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# Oven-Drying Method for Polyacrylamide Gel Slab Packed in Cellophane Sandwich

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Polyacrylamide gel slabs can be dried quickly without elaborate tools and the results are similar or even better than those obtained with a commercial drying apparatus. The discontinuous, sodium dodecyl sulfate, and gradient polyacrylamide gel slabs yielded similar results regardless of the staining methods, e.g., Coomassie blue, periodate–Schiff's reagent, or ammoniacal silver.

KEY WORDS: electrophoresis; gel slabs; polyacrylamide; cellophane; drying method; oven drying.

Among many types of polyacrylamide gel electrophoresis (PAGE),[1] slab gel is the choice because of its convenience and versatility, especially in the increasing application of two-dimensional electrophoresis. Many slab gel dryers utilizing vacuum heating and gel-supporting devices such as steel-perforated screen, porous polyethylene overlay, and cellophane dialysis membrane have been developed. These instruments are expensive, and a very good vacuum pump is a must. Generally the commercial dryers will dry a slab in 60–120 min when appropriate conditions are maintained. We have developed a simple drying method utilizing only cellophane sheets, a glass plate, binder clips, and an oven. No vacuum pump was required, and the results were equal to, or even better than, those obtained with commercial dryers.

## MATERIALS AND METHODS

*Electrophoresis.* Electrophoresis was performed in a vertical slab gel system (BRL V16, slab dimension 16 × 17 cm). Discontinuous and SDS–PAGE were carried out essentially according to Davis (1) and Laemmli (2), respectively. After electrophoresis, the gel was stained with either Coomassie brilliant blue R (3), periodate–Schiff's reagent (4), or ammoniacal silver (5) and then destained as described. The gel slab was stored in 50% methanol after destaining.

*Shrinking the gel slab.* Before drying, the gel must be shrunk to its original size or slightly smaller. Generally, a solution of methanol (65%) and glycerol (0.5%) was used for this purpose. Thicker or higher-percentage gels needed higher concentrations of methanol, and it might take overnight incubation to shrink these gels to their original sizes.[2] During the shrinking process, shaking is needed, and the vessel should be covered with aluminum foil. Gradient gel was treated similarly according to its highest gel concentration.

*Packing the gel slab.* The shrunken gel was packed according to the following procedure:

(i) On a square glass plate (20 × 20 cm), a wet cellophane sheet (25 × 25 cm) was spread evenly.

[1] Abbreviations used: PAGE, polyacrylamide gel electrophoresis; SDS, sodium dodecyl sulfate.

[2] Tables describing the shrinking and drying conditions are available on request.

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(ii) The gel was laid on the center of the plate. Avoid any air bubble between the gel and the cellophane layer.

(iii) Another wet cellophane was overlaid on the gel. This could be easily done by rolling a wet cellophane around a glass tube (i.d. approx. 2 cm) and then, beginning from one edge of the plate, rolling the tube over through the gel evenly and leaving the cellophane on the plate.

(iv) The margins of the cellophane layers which were larger than the glass plate were folded to the back of the plate.

(v) The edges of the plate were then clamped with binder clips.

(vi) Water drops on the packed sandwich were wiped away with clean tissue.

*Gel drying.* Generally the packed sandwich was dried in an oven at 70°C until the gel was completely dry. For higher acrylamide concentrations (≥15%) and thicker gels (≥1.5 mm), a lower temperature (about 50°C) and prolonged drying time were more suitable.

To test the dryness of the gel slab, it was convenient to press a fingernail lightly on the surface of the gel. A completely dried gel will leave no mark on the surface. When the drying was complete, the sandwich was taken out from the oven. After the sandwich was cooled off, the clips were removed. The edges of the gel slab were trimmed with a pair of scissors. It should be kept away from water or humid air.

*Autoradiography.* For higher energy radioactive sources (e.g., $^{32}P$ or $^{125}I$) the gel slabs were dried by the method described above and autoradiography was performed as usual. But for soft beta radiation sources (e.g., $^{3}H$ or $^{14}C$) the gel was packed by one cellophane sheet only; e.g., the first step in the packing procedure described above was omitted. In this case, siliconization of the glass plate was needed. The packed gel was dried under the same conditions as described above. Autoradiography was performed by facing the naked face of the dried slab to an X-ray film (Fuji RX) and exposing at room temperature for 5 days.

## RESULTS AND DISCUSSION

*The nature of the gel slab.* All discontinuous, SDS, and gradient polyacrylamide gels were successfully preserved by this method. Gel slabs which were stained with Coomassie blue, periodate–Schiff's reagent, or ammoniacal silver were dried without much difference, except that a much more thorough washing after silver staining was required. For 0.8-mm-thick gels there were few problems in drying them regardless of the gel concentration. But for 1.5 mm or thicker gels, cracking was a common problem. This was more serious when the gel concentration was higher than 15%. We found that the cracking was caused essentially by insufficient shrinking of the gel slab. The vessel must be covered well with aluminum foil; otherwise, the gel will not be well shrunken.

*Drying method.* Although several devices including infrared lamp, hot plate, and microwave oven (6) can be used, we found that an ordinary electric laboratory oven was the choice. A vacuum oven also worked well but was not necessary. For all types of 0.8-mm-thick gel slabs and lower concentration gels (<12%) of 1.5-mm slabs, it took only 30 min to 2 h to dry a slab at 70°C. For "heavy gels," a lower temperature (45–60°C) and prolonged drying time were more suitable. The result would be better if all the gels could be dried overnight at approximately 45°C.

*Autoradiography.* A gel slab with $^{14}C$-labeled protein markers was packed by only one cellophane sheet and dried. When counted on a Geiger counter, the counts on the naked surface were about twofold that of the other surface on which a cellophane sheet was attached. The autoradiograms also showed that the one facing the naked surface resulted in higher intensities of radioactive marker bands.

*General comments.* Gel cracking is a common problem when a gel slab is dried. When our method was used, almost no cracking was observed when a 0.8-mm-thick slab was dried.

Only very mild cracking was observed on "heavy gels" in a few cases. This might be due to insufficient shrinking, improper packing, or overheating. If the edge of the slab was impaired, cracking began from that site and extended inward. All these defects could be overcome by a few exercise runs.

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