PRINCIPLES OF PLASTINATION - DEHYDRATION OF SPECIMENS

Robert W. Henry
College of Veterinary Medicine,
The University of Tennessee,
Knoxville, TN, USA.

Specimens to be plastinated are often moist which necessitates the removal of tissue fluid **(dehydration)** before forced impregnation or plastination can be carried, out. Dehydration removes the specimen fluid (water), as well as, some fat. The tissue fluid is replaced with an organic solvent. To be a dehydrating agent, the solvent must be miscible with water and may consist of a variety of chemical structures (ketones or alcohols). Either alcohol or cold acetone may be used as a dehydrant for plastination. Methylene chloride (chlorinated hydrocarbons) is not a dehydrating agent. Shrinkage accompanies dehydration and may be minimized by: 1) using cold acetone (known as freeze substitution) or 2) starting dehydration in a lower % of ethanol. With freeze substitution, the ice in the specimen is replaced by the dehydrating liquid (acetone). It is essential to use an adequate volume of dehydrating liquid (either cold acetone or ethanol). The recommended ratio is: 10 volumes of dehydrating fluid to 1 volume of tissue. It is necessary to monitor the concentration of the dehydration fluid at weekly intervals. Once the fluid content has remained similar for a few days, the specimen is moved to a fresh dehydrating solution. **Cold ACETONE** (**-15° to -**25°C): usually has been considered the best method of dehydration. However, dehydration with acetone must be carried out in the cold and not at room temperature; warm acetone will cause excessive shrinkage and complete dehydration may not occur.

Disadvantages: must be done in a deep freezer and acetone is a hazardous material.

Advantages: Minimal shrinkage; Acetone serves as the intermediary solvent; Superior specimens are produced; Dehydration time is shorter and previously used acetone (70% - 90%) maybe used to commence dehydration. **ETHANOL:** Specimens are started in a low % of room temperature ethanol (50%), allowed to equilibrate and later placed in ascending concentrations of ethanol, ie: 60%, 70%, 80%, 90%, 100%. Carried out at room temperature; therefore, less deep freezer space is necessary. Specimens can be stored in 70% ethanol. Specimens from embalmed tissues, containing standard embalming fluids, are cleansed of the polyvalent alcohols (glycerin or ethylene glycol) or phenols. Specimens are defatted.

Disadvantages: excess shrinkage and the dehydrated specimens must be saturated with intermediary solvent [acetone or methylene chloride (dichloromethane)]. Why? The saturated vapor pressure (boiling point) of ethanol is too low to be slowly extracted at -15°C and allow concurrent influx of the silicone polymer. As for the choice of intermediary solvents, methylene chloride may be more cost and time efficient, but it is more hazardous. An inherent problem with using acetone is that the specific gravity of ethanol and acetone are similar (0.79) making it difficult to determine when the ethanol has been totally replaced with acetone. When specimens are totally dehydrated they are ready for impregnation with the silicone polymer mixture.

RECLAMATION of ACETONE by FREEZE VACUUM DISTILLATION

Janick, L.M. and R.W. Henry,
College of Veterinary Medicine
The University of Tennessee, Knoxville, USA.

SUMMARY

Reclamation of large volumes of acetone by freeze-vacuum distillation was practical, simple, economical to perform, and environmentally wise. The apparatus, constructed primarily from items found within a plastination laboratory, proved to be effective for the distillation of the various percentages (45 - 94%) of acetone used for conducting this study. Three liter aliquots, of known acetone content, were distilled over a six hour period and resulted in reclamation of 94 to 98 percent acetone. Further distillation, of the remaining lower percentage acetone (2 - 20%), provided residual solutions to as low as 1 percent acetone. Freeze-vacuum distillation has served to