

TECHNICAL
REPORT

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Bleaching of specimens before dehydration in plastination: a small-scale pilot study using human intestine

ABSTRACT:

Objective: The aim of this study was to explore the factors that influence bleaching of specimens prior to plastination.

Materials and Methods: Four sections of formalin-fixed human intestines were divided into two groups, to compare the effects of hydrogen peroxide concentration (5% and 10%) and temperature (20 °C and 30 °C) on the effectiveness of bleaching.

Results: In the first group, a high concentration of bleach appeared to make a better appearance. In the second group, a higher temperature gave a better appearance.

Conclusion: A high concentration of bleach and temperature can both lead to a better appearance of the specimen.

KEY WORDS: Bleaching, intestine, plastination

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Introduction

Plastination is a technology that can preserve biological tissues in a life-like state for long-term preservation without unpleasant odors (Weber et al., 2007); as a result, it has now become more and more popular both for medical/veterinary teaching, and public exhibitions. Plastination technology is a technique purely for preservation, so in order to create a good specimen, it is vital to start with a high quality dissection. This is because plastination cannot make the specimen better if the quality of the dissection is not good enough in the first place, and a good specimen requires a clear structure and a natural color (Smodlaka et al., 2005). Color is a very important factor in a good specimen, because it can make the surface of the specimen more natural, and improve the appearance of the specimen. It can also give a better experience for the person who is using the plastinated specimen. Bleaching is a key technology, and is very important in enhancing the color, as it can make the color brighter (Sui and Henry, 2007). Hydrogen peroxide solution is usually used as the bleaching agent; the specimen is bleached for 2-5 days at a concentration of 10%, at a temperature of 24 °C in the hydrogen peroxide

bath. In this study, we investigated the effects of hydrogen peroxide concentration and temperature on samples of human intestines.

Materials and Methods

Four sections of formalin-fixed human intestines were used in this experiment. The samples were divided into two groups (Fig. 1); one group (Group 1) was used to study the effect of concentration of hydrogen peroxide on the color of the specimen, while the other group (Group 2) was used to investigate the effect of temperature.

In Group 1, investigating the effect of hydrogen peroxide concentration, two lengths of intestine were placed into separate baths of hydrogen peroxide at 24° C for 24 hours. The baths contained 5% and 10% hydrogen peroxide, respectively.

In Group 2, the effect of temperature on the bleaching process was investigated. Two lengths of intestine were

placed into separate baths of 5% hydrogen peroxide at 20° C and 30° C, respectively, for 24 hours.



Figure 1. The four intestinal canals were dissected, and divided into two groups prior to bleaching.

Results

In Group 1 (Fig. 2), we found that the intestine segment which was bleached in 10% hydrogen peroxide had a better appearance, and brighter color, than the other specimen, which was bleached in 5% concentration. In Group 2 (Fig. 3), the intestine segment which was placed in 5% hydrogen peroxide at 30° C had a better appearance than the specimen that was bleached at 20°C.



Figure 2. Group 1. The two intestine specimens after bleaching at 24° C for 24 hours in 5% hydrogen peroxide (left) and 10% hydrogen peroxide (right).



Figure 3. Group 2. The two intestine specimens after bleaching for 24 hours in 5% hydrogen peroxide at 20° C (left), and at 30° C (right).

Discussion

The color of an anatomical specimen is very important to the people who use it, whether it is used in medical teaching or in popular exhibitions. A good color in a plastinate means that, technically, a better result has been achieved. In plastination, bleaching is an important step before dehydration, in which the color of the specimen can be changed to enhance the appearance of the specimen. From our own experience, we use hydrogen peroxide bleaching solution of sufficient depth to completely cover the specimen (Gao, et al., 2006). The specimen is bleached for 2-5 days in a 10% hydrogen peroxide bath, at a temperature of 24 °C. During the bleaching process, the specimen should be inspected regularly, until the specimen has turned white or pink.

There are three factors that can affect the bleaching process: the concentration of the bleach, the temperature, and, in our experience, sunlight can also be a factor. Findings from the small-scale study reported here, confirmed that when the concentration of bleach and the ambient temperature are high (20%, and 30 °C, respectively) the bleaching is fast and effective. We have also found, through our own practical experience, that with exposure to sunlight, the speed of bleaching is faster. However, for those who are new to bleaching, it is advised to use low concentration and low temperature, and a longer period in the bleach solution. This is because the contrast of the tissue may be very low if the bleaching is too fast, and is not stopped in time.

Conclusion

Increasing the concentration or the temperature of the hydrogen peroxide during the bleaching process can enhance the appearance of anatomical specimens. However, this is not advised for inexperienced plastinators.

References

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