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## safer and more sensitive nucleic acid gel stains

### The safest and most sensitive nucleic acid gel stains

GelRed™ and GelGreen™ are next-generation fluorescent nucleic acid gel stains designed to replace highly toxic ethidium bromide (EtBr) and other so-called safe gel stains.

To make safer gel stains, scientists at Biotium designed GelRed™ and GelGreen™ to make them cell membrane impermeable, and therefore incapable of entering living cells. Ames tests have confirmed that GelRed™ and GelGreen™ are nonmutagenic at concentrations well above the concentrations used for gel staining. Furthermore, environmental safety tests showed that GelRed™ and GelGreen™ are non-toxic to aquatic life, and thus these stains are classified as non-hazardous waste, permitting disposal down the drain or in regular trash.

For more information and references, download our white paper, Comparison of Nucleic Acid Gel Stains: Cell Permeability, Safety, and Sensitivity and the complete Safety Report of GelRed™ and GelGreen™ at [www.biotium.com](http://www.biotium.com).

#### Safer than EtBr and other so-called safe gel stains

Shown by Ames test and other tests to be nonmutagenic and noncytotoxic

#### Easy disposal

Passed environmental safety tests for direct disposal down the drain or in regular trash

#### Superior sensitivity

More sensitive than EtBr, SYBR® Safe, EZ-Vision® In-Gel Dye, and others

#### Extremely stable

Stable in solution at room temperature

#### Simple to use

For precast or post-electrophoresis gel staining

#### Compatible with standard instruments

GelRed™ replaces EtBr

GelGreen™ replaces SYBR® Safe, GreenSafe Premium, and others

#### Compatible with downstream applications

Use your regular gel extraction kit to remove dyes from DNA for cloning or sequencing



Figure 1. GelRed™ and GelGreen™ gel stains are safer because they cannot penetrate cell membranes to bind DNA in living cells. HeLa cells were incubated at 37°C with 1X SYBR® Safe, GelGreen™ or GelRed™, respectively. Images were taken following incubation with dye for 30 min using FITC filter set for SYBR® Safe and GelGreen™, and Cy@3 filter set for GelRed™. SYBR® Safe rapidly entered cells and stained nuclei. GelRed™ and GelGreen™ were unable to cross cell membranes, demonstrated by the absence of fluorescence staining. Staining was observed in dead cells present sporadically in the cultures, as is observed with other non-membrane permeable nucleic acid dyes (not shown). The presence of cell in the imaging field was confirmed by phase contrast microscopy (not shown).

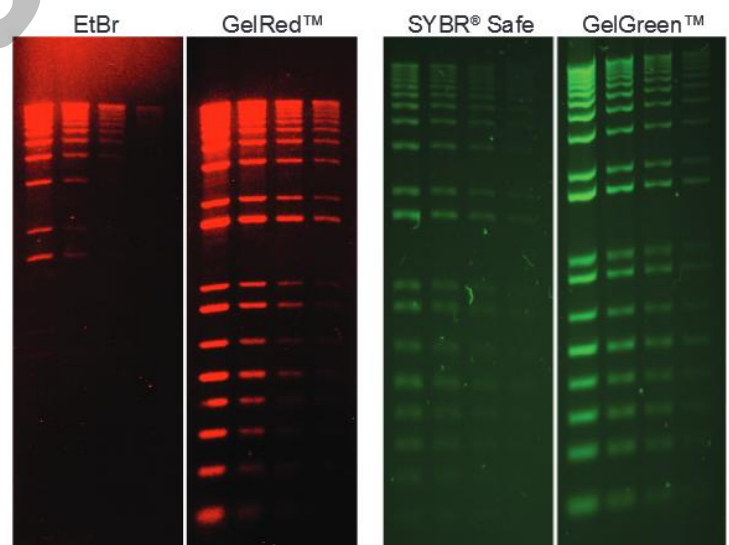


Figure 2. GelRed™ and GelGreen™ are more sensitive than EtBr and SYBR® Safe. Left: Comparison of GelRed™ and ethidium bromide (EtBr) in precast gel staining using 1% agarose gel in TBE buffer. Right: Comparison of GelGreen™ and SYBR® Safe in post gel staining using 1% agarose gel in TBE buffer. Two-fold serial dilutions of 1 kb Plus DNA Ladder from Invitrogen were loaded onto each gel in 4 lanes in the amounts of 200 ng, 100 ng, 50 ng and 25 ng, respectively, from left to right.

GelGreen and GelRed and their uses are covered by granted and pending US and international patents. SYBR is a registered trademark of Thermo Fisher Scientific. EZ-Vision is a registered trademark of AMRESCO. Cy@ is a registered trademark of GE Healthcare.

#### Ordering Information

Cat #	Product Name
41003-T	GelRed™ Nucleic Acid Gel Stain; 10,000X in water, 0.1 mL
41003	GelRed™ Nucleic Acid Gel Stain; 10,000X in water, 0.5 mL
41003-1	GelRed™ Nucleic Acid Gel Stain; 10,000X in water, 10 mL
41002	GelRed™ Nucleic Acid Gel Stain; 10,000X in DMSO, 0.5 mL
41002-1	GelRed™ Nucleic Acid Gel Stain; 10,000X in DMSO, 10 mL
41001	GelRed™ Nucleic Acid Gel Stain; 3X in water, 4 L
41005-T	GelGreen™ Nucleic Acid Gel Stain; 10,000X in water, 0.1 mL
41005	GelGreen™ Nucleic Acid Gel Stain; 10,000X in water, 0.5 mL
41005-1	GelGreen™ Nucleic Acid Gel Stain; 10,000X in water, 10 mL
41004	GelGreen™ Nucleic Acid Gel Stain; 10,000X in DMSO, 0.5 mL

