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SPECIAL FEATURES AND ADVANTAGES OF FREEZE-DRYER PLASTINATORS

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INTRODUCTION

Anatomists at the College of Veterinary Medicine at North Carolina State University first came into contact with plastinated specimens in late 1983 and immediately decided to incorporate the technique into their teaching program. As has been the case with many other plastinators, the first Step was to attend the next, regularly scheduled International Conference on Plastination (San Antonio, 1984). It was soon evident that the greatest difficulty to overcome for any beginning plastinator is the building of the actual plastination unit.

Following the Conference, Dr Harmon Bickley, of (at that time) The University of Texas Health Science Center at San Antonio, was called and asked a few questions about the unit being used there. Probably the most influencing bit of Information passed on by Dr Bickley was the comment that he would try to find an old freeze-dryer vacuum chamber if he was starting again to assemble such a unit. This was reasonable in that a freeze-dryer chamber is specifically built for vaccum. It is cylindrical (for greatest strength), well-iealed and fitted with a gasket and a heavy door.

It was then realized that the cooling System of a freeze-dryer could be used since it is specifically intended to maintain the temperatures needed for plastination. Also, a freeze-dryer comes equipped with a vacuum pump, capable of reaching the 5 microns of pressure desirable in plastination.

It gradually became apparent that there would be no need to disassemble a freeze-dryer to build a plastinator. All that was necessary to convert one to the other was to simply add a valve that could be used for vacuum cpntrol. A bonus not anticipated at the time was that, having done this, the freeze-drying capability of the machine would still be intact.

Having used a commercial freeze-dryer (Virtis Co. Model 220-PR) as a plastinator for the past three years, the author feels that scientists at this institution have an unusual opportunity to communicate Information that might be helpful to others who are either starting plastination or considering a change of equipment. The purpose of this article is to discuss the Special features and advantages of the freeze-dryer plastination apparatus.

OBSERVATIONS

1. Commercially available freeze-dryers come equipped with vacuum pumps of sufficient strength and capacity for plastination and have refrigeration Systems intended to hold the temperatures needed.

2. The only modification needed to give a freeze-dryer plastinating capability is the addition of a valve to the vacuum line. (Our

plastinator was "built" in 1/2 hour at a cost of $23.00).

3. Many individuals planning to start plastination have access to freeze-dryers and need not purchase a new set of equipment. For example, plastination was begun without delay by the Animal Science Department of this institution because a freeze-dryer was available and not being used. State and university property storage agencies often are able to provide surplus freeze-dryers (sometimes without charge). These may be as good as new or in need of minor repair. Even vacuum pumps are common surplus items.

4. Freeze-dryers (and plastinators) are are commercially available. These units are professionally assembled and guaranteed. Such machines cost about the same as might be spent assembling a more makeshift apparatus and often have a larger vacuum chamber. Acquiring a commercially available machine often results in a substantial savings of time and effort. Table 1 is provided as a means of comparing cost and capacity.

5. Commercially available freeze-dryers are easily modified to a top-load position if desired or, alternatively, it is not expensive to fabricate an aluminum box to fill the available space. The box used at this institution cost $80.00 and has a volume of about 2 cubic feet. It, has proven quite serviceable.

6. Most commercially available plastination devices have vacuum chambers of 2-4 cubic feet. Although fully capable,of serving as a, primary infiltration apparatus, such units also make ideal secondary, plastinators that can be devoted exclusively to an advanced process such as sheet plastination.

7. Freeze-dryer-derived plastinators take up little floor space, a major concern in most laboratories. The unit used by the author occupies a space only 24x34 inches (less than 6 square feet) and still has a 3.5 cubic-foot vacuum chamber (in the form of a cylinder 18 inches in diameter and 24 inches deep). Another consideration is that they also are equipped with wheels and can be easily moved.

8. A converted freeze-dryer serves not only has an exceptional plastination unit (The one used by the author has operated continuously for 3 years without a single problem.) but also provides a second major function for no additional cost. The author has freeze-dried many anatomical specimens, as well as several rattlesnakes, turtles, birds and small mammals WHILE plastinating laboratory specimens.

9. A major advantage of the converted freeze-dryer; is that the ice sludge which tends to form on the surface of the impregnation polymer is no longer a problem. A freeze-dry unit removes and traps moisture. This is due to the only real difference between a freeze-dryer and a plastinator, the incorporation of a condensing chamber. This condenser usually operates at -55 to -60 degrees Centigrade and accumulates the sublimated water. Impregnation is usually begun with the condenser turned off and the freeze-dryer functioning as any other plastinator. If turned on early during impregnation, the condenser will accumulate acetone, unless pressure is reduced very slowly. After the first few days, the condenser is turned on and begins to scavenge water. Not only does this keep the silicone impregnation mixture cleaner it also permits impregnation with less perfect specimen dehydration.

10. Even the least expensive freeze-dryers have lighted vacuum chambers, making bubble monitoring very easy. ,,, There is no need to open a freezer to view the impregnation since the heavy acrylic door is completely transparent. Due to the depressed solvent activity of acetone at this very low temperature, the door is not affected by its vapor. The unit used by the author shows no sign of solvent damage after 3 years of continuous use.

SUMMARY

The typical freeze-dryer can be considered a plastinator with a condenser added. The presence of the condenser, although not essential for plastination, actually improves the performance of the unit as a plastinator. In fact, with the addition of a valve for vacuum control, the freeze-dryer becomes a superior plastination apparatus. Freeze-dryers are often available in departments considering the establishment of a plastination laboratory. They also may be found in state or university surplus warehouses. The author and his colleagues would not hesitate to recommend the purchase of a new freeze-dryer or plasatinator in lieu of collecting and assembling separate components. This may amount to a considerable savings in money, time and effort.

TABLE 1.
SPECIFICATIONS OF COMMERCIALLY AVAILABLE
FREEZE-DRYER/PLASTINATORS*

Chamber Size (dia x length, inches)	Chamber Volume (cubic feet)	New Cost ($ American)
15 x 14	1.4	3,415
24 x 24	6.3	7,870
36 x 66	38.9	16,700

The first unit is abit larger than some in current use which cost almost twice as much to assemble. The second is suitable for general use. The third has a chamber large enough for four standing adults and would probably tempt only a few beginning plastinators.