TECHNICAL NOTE

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An Aluminum Template for Casting Agarose Gels

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ABSTRACT: Time-consuming construction and repair often is necessary for gel templates composed of glass plates and plastic strips. An aluminum template was developed to overcome these problems. It is sturdy, permanent, and produces agarose gels that yield linear, well resolved, and reproducible protein profiles. Further, agarose gels of varying thicknesses (1 to 3 mm) can be cast with this template.

KEYWORDS: forensic science, castings, templates, gel casting, aluminum templates, agarose, electrophoresis, glyoxalase I, adenylate kinase, adenosine deaminase

In the forensic serology arena, the predominate method for casting agarose and starch-agarose gels is the "scrape technique." A gel is cast upon a glass plate to which a "permanent" template has been attached. The template usually is comprised of glass or plastic strips which have been glued to the glass plate to form a continuous border around the plate. After molten gel solution is poured onto the face of the glass plate, a beveled gel scraper is pulled along the surface of the border strips to remove excess gel solution. The remaining solution gels within the template. While the scrape technique is an effective method for casting agarose and starch-agarose gels, the use of this type of template has several drawbacks. First, the border strips do not adhere permanently to the glass plates. Second, rapid exposure to high temperatures can crack the glass, thus a new template will have to be made. In addition to time-consuming construction and repair of the templates, these problems may pose difficulties when the assay results are needed expeditiously. This paper reports on the development of a permanent gel casting template that eliminates the aforementioned problems and also can be used to produce gels of different thicknesses (1 to 3 mm).

Materials and Methods

An aluminum gel casting template was designed by the authors and manufactured by Bellco Glass, Inc. (Vineland, New Jersey). Figure 1 shows the design and dimensions of the

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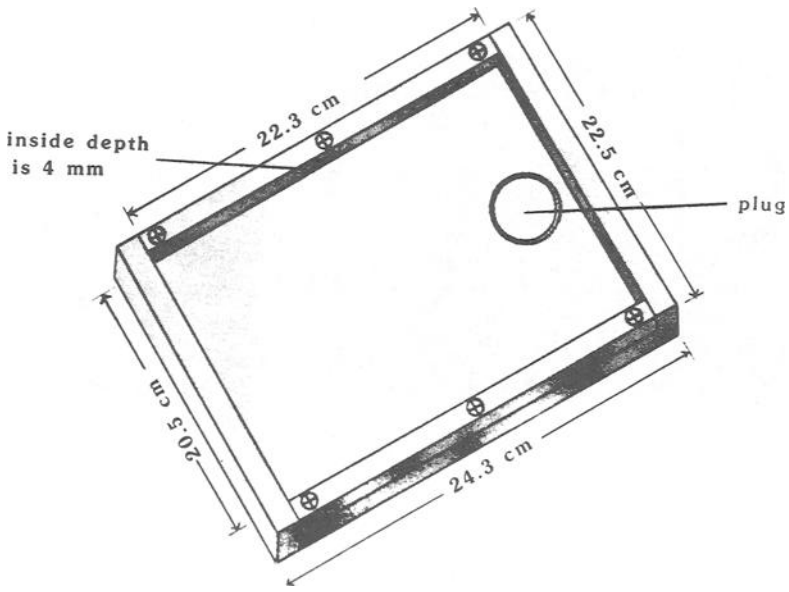

FIG. 1—*A diagrammatic representation of the aluminum template.*

aluminum gel casting template. The dimension of the inside depth of the mold (where the glass plate is inserted) is 4 mm. The glass plate dimensions are 220 by 200 by 3 mm.

The aluminum template was chilled at 4°C for a minimum of 10 min. The template (the aluminum plug must be in place) was removed from the refrigerator and placed on a leveling table. A glass plate, maintained at room temperature, was placed in the mold. Molten agarose gel solution was poured onto the face of the glass plate and scraped. The solution was allowed to gel. The template was lifted off the leveling table and the loosely fitting aluminum plug was allowed to fall out of the template. By pushing a finger through the hole, the glass plate and thus, the gels were easily removed from the aluminum template.

Bloodstains from donors at the FBI Academy were prepared as previously described [*1*]. Glyoxalase I (GLO) was typed according to the method of Budowle [*2*] except the separation time was 45 min. Adenosine deaminase (ADA) and adenylate kinase (AK) were typed using the double origin method [*3*].

Results and Discussion

Figures 2 through 4 show GLO, AK, and ADA can be separated on agarose gels prepared in the aluminum casting tray. The patterns are linear, well resolved, and reproducible.

In addition to the fact this template is permanent, sturdy, and should not require repair, it permits the thickness of the gels to be varied. Since the inside depth of the mold is 4 mm, using glass plates with different thicknesses will result in gels of different thicknesses. The thickness of a gel on a 1-mm-thick glass plate will be 3 mm, on a 2-mm-thick glass plate will be 2 mm, and on a 3-mm-thick glass plate will be 1 mm.

