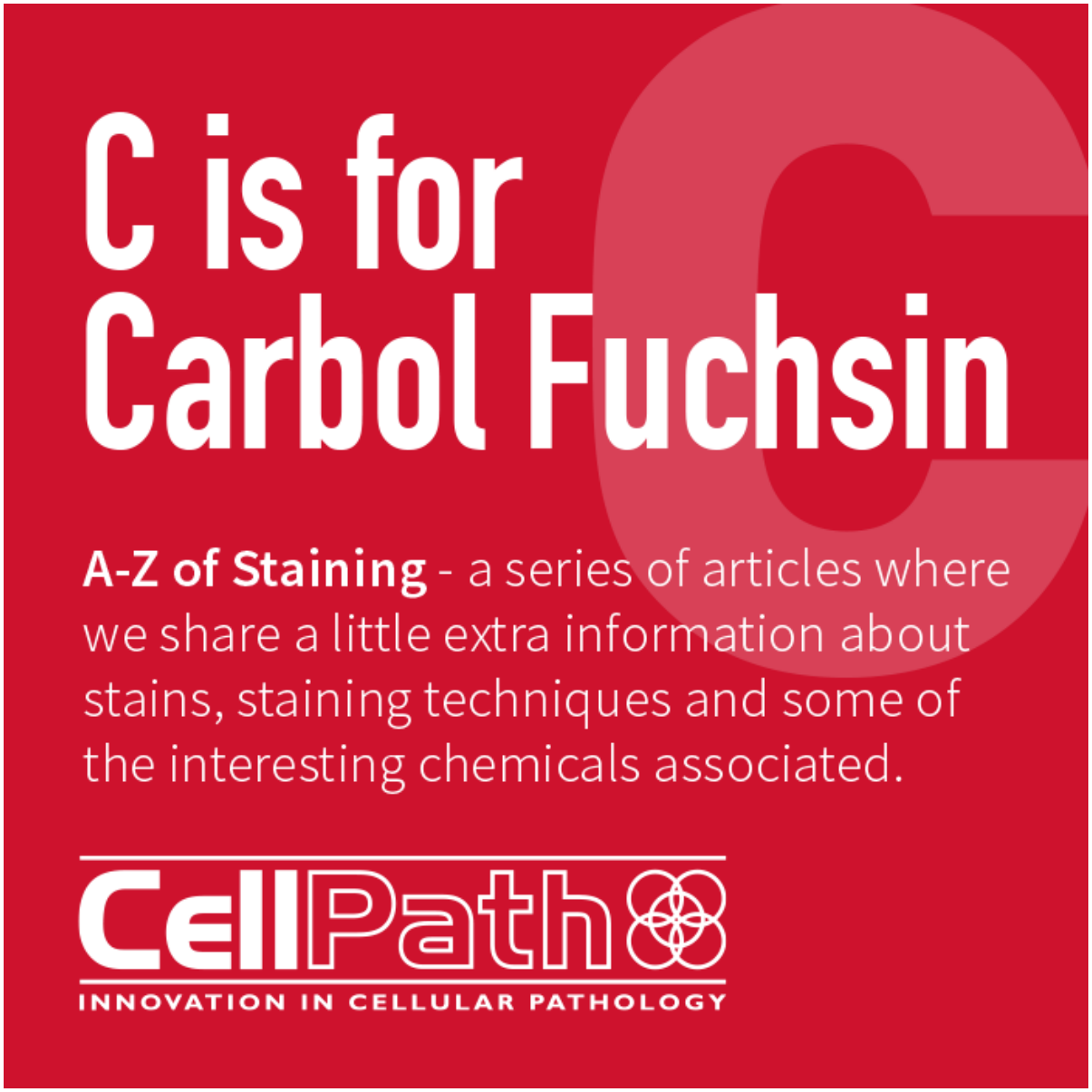

Welcome to the third post in our A-Z of staining series. Here, we discuss the letter C, that's C for Carbol Fuchsin.

