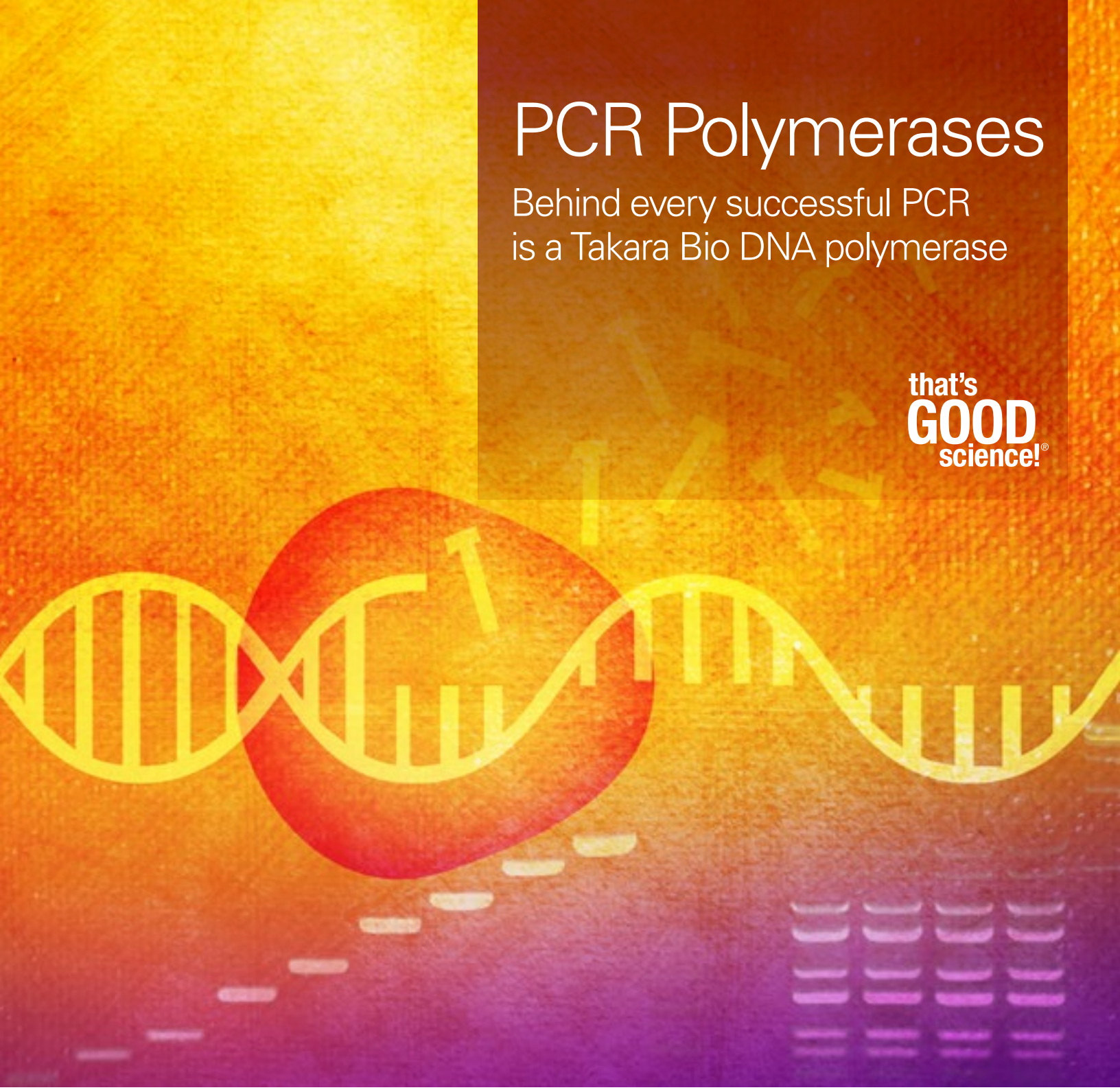
PCR Polymerases

Behind every successful PCR is a Takara Bio DNA polymerase

that's GOOD science!®



TaKaRa

Clontech TaKaRa cellartis

Powerful polymerases for high-impact results

Best-in-class enzymes backed by expert support

Our large and diverse portfolio of PCR polymerases was designed for success across a variety of applications, from basic and translational research to routine laboratory testing. High performance, value, and expert technical support are why researchers worldwide have published tens of thousands of peer-reviewed studies using PCR polymerases from Takara Bio.

