

Identifying fast acting, surface cleansing products for the removal of pathogenic *Candida auris*

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Abstract

In this study the ability of PHMB, benzylkonium chloride, DDAC and a commercially available spray were assessed for their ability to sanitise high loadings (>10⁶CFU/cm²) of *C.auris* from the surface of 304 grade stainless steel, using BSEN 13697:2015 as a standardised testing method against four *C.auris* strains. The results indicated that the commercial product was capable of generating the >4 Log (99.99%) reduction stipulated by the testing against all four yeast strains* within 5 minutes. The results obtained from the remaining compounds indicated the potential for strain to strain variation >4 Log reductions with both DDAC and BZK with *C.auris* 8984 only. PHMB was the least effective compound.

Introduction

Candida auris is a known pathogenic yeast which has been detected worldwide. It was first isolated in a hospital in Japan from an infected ear canal and reported as a novel strain by 2009. Since then it has shown high levels of antifungal resistance, across the 4 classes of human antifungal drugs (topical, oral intravenous, and intravaginal antifungal pessaries), which is considered rare in other *Candida* spp. This has led to blood stream infections including sepsis where cases have been fatal, to name one example. Mortality rates of *C.auris* related Candidiasis are high (30-day mortality rate of 35.2%) as a consequence of infections occurring in the highly vulnerable. As a result, one of the major risk factors within the hospital setting is that of transfer to, and persistence on, surfaces as a result of skin colonisation and shedding. Having an effective biocidal treatment for surfaces is therefore an important consideration in regards to fighting *Candida auris* transmission. ¹²³⁴

Methods: BS EN13697:2015

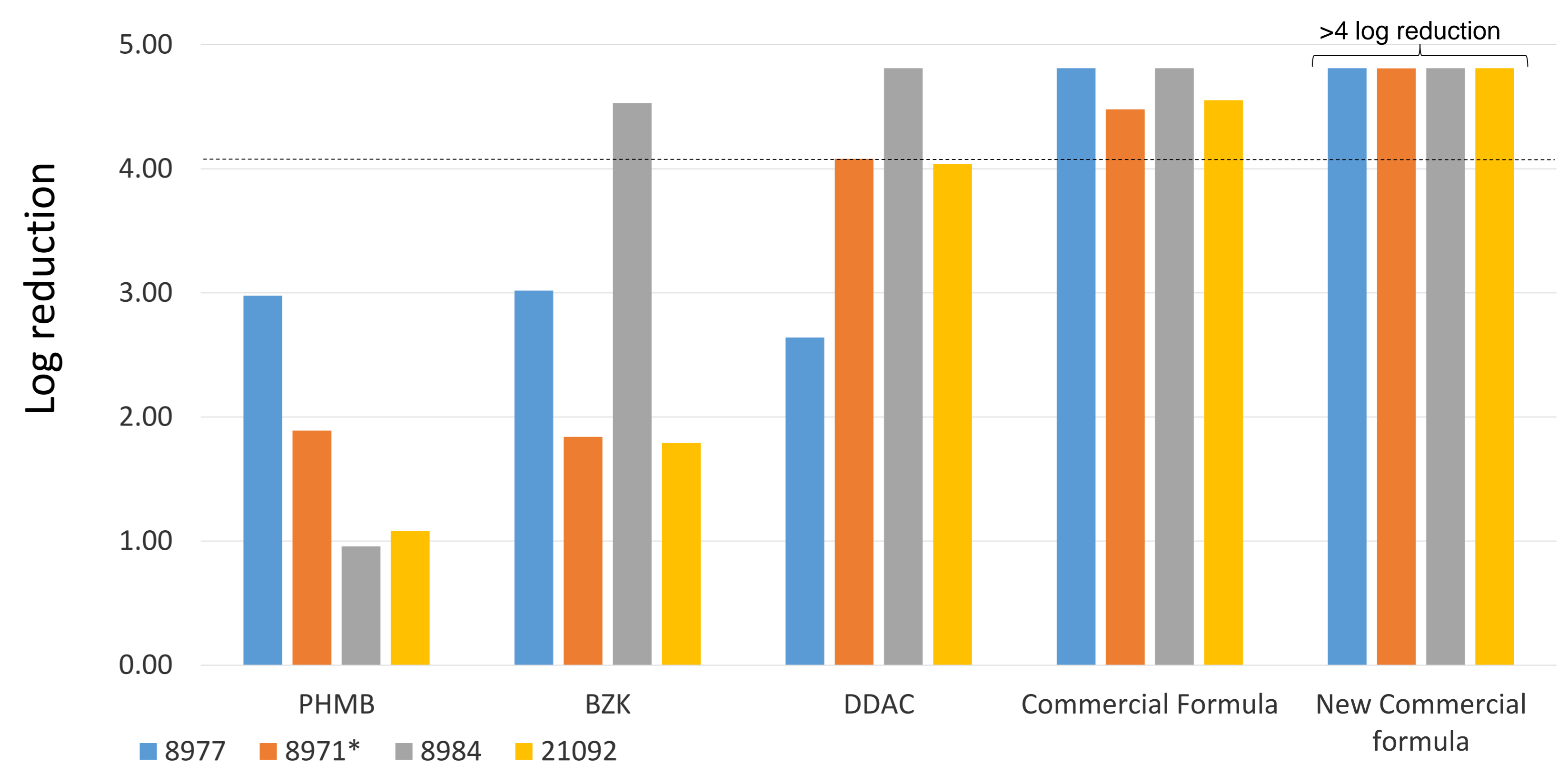
The test was carried out as specified by standardised method of BS EN13697:2015. The standard test micro-organisms was substituted with, *Candida auris*, was selected to assess yeasticidal activity. The formulations used were supplied by GAMA Healthcare Ltd for testing and which were a series of solutions containing polyhexamethylene biguanide (PHMB) 0.1%, Benzalkonium chloride (BZK) 0.45%, Dimethyldidecylammonium chloride (DDAC) 0.4%, and two of their commercial formulations which are a blend of the three chemical compounds mentioned (0.45% BZK, 0.4% DDAC, 0.1% PHMB).