Before gel casting, the template was cooled to 4°C to facilitate gelling of the agarose solution. Although small gaps occur between the edges of the glass plate and the chilled template, agarose solution immediately gels when it fills these gaps. Consequently, the agarose is

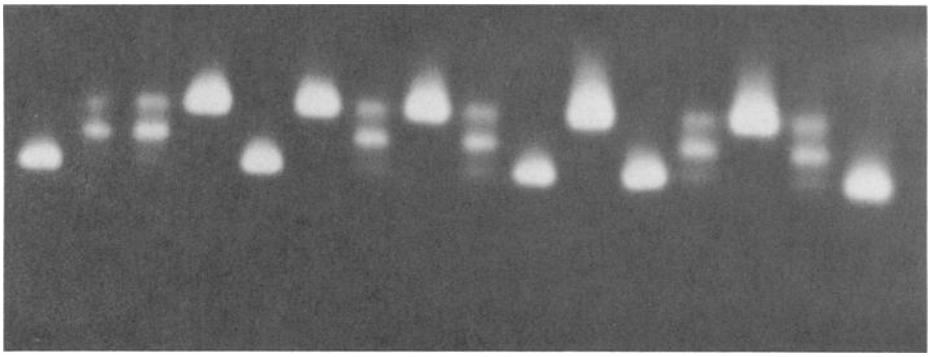

FIG. 2—*A gel displaying GLO phenotypes. The phenotypes from left to right are: 1, 2-1, 2-1, 2, 1, 2, 2-1, 2, 2-1, 1, 2, 1, 2-1, 2, 2-1, and 1. The cathode is at the bottom.*

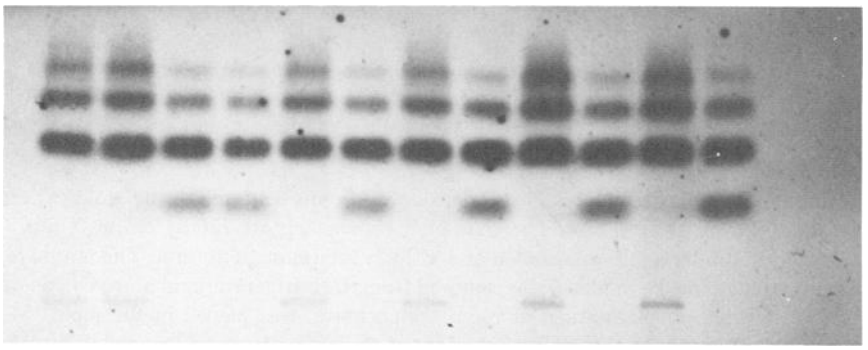

FIG. 3—*A gel displaying ADA phenotypes. The phenotypes from left to right are: 1, 1, 2-1, 2-1, 1, 2-1, 1, 2-1, 1, 2-1, 1, and 2-1. The cathode is at the bottom.*

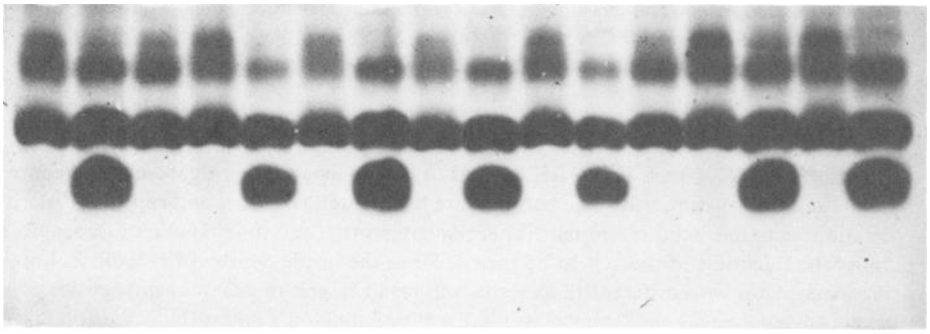

FIG. 4—*A gel displaying AK phenotypes. The phenotypes from left to right are: 1, 2-1, 1, 1, 2-1, 1, 2-1, 1, 2-1, 1, 2-1, 1, 1, 2-1, 1, and 2-1. The anode is at the bottom.*

prevented from flowing under the glass plate. Therefore, gels cast using this template will have the same thickness along their edges as in the center.

The loosely fitting aluminum plug must remain in the template during gel casting. If the plug is removed, there will be a temperature differential at the resulting hole compared with the rest of the template. This has been observed to cause an undesired depression in the gel at a position corresponding to the hole in the template.

Conclusion

In conclusion, an aluminum template for casting agarose gels offers several advantages over traditional templates. An aluminum template produces uniform, reproducible agarose gels. The thickness of the gels can be varied. Further, the template is permanent, sturdy, and does not require periodic repairs.

References

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