The successful amplification of nucleic acids is key to many technologies, including next-generation sequencing, cloning, and genotyping. It is critical that your polymerases can reliably amplify target sequences regardless of sample type, sequence complexity, or amount of starting material. At Takara Bio, we have developed a wide range of high-performance PCR enzymes for both routine applications and challenging reaction conditions like multiplexing, long and accurate PCR, fast PCR, and inhibitor-resistant direct PCR.

Take advantage of our deep enzymology expertise and delve into every scientific inquiry, leaving no opportunity unanswered.

1842 Predecessor to Takara Bio begins as a small sake brewery business

1925 Formally incorporates as Takara Shuzo Co., Ltd.

1983 The first article on PCR technology is published

1984 Clontech Laboratories, Inc. is established in the United States

1993 The Nobel prize is awarded for the discovery of PCR; Takara Bio begins selling PCR products

1996 Takara Bio develops Takara *LA Taq*® DNA polymerase

1998 Clontech Laboratories, Inc. launches Titanium®*Taq* DNA polymerase

2005 Takara Bio acquires Clontech Laboratories, Inc. of the United States

2011 Takara Bio launches the PrimeSTAR® DNA polymerases

2017 Takara Bio USA, Inc. acquires WaferGen Bio-systems, Inc. and the SmartChip™ Real-Time PCR System

...whatever your needs

- **Multiplex applications—exceptionally high yield and sensitivity**
  Titanium® *Taq* DNA polymerases: for multiplex genotyping, pathogen detection, whole genome SNP detection, amplifying cell-free DNA, and validated use on CytoScan and MassARRAY systems
- **Clinical samples—highly accurate detection for low-input starting material**
  Advantage® 2 DNA polymerases: for cDNA amplification and carrier screening
- **Complex and long templates—reliable and unbiased amplification**
  PrimeSTAR® GXL DNA polymerases: for NGS library prep and targeted sequencing for multiplex HLA typing and highly polymorphic regions
- **High-fidelity applications and fast PCR—streamlined high-throughput workflows**
  PrimeSTAR® Max DNA polymerases: for cloning, antibody engineering, and amplifying repetitive sequences
- **No need for DNA extraction or purification—sample conservation and time-saving workflows**
  Terra™ PCR direct DNA polymerases: for direct PCR with blood, tissues, cells, or crude DNA extracts; drop-seq; and single-cell RNA-seq
- **Long-range PCR—optimized performance for long targets, up to 48 kb**
  Takara *LA Taq*® DNA polymerases: for sequencing of mitochondrial DNA, pseudogenes, and other highly homologous sequences
- **Diverse sample types—versatility and reliability for consistently successful amplification**
  Takara *Ex Taq*® DNA polymerases: for probe-based qPCR, routine PCR, and sgRNA amplification for sequencing