Methods: *Candida auris*

The *Candida auris* clades used are 8977 which originated in South Africa, 8971 from India, 8984 from Japan/Korea, and 21092 which is a type strain.

Results and Discussion

Figure 1 Graph showing Log reduction of *Candida auris* after a 5 minute contact time against a range of compounds (n=3)



The data in Figure 1 shows that, from the formulations tested, the original Commercial Product and New Formula Commercial Product are proving to be most successful at a 5 minute contact time among the four clades (8971, 8977, 8984, 21092). The product containing DDAC is successful generating at least a 3 log reduction among 3 of the 4 clades (8971, 8984, 21092), it was not as successful on 8977. The BZK had varied levels of efficacy amongst the clades tested ranging from a 1 to 4 log reduction, however only achieving 4 log reduction against 8984. PHMB fails to reach a 4 log reduction on any of the strains tested.

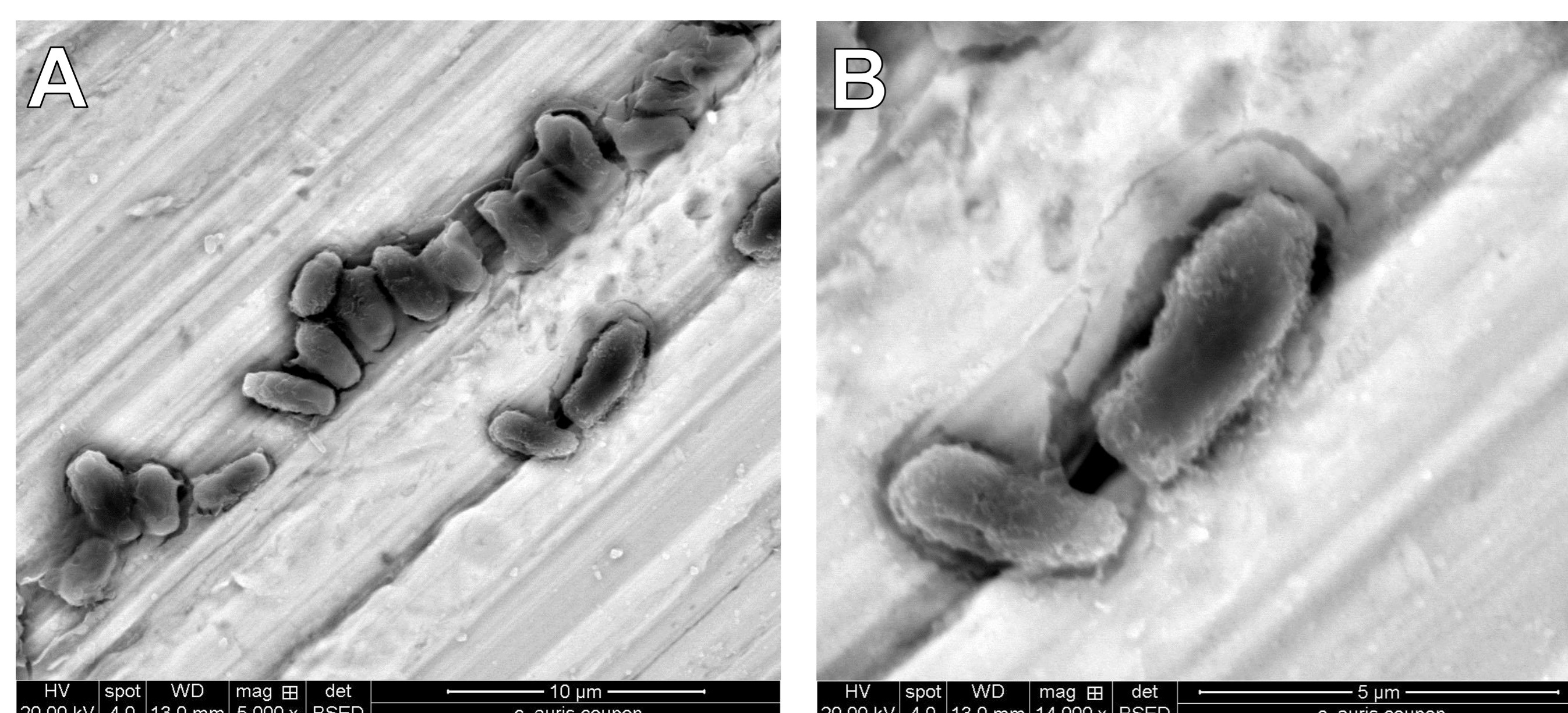
* In order to meet growth requirements in the validation controls, stocks had to exceed maximum limits and with a \pm 0.5 variance between validation controls as opposed to \pm 0.3 as defined by the standard BS EN13697:2015

Conclusion

With the data obtained and presented in this poster, there is scope for advancement in improving common biocides and antiseptics in the hospital environment. PHMB, BZK, and DDAC formulations are not efficient enough to give reliable log reductions and have shown to be strain dependant. This causes unpredictable results within the PHMB, BZK, and DDAC formulations. Thus, going forwards in regards to hospital disinfectants and their efficacy for reducing the spread of *C. auris*, the New Formulation (provided by GAMA Healthcare Ltd) has shown to be the most consistent and effective.

