10x Bionic™ Buffer... Better, Faster, Stronger

By Betsy Boedeker
Sigma-Aldrich Corporation, St. Louis, MO, USA

- Run gels 2-3x faster than in TBE or TAE
- Excellent band resolution and separation
- Compatible with pre-cast gels
- Voltage less limited by heat generation

Introduction

Agarose gel electrophoresis is a widely used technique for many molecular biology applications. It can be used to visualize a variety of nucleic acids from oligonucleotides to RNA and DNA. Not only can electrophoresis be used to check nucleic acid quality and quantity downstream from purification, but it also can be utilized in determining the extent of completion of restriction digests. Electrophoresis is also a tool for procedure verification or screening purposes of PCR amplicons (e.g., colony PCR, mouse genotyping, etc.).

Tris Borate EDTA (TBE) Buffer is the traditional buffer used for agarose electrophoresis. Tris Acetate EDTA (TAE) is also a popular selection. These buffers provide good results, producing acceptable resolution of bands and reasonable size separation. Typically, gels are run at 100 Volts with a run time of 1-2 hours depending on gel size and percentage. An increase in voltage can be attempted to reduce run times, but when voltages are increased, heating of the gel occurs, which can produce poor results. Distorted bands, smearing, or smiling can interfere with proper size or quality determinations. Overheating can cause the gels to break down, damaging the DNA and making proper determinations and extraction nearly impossible.

It is desirable to maintain the good qualities of TBE electrophoresis, while reducing the run time. The Bionic™ Buffer composition, different than that of TBE, allows the user to run gels at voltages 2 to 3 times higher without the deleterious effects. The user can obtain the same result or better in a fraction of the time (10 minutes versus 90 minutes or longer).

Bionic Buffer versus TBE

Agarose gels at 0.8% were prepared with either 1x TBE or 1x Bionic Buffer. Each gel was electrophoresed using the appropriate buffer at a variety of voltages and run times. Higher voltage runs (250 Volts) using the TBE gel with TBE buffer for 20 minutes or longer resulted in gel distortion or complete disintegration. 1x TBE gels with TBE buffer were, therefore, run under more traditional conditions (100 Volts). Bionic Buffer under identical conditions (100 Volts) produced equivalent resolution as TBE (data not shown). Extended Bionic Buffer runs at high voltage did result in some gel warping, which was expected given the conditions (250 Volts, 30 minutes or longer; data not shown).

As a comparison, 1x TBE gel in 1x TBE buffer was run at 100 Volts for ten minutes. A Bionic Buffer gel in 1x Bionic Buffer was run at 250 Volts for ten minutes (Figures 1 and 2). The Bionic Buffer gel is nearly complete after that time, where as the TBE gel has barely resolved any bands. After twenty minutes, the Bionic Buffer gel has resolved high and low molecular weight bands, while little progress is seen with the TBE gel.

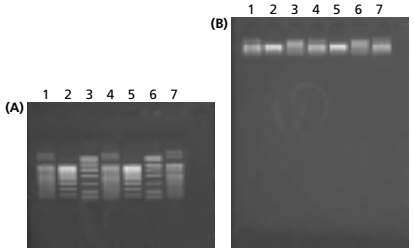

Figure 1. Electrophoresis after 10 minutes. (A) *Bionic Buffer gel run in 1x Bionic Buffer at 250 volts.* ***(B)*** *TBE gel run in 1x TBE Buffer at 100 volts. Resolution of lower molecular weight bands is clear after only 10 minutes using Bionic Buffer, but no resolution or even separation is evident on the TBE gel. Both gels were loaded identically and in the following manner: Lanes 1, 4 and 7: 50-3000 base pair Step Ladder (Product Code D3812); Lanes 2 and 5: 100-1000 base pair DNA Ladder (Product Code D3687); Lanes 3 and 6: 50-2000 base pair PCR Marker (Product Code P9577).*

Also, many laboratory personnel have turned to pre-cast gels for convenience and time savings. Bionic Buffer is compatible as a running buffer to use with these gels. Some investigators may choose to equilibrate their pre-cast gels with Bionic Buffer before loading and running, but testing has shown this step is not necessary. Excellent band resolution and short run times are still achieved without this time-consuming step. Users can simply take their pre-cast gel, place it into their electrophoresis chamber, cover with Bionic Buffer, load, and run (Figure 3).

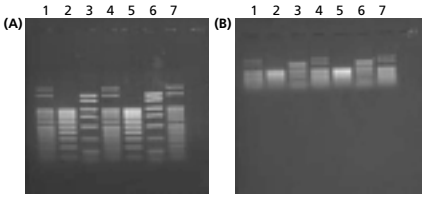

Figure 2. Electrophoresis after 20 minutes. (A) *Bionic Buffer gel run in 1x Bionic Buffer at 250 volts.* ***(B)*** *TBE gel run in 1x TBE Buffer at 100 volts. Separation of low and high molecular weight bands is evident after 20 minutes using Bionic Buffer, but only minimal band resolution is seen on the TBE gel run over the same amount of time. For DNA standards loaded and order, please see description for Figure 1.*

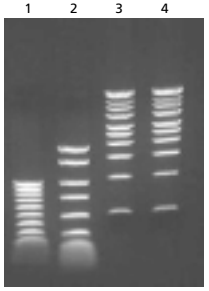

Figure 3. 1% TBE pre-cast gel. *This is a 1% TBE pre-cast mini gel (Product Code P5472) electrophoresed with 1x Bionic Buffer for 10 minutes at 250 Volts. There is excellent band resolution and separation in a very short time with this pre-cast gel. This gel was loaded and then run with no equilibration time. Gel was loaded as follows: Lane 1: 100-1000 base pair DNA Ladder (Product Code D3687); Lane 2: 50-2000 base pair PCR Marker (Product Code P9577); Lanes 3 and 4: 500-10,000 base pair 1 Kb Ladder (Product Code D3937).*

Summary

The robust formula in Bionic Buffer allows the user to run gels at 2 to 3 times higher voltages than a more typical buffer like TBE. These high voltage runs allow optimal band resolution and separation with a minimal time commitment. The compatibility of Bionic Buffer with pre-cast gels is another advantage, making it unnecessary to cast a fresh gel before running. Verifying a PCR amplicon or checking a restriction digest can be done in a fraction of the time. Other downstream applications, such as fragment purification for cloning, have been tested and can be performed using Bionic Buffer instead of TBE. Bionic Buffer improves laboratory efforts by reducing time required for electrophoresis. This allows for greater flexibility during a laboratory day. Bionic Buffer can be a superior advantage to make any laboratory's results turn out better, and faster.

Ordering Information

Product	Description	Unit
B6185	Bionic Buffer, 10x	100 ml 1 L
P5472	1% TBE pre-cast mini gel 8-well	Pack of 20 gels