Carbol Fuchsin is made of carbol and basic phenol and you may be aware of it due its use as an essential component of Ziehl-Neelsen stain. The Ziehl-Neelsen staining method is commonly used to test for mycobacterium, such as the tuberculosis causing Mycobacterium tuberculosis. The Carbol Fuchsin dye forms a yellow-brown compound in the presence of acid which is retained well by the waxy walls of mycobacteria. A rarer use for Carbol Fuchsin within histopathology

is as a test for leprosy. The leprosy causing Mycobacterium leprae is much less acid and alcohol fast than Mycobacterium tubercolis meaning a modified version of the Ziehl-Neelsen method is required. This modified method is known as the Wade-Fite stain. Though fairly similar to the Ziehl-Neelsen method, the Wade-Fite method requires peanut oil to be combined with xylene to prevent decolourisation. This modification helps to optimise stain quality as the added peanut oil protects the leprosy bacilli from the xylene, by which it is greatly affected.

In the hospital laboratory, detection of mycobacteria is likely to be the use of carbol fuchsin you are most familiar with, however scientists from multiple disciplines have trialled many interesting and alternative uses. For example, a long-established use of carbol fuchsin is to treat skin conditions. In this form the dye is known as Castellani paint and can be applied topically to many areas of the body to soothe itchiness. One study found that a difficult to treat condition Hailey Hailey Disease was soothed in a 47 year old female patient when treated with Castellani paint (Swanson et al, 2019). Dental researchers have studied the ability of three different dyes to stain the composite material used to fix teeth (Sivakumar and Sharma, 2020). They compared three dyesmethyl violet, disclosing solution and carbol fuchsin and found carbol fuchsin to be the most effective in dyeing the composite material. This knowledge will help to ensure that only composite material is removed when a tooth requires a secondary restoration.

Another important use for carbol fuchsin has been identified by a team of researchers from Costa Rica. When Giardia cysts, responsible for causing Giardiasis (an infection in the small intestine resulting in diarrheal disease), were

stained with hot carbol fuchsin they could be used as low cost internal controls in a concentration method for surface water samples (Barquero et al, 2019). The stained cyst preparation has low cost, high stability, and is suitable for both light and immunofluorescent microscopy, making it affordable to researchers in low- and middle-income countries. Within veterinary medicine, carbol fuchsin can be used to stain for parasite embryos in faeces. Das, Sreekrishnan and Kumar (2017) found that although eggs of Toxocara canis or Ancylostomum caninum were not stained by any of the colouring agents trialled, carbol fuchsin did give a reddish tint to T. canis embryos. The other colouring agents, including malachite green and writing blue ink amongst others, had varied success. Detection of parasite eggs in faecal smears using low cost dyes can aid diagnosis of parasitic infection within dogs. With established roles already cemented and a range of versatile opportunities for alternative uses Carbol Fuchsin cements itself as a useful and versatile component of your laboratory toolkit.

References

Barquero, M.S., Mora, E.M., Jiménez, L.C., Jara, E.C., Lizano, L.R., Jiménez, K.B. and Achí, R., 2019. Low-cost internal controls for detection of Giardia cysts in water samples. *Parasitology international*, 71, pp.177-179.

Das, S.S., Sreekrishnan, R. and Kumar, D., 2017. Use of colouring agents in wet faecal mounts for diagnosis of parasite eggs. *Journal of Veterinary Parasitology*, 31(1), pp.37-39.

Sivakumar, P. and Sharma, S., 2020. Use of various disclosing dyes to differentiate composite from tooth structure. *Drug Invention Today*, 13(1).

Swanson, L.A., Lehrer, M.D., Mangold, A.R., Connolly, S.M., Nelson, S.A., DiCaudo, D.J. and Swanson, D.L., 2019. Management of Hailey-Hailey disease with Castellani paint. JAAD case reports, 5(10), pp.855-856.

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