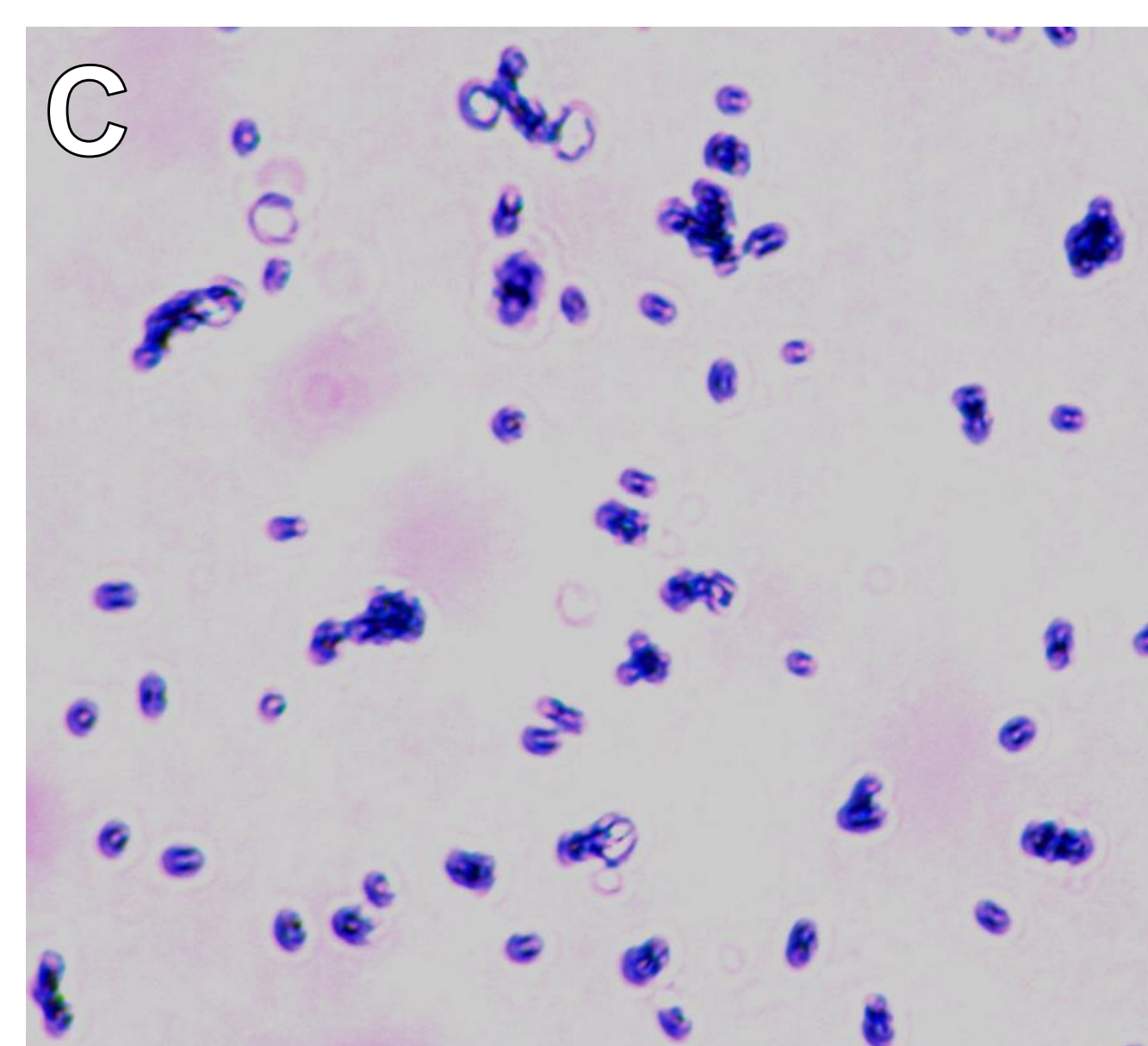
References

- Chowdhary, A., Sharma, C., & Meis, J. F. (2017). *Candida auris*: A rapidly emerging cause of hospital-acquired multidrug-resistant fungal infections globally. *PLoS Pathogens*, 13(5), 1–10. <https://doi.org/10.1371/journal.ppat.1006290>
- Morales-López, S., Parra-Giraldo, C., Ceballos-Garzón, A., Martínez, H., Rodríguez, G., Álvarez-Moreno, C., & Rodríguez, J. (2017). Invasive Infections with Multidrug-Resistant Yeast *Candida auris*, Colombia. *Emerging Infectious Diseases*, 23(1), 162–164. doi: 10.3201/eid2301.161497
- Satoh, K., Makimura, K., Hasumi, Y., Nishiyama, Y., Uchida, K., & Yamaguchi, H. (2009). *Candida auris* sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital. *Microbiology and Immunology*, 53(1), 41–44. <https://doi.org/10.1111/j.1348-0421.2008.00083.x>
- Schelenz, S., Hagen, F., Rhodes, J. L., Abdolrasouli, A., Chowdhary, A., Hall, A., ... Fisher, M. C. (2016). First hospital outbreak of the globally emerging *Candida auris* in a European hospital. *Antimicrobial Resistance and Infection Control*, 5(1), 1–7. <https://doi.org/10.1186/s13756-016-0132-5>



A) SEM Image of *Candida auris* at 5000x magnification

B) SEM Image of *Candida auris* at 14000x magnification



C) Crystal violet stain of *Candida auris* at 40x magnification

Questions or queries please contact microbiology@hud.ac.uk