Brief Notes

Knives of High Silica Content Glass for Thin-Sectioning. By MARY ANN GAVIN AND BOLIVAR J. LLOYD, JR. (*From the Ophthalmology Branch, National Institutes of Neurological Diseases and Blindness, and the Laboratory of Physiology, National Cancer Institute, National Institutes of Health, Public Health Service, United States Department of Health, Education, and Welfare, Bethesda.*)*

The use of glass knives in cutting sections for electron microscopy has been a standard procedure for several years. During this period various modifications in methods of scoring and breaking knives have been recommended, as well as types of glass which can be used (1, 2). Knives of high silica content glass were first suggested by Eaves and Flewett (1953) who reported that such knives retained a sharp edge longer and gave generally better sections than soft glass (3). At least two kinds of high silica glass are commercially available in this country, pyrex brand and vycor brand plate.[1]

Both types of glass were used to section muscle, lens capsule and epithelium, lens fibers, *Limulus* eye, and residues obtained from lens fractionation. All tissues were fixed with buffered, 1 per cent osmium tetroxide and embedded in a mixture of butyl- and methyl-methacrylates in the ratios of either 9:1 or 4:1. The plastic was polymerized at 65°C. either in a nitrogen atmosphere (4) or in a conventional incubator. Since vycor brand glass proved to be superior to pyrex in sectioning qualities, *i.e.* it produced fewer striations, and had a longer lasting cutting edge, the following discussion concerns this type of glass only.

Vycor glass can be obtained in 6 inch x 6 inch sheets, ¼ inch thick, with polished edges. In the laboratory, such a plate is cut into three strips, each two inches wide. These strips are then scored and easily broken according to the method of Cameron (2). However, in order to obtain a less pronounced curvature of the edge, the knives are broken between two glazier's pliers rather than with a heated glass rod.

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[1] Vycor glass 7900 is 96 per cent silica glass. It is highly resistant to scratching, bruising, and is comparable to fused quartz in its mechanical strength. Pyrex brand glass is a borosilicate glass. Its abrasion resistance is three times as great as ordinary plate glass. (Specifications given by Corning Glass Works, Corning, New York).

It has been observed that the angle which forms the cutting edge is of critical importance. The optimum is between 40° and 50°. A more acute angle produces numerous striations whereas a blade with a greater angle very often gives rise to pronounced compression phenomena. With a vycor glass knife, broken in the prescribed manner, it is possible to prepare ribbons of adequately thin sections that exhibit blue-gray interference colors. Prior to mounting in the knife holder, adhesive tape is affixed to the knife to form a trough which is filled with distilled water. In order to maintain the liquid at an adequate level, the angle at the knife edge must be within the optimal range. If the knife is used in a Porter-Blum microtome, it should be inclined so that the angle formed between the front side of the knife and the plane of the passing specimen does not exceed 10°.

It is difficult to state the advantage of the vycor glass knife over other kinds of glass in quantitative terms because the conditions of sectioning vary from one block to another even when the same type of tissue is used. However, after testing various kinds of glass alternately, there is a definite impression that the vycor knife retains its sectioning properties over a considerably longer period than any other available glass. Occasionally, it was even possible to section several blocks with the same knife without reducing the quality of the sections. Therefore, it seemed advisable to use vycor glass knives exclusively, and this has been done with satisfactory results for about 9 months.

REFERENCES

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