PRODUCT NOTE

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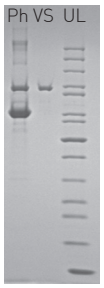
VeraSeq™ ULtra DNA Polymerase

KEY BENEFITS

- High Fidelity polymerase that tolerates uracil containing primers, nucleotides and templates
- Fidelity measured at >30x that of TaqB DNA polymerase
- Highest sensitivity of all available proofreading polymerase, showing successful amplifications down to 100 pg template DNA
- Increased speed, amplifying at rates of 15 s/kb, enabling shorter PCR reaction time
- 24h room temperature stability simplifying reaction set up
- Simplified optimization - Tolerates a broad Mg^{2+} and DMSO concentration range, simplifying PCR optimization
- Simplified licensing structure including clinical applications
- Unmatched polymerase purity with zero animal derived protein additives (below)



High Fidelity DNA Amplification

The PCR is routinely used for DNA amplification and serves a number of downstream applications, such as cloning or DNA sequencing. The requirements for the PCR continue to increase in stringency with the emergence of next generation sequencing technologies and particularly in molecular diagnostic based applications. VeraSeq ULtra DNA polymerase possesses a dsDNA-binding domain fused to a *Pyrococcus*-like proofreading polymerase, analogous to the industry leading VeraSeq 2.0. The presence of the dsDNA binding domain is known to increase the affinity of the resulting fusion protein for double-stranded DNA, increasing processivity. VeraSeq ULtra has been designed to partner proof reading activity with an ability to tolerate uracil bases in primer, template or nucleotide. The resulting protein generates PCR products ideal for methylation sequencing applications, or can be used in conjunction with Uracil DNA Glycosylase (UDG) to prevent template carryover in downstream experiments. The polymerase also demonstrates very high amplification success rates across a broad range of templates with a mid-high fidelity, >30x that of Taq.

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The Best of All Worlds

Previous generations of high fidelity PCR formulations have carried significant compromises, in terms of available markets or technically, whether it be increased amplicons length at the expense of fidelity, or the highest fidelity at the expense of sensitivity. VeraSeq Ultra DNA polymerase overcomes current compromises by offering highest fidelity with no compromise in other features of interest:

- Sensitivity to 100 pg human genomic DNA input template
- 15 s/kb incorporation rate
- Simplified reaction optimization
- Unrestricted field of use, including clinical applications

Demonstrated Quality, Consistency, Scalability

In addition to the above key performance features, VeraSeq ULtra DNA polymerase benefits from Enzymatics' world-renowned record of producing benchmark-quality enzyme products under its ISO 13485:2003 Quality System. Enzymatics uses the same strict quality control processes and proprietary methods for maintaining purity that it incorporates into all its enzyme and protein products. This ensures that our products meet the rigorous demands of global supply and are of unmatched purity in the industry. There are no animal derived protein additives in VeraSeq ULtra DNA Polymerase.

Sensitivity

One of the current challenges in using higher fidelity polymerase formulations is a trade off with sensitivity. Competitor products resort to the use of protein additives, to drive performance. Enzymatics unmatched expression and purification methods yield proteins of the highest purity in the industry today and as a result VeraSeq ULtra reaches unmatched levels of sensitivity (Figure 1).

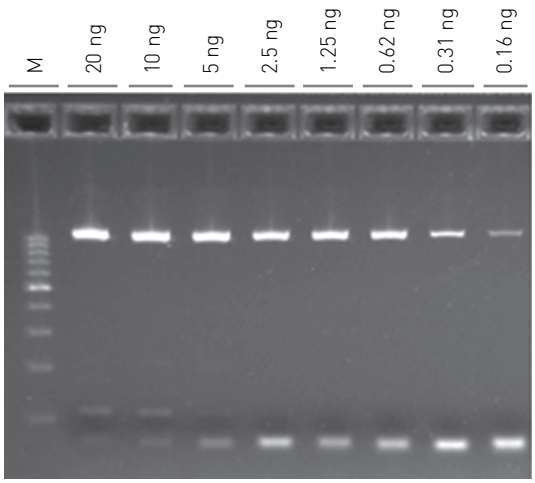

Figure 1. Shows successful amplification down to 100 pg of human genomic DNA. Labels indicate ng input DNA.

