PLASTINATION AT ROOM TEMPERATURE

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INTRODUCTION

In the standard plastination procedures, originally developed and described by von Hagens (see von Hagens et al., 1987), the dehydration of specimens is normally achieved by freeze substitution in acetone at -25°C; forced impregnation is also carried out at this same, low temperature usually in a deep freezer. Since 1993 in Iceland and 1995 in Hong Kong we have been able to develop procedures which successfully allow these steps to be carried out at room temperature (15-20°C); the results of which are high quality gross anatomical specimens prepared in this way.

MATERIALS AND METHODS

We perform stepwise dehydration at room temperature in a graded series of acetone solutions of increasing concentration from 70% to 100%. After fixation in 10% formalin or a formalin/phenol/alcohol-based embalming fluid the removal of formalin and other compounds is effected by immersion in running tap water for 2-3 days. The specimens are then transferred to a 70% solution of acetone. Once the acetone level is stable, the specimens are removed to the next higher concentration of acetone solution. In this manner, the specimens are gradually brought to the 100% acetone bath when they are ready for polymer impregnation. The volume ratio between the specimens and the acetone solutions ratio is maintained at about 1:10. We have found that at room temperature, dehydration is complete for most specimens in about 3-5 weeks, which is long enough for the specimens to be completely dehydrated and degreased. This is markedly shorter than the time needed for dehydration at low temperature and there is no danger of ice-crystal formation within cells and tissues.

After the completion of dehydration and degreasing, specimens are submerged in a polymer mix of resin S10/S3 at room temperature for 3-5 days which allows the acetone to escape and the specimens to equilibrate with the polymer mix. After this initial period of equilibration, the specimens are transferred to a vacuum chamber (designed and built locally to our own specifications) and the pressure decreased slowly over a period of 3-4 weeks. The vacuum is monitored by a manometer, vacuum gauge, and the progress of impregnation is checked by observing the evolution of acetone gas bubbles from the surface of specimens. The acetone gas bubbles should rise slowly to the surface of the polymer mix.

Each working day, the vacuum is re-established and slowly decreased. At the end of the working day the vacuum is released and the chamber opened to allow the specimens to be moved around to relax them and facilitate further equilibration with the polymer mix. Over time, the pressure is gradually lowered to about 1-3 mm Hg (0.13-0.40 kPa) and the vacuum maintained for 3-4 more days until no more acetone gas bubbles appear, which indicates that the polymer mix retains a much lower viscosity than at -25YC, permitting faster penetration, and acetone gas bubbles can escape more easily.

DISCUSSION

Omitting the requirement for substitution and impregnation at low temperature reduces capital costs and reduces the likelihood of explosion should acetone vapor be generated in an enclosed space in a freezer which is not designed for complete spark-proof operation. More than 300 large and small anatomical specimens have been plastinated in this way and they have remained in good condition and with stable color for up to three years. In our experience the shrinkage of specimens has been less than 5%.

REFERENCE

von Hagens, G.; Tiedemann, K.; Kriz, W.; "The current potential of plastination." Anatomy and Embryology 175:411-421, 1987.

SUMMARY

Our current practice in plastination techniques at room temperature is described. The practice is inherently safer than the traditional method and produces durable specimens with stable color, the shrinkage of which has been less than 5%.

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