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 Phone: 800-304-535





# DESIGNED FOR POLYACRYLAMIDE GEL STAINING

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## The safety and sensitivity of GelRed™ and GelGreen™ now for PAGE gels

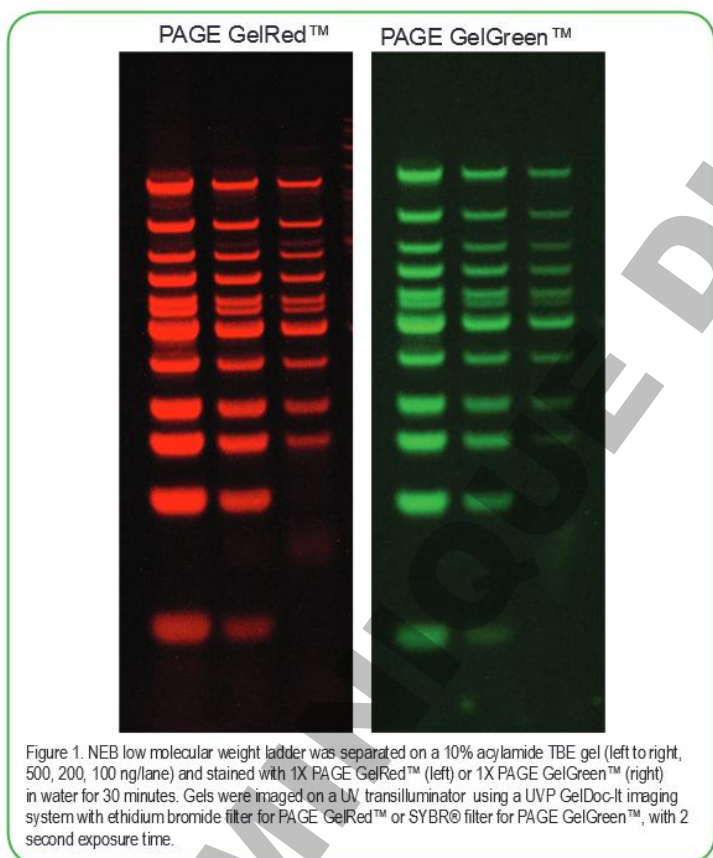
Biotium scientists recognize that a fundamental approach for making a gel stain safe is to eliminate or minimize the chance for the dye to interact with genomic DNA in living cells. Based on this design principle, chemists at Biotium incorporated structural features to make the dyes impermeable to latex gloves, nitrile gloves, and cell membranes.

In the design of the original GelRed™ and GelGreen™ dyes, we achieved the dyes' membrane impermeability mainly by making the dyes physically large. While this strategy works extremely well to improve the dyes' safety and at the same time produces exceptional gel staining sensitivity for agarose gels, the relatively large size of GelRed™ and GelGreen™ make the dyes difficult to penetrate into the more densely packed polyacrylamide gels, rendering the dyes less optimal for PAGE gel staining. In designing PAGE GelRed™ and PAGE GelGreen™ dyes, we used a novel approach to make the dyes membrane impermeable without making the dyes large. Importantly, the new design strategy still ensures that the PAGE dyes possess essential properties for gel staining, including good sensitivity, stability and compatibility with existing instruments and downstream sample analysis.

### Safer gel stains designed for use in polyacrylamide gels

- Formulated in water and impermeable to latex and nitrile gloves
- Non-toxic and non-mutagenic in AMES test
- Non-toxic to aquatic life, okay for drain disposal by EPA Title 22 hazardous waste test

Download the PAGE GelRed and PAGE GelGreen Safety Report at [www.biotium.com](http://www.biotium.com)



PAGE GelGreen and PAGE GelRed and their uses are covered by granted and pending US and international patents. SYBR is a registered trademark of Thermo Fisher Scientific. Cy® is a registered trademark of GE Healthcare.



Figure 2. PAGE GelRed™ and PAGE GelGreen™ gel stains are safer because they cannot penetrate cell membranes to bind DNA in living cells. HeLa cells were incubated at 37°C with 1X SYBR Safe, 1X PAGE GelRed™, or 1X PAGE GelGreen™. Images were taken following incubation with dye for 30 min using FITC filter set for SYBR® Safe and PAGE GelGreen™, and Cy®3 filter set for PAGE GelRed™. SYBR® Safe rapidly penetrated cell membranes as evident from the bright green staining of nuclei and cytoplasm. However, PAGE GelRed™ and PAGE GelGreen™ were unable to cross cell membranes, as shown by the absence of fluorescence staining in healthy cells. Staining was observed in dead cells present sporadically in the cultures, as is observed with other non-membrane permeable nucleic acid dyes. The presence of cells in the field of view was confirmed by phase contrast microscopy (not shown).

### Ordering Information

Cat.#	Product Name
41008-T	PAGE GelRed™ Nucleic Acid Gel Stain; 10,000X in water, 0.1 mL
41008-500uL	PAGE GelRed™ Nucleic Acid Gel Stain; 10,000X in water, 0.5 mL
41014	PAGE GelRed™ Nucleic Acid Gel Stain; 1X in water, 4 L
41007-T	PAGE GelGreen™ Nucleic Acid Gel Stain; 10,000X in water, 0.1 mL
41007-500uL	PAGE GelGreen™ Nucleic Acid Gel Stain; 10,000X in water, 0.5 mL

[www.biotium.com](http://www.biotium.com)

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