear cytology.

References:

Bond R, Morris DO, Guillot J, Bensignor EJ, Robson D, Mason KV, Kano R, Hill PB. 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.

Pye C. Pseudomonas otitis externa in dogs. Can Vet J. 2018 Nov;59(11):1231-1234. PMID: 30410185; PMCID: PMC6190182.

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 Jun;13(3):151-6. doi: 10.1046/j.1365-3164.2002.00288.x. PMID: 12074704.

Saridomichelakis MN, Farmaki R, Leontides LS, Koutinas AF. Aetiology of canine otitis externa: a retrospective study of 100 cases. Vet Dermatol. 2007 Oct;18(5):341-7. doi: 10.1111/j.1365-3164.2007.00619.x. PMID: 17845622.

Budach SC, Mueller RS. Reproducibility of a semiquantitative method to assess cutaneous cytology. Vet Dermatol. 2012 Oct;23(5):426-e80. doi: 10.1111/j.1365-3164.2012.01075.x. Epub 2012 Jul 19. PMID: 22809453.