Robust Amplification Across G:C Rich Templates

VeraSeq Ultra has been shown to yield successful amplifications across a broad range of G:C containing templates. Utilizing the optimized buffer minimizes any loss of fidelity observed when utilizing buffers designed for G:C amplifications. Representative data is shown below in Figure 2.

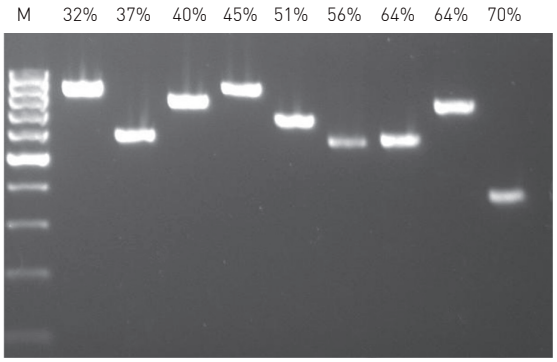

Figure 2. Successful amplification up to 70% GC rich templates.

Fidelity

VeraSeq Ultra DNA polymerase is a fusion of a single stranded binding protein to a *Pyrococcus*-like polymerase domain to yield a polymerase with fidelity measured at greater than 30x that of Taq DNA polymerase. Fidelity measurements are shown in Figure 3 utilizing the industry standard lacI assay. Two buffers are supplied, VeraSeq buffer II for regular amplifications, the second, VeraSeq GC buffer for G:C rich templates. Fidelity versus Taq DNA polymerase for each product is shown below.

POLYMERASE	BUFFER	ERROR RATE	Fold Better than Taq-B
VeraSeq 2.0	VeraSeq Buffer II	4.0×10^{-7}	61
VeraSeq 2.0	VeraSeq GC Buffer	4.6×10^{-7}	54
VeraSeq Ultra	VeraSeq Buffer II	1.0×10^{-6}	25
VeraSeq Ultra	VeraSeq GC Buffer	7.3×10^{-7}	34
Taq-B	PCR Buffer I	2.5×10^{-5}	1

Figure 3. VeraSeq ULtra DNA polymerase shows >30x improvement in fidelity with respect to Taq B DNA polymerase. Use of the G:C buffer increases fidelity and further improves success rate of G:C rich templates.

Rapid Extension Rate

The increased affinity for DNA templates from the SSB binding protein increases processivity. VeraSeq ULtra DNA Polymerase has extension rates of 1 kb in 15 seconds, managing amplifications up to 8 kb with minimized turnaround time. Partnering this with a high amplification success rate, VeraSeq ULtra DNA polymerase will minimize rework time, making it the most effective mid-high fidelity polymerase on the market today.

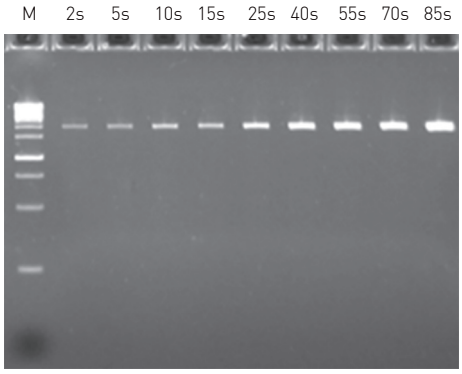

Figure 4. 20 cycles of amplification at 72°C extension temperature. Clear product bands can be observed at an extension time of 2 s with robust amplification clearly observed at a rate of 15 s/kb.

Simplified Optimization

VeraSeq ULtra DNA polymerase has been developed to simplify optimization of your individual PCR amplifications. The polymerase formulation works under a broad range of Mg^{2+} concentrations (from 1.5-3.0 mM) and is tolerant to routinely used additives known to positively impact PCR success rate. For example, the addition of up to 9% DMSO will improve success rate on the most difficult of PCR templates (Figures 5 and 6).

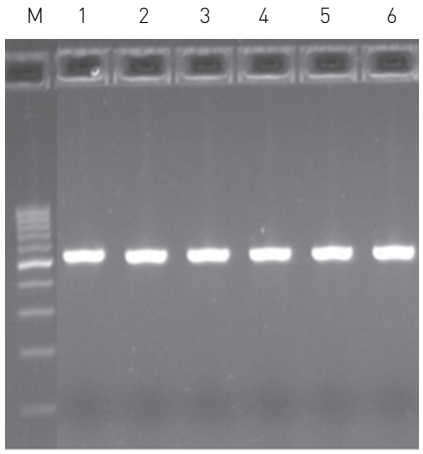

Figure 5. Titration of VeraSeq ULtra DNA polymerase units and Mg^{2+} shows successful amplification. Lanes 1-3 show amplification with 1U polymerase, lanes 4-6 show amplification using 2U. Lanes 1-3 also show increasing concentration of Mg^{2+}, starting at 1.5mM, then increasing to 1.8 and 3.0 mM respectively. Lanes 4-6 follow the same trend in Mg^{2+} concentration.

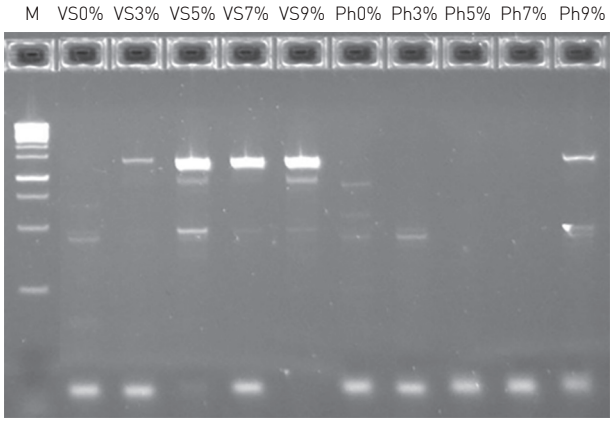

Figure 6. Addition of increasing volume of DMSO on human genomic DNA. No amplification is observed for this difficult target until larger volumes of DMSO are added. Up to 9% v/v can be added with a positive impact on amplification success rate (lanes 1-5). Phusion failed to amplify the template (lanes 7-11).

Uracil Tolerance

VeraSeq ULtra DNA polymerase has been demonstrated to accommodate uracil bases in the template, the primer and in the nucleoside triphosphate present in the PCR. The combination of high fidelity with uracil tolerance makes VeraSeq Ultra an ideal choice for methylation studies or in combination with UDG to avoid sample cross-contamination in sequencing or molecular diagnostic applications.

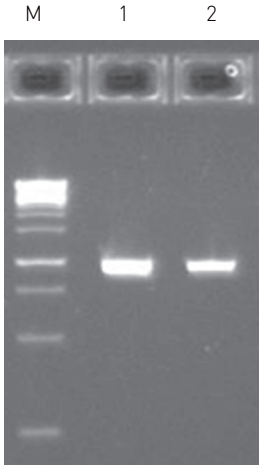

Figure 7. Successful amplification utilizing dUTP (lane 2) in place of dTTP (lane 1).

Quality and Service You Can Count On

Enzymatics manufactures pure, superior enzymes and reagents for molecular biology and other applications. Founded in 2006 by expert enzyme production scientists, Enzymatics has strived to resolve its customer's challenges by providing the highest-quality materials available, an unbreakable supply chain, and paradigm-shifting service. With a manufacturing record unmatched in commercial enzyme production, Enzymatics designs analytical grade quality into all its products to meet the most rigorous specifications.

The introduction of VeraSeq ULtra DNA Polymerase furthers our commitment to identifying, developing, and delivering the very best in protein technologies. If your company has a requirement for a protein product and service partner that stands above the crowd then we want to hear from you.

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ORDER DETAILS			
Product Description	Part #	Concentration	Unit Size
VeraSeq ULtra DNA Polymerase	P7520L	2000 U/ml	625 Units

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