PCR polymerase	Titanium *Taq*	Advantage 2	PrimeSTAR GXL	PrimeSTAR Max	Terra PCR Direct	Takara *LA Taq*	Takara *Ex Taq*
Page #	4	5	6	7	8	9	10
Recommended amplicon size							
gDNA	≤2 kb	≤6 kb	≤30 kb	≤6 kb	≤2 kb	≤30 kb	≤20 kb
plasmid/λ	≤2 kb	≤18 kb	≤40 kb	≤15 kb	—	≤48 kb	≤30 kb
cDNA	≤4 kb	≤8.5 kb	≤13.5 kb	≤6 kb	—	—	—
Fidelity vs wild-type *Taq*	+	++	++++	+++++	Not tested	+++	++
Yield	++++	+++	+	+	+	++	++
Suitable for GC content >65%	—	—	✓	—	✓	—	—
Exonuclease activity	None	3′–5′	3′–5′	3′–5′	None	5′–3′ 3′–5′	5′–3′ 3′–5′
Speed	Standard	Standard	10 sec/kb (with fast protocol)	5 sec/kb	Standard	Standard	Standard
PCR products	T/A overhangs	T/A overhangs	Blunt ends	Blunt ends	T/A overhangs	T/A overhangs	T/A overhangs
Available formulations							
Antibody-mediated hot-start	✓	✓	✓	✓	✓	✓ (non-hot-start also available)	✓ (non-hot-start also available)
Glycerol-free	✓	—	—	—	—	—	—
2X premix	—	—	✓	✓	✓	✓	✓
Lyophilized 2X premix	✓	✓	—	—	—	—	—

Titanium *Taq* DNA polymerase

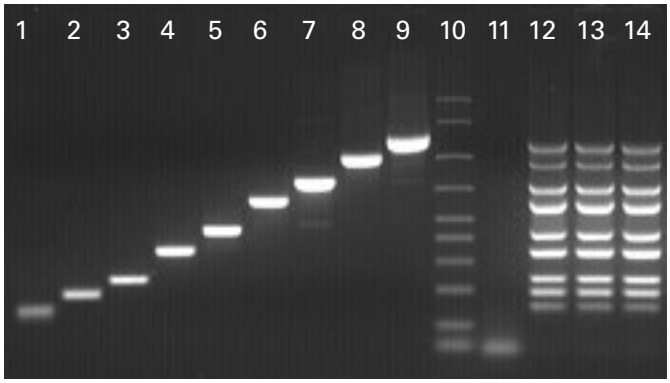
Ideal for multiplexing or amplifying rare targets

You can rely on Titanium *Taq* to provide high yields from low amounts of starting material without time-consuming optimization. Titanium *Taq* is specially formulated to tolerate a wide range of Mg^{2+} concentrations, making it unnecessary to test multiple reaction conditions, and thus streamlining multiplex applications. A glycerol-free formulation is also available for dry-down applications or automation workflows. A lyophilized version offers convenient room-temperature storage for field-based or point-of-care applications.

With Titanium *Taq*, you can:

- Generate exceptionally high yields of PCR products even from rare or low-copy-number targets
- Save time by avoiding optimization of your reaction conditions, even when multiplexing
- Use fewer PCR cycles, thus reducing background signals and saving even more time

Titanium *Taq* is a mutant polymerase, based on wild-type *Taq*, with an N-terminal deletion that removes the 5′-to-3′ exonuclease activity and greatly improves the sensitivity of the enzyme. Titanium *Taq* comes preblended with our TaqStart® Antibody for hot-start PCR for increased specificity—especially useful for multiplex reactions.



Highly specific and efficient multiplexing with Titanium *Taq*. PCR was performed using human genomic DNA as a template and primer pairs for nine different targets. PCR products were analyzed on a 2% agarose gel. Lanes 1–9 contain individual reactions for each primer pair amplified using Titanium *Taq*. Lanes 12–14 contain multiplex PCR reactions performed with all nine primer pairs in a single reaction. Lane 1: *LRP5* (155 bp). Lane 2: *KIT* (201 bp). Lane 3: *CCR5* (247 bp). Lane 4: *GHR* (353 bp). Lane 5: *PIK3R1* (449 bp). Lane 6: *F683/R1288* (604 bp). Lane 7: *SPP1* (780 bp). Lane 8: *RN3C1* (1,068 bp). Lane 9: *IL12B* (1,321 bp). Lane 10: 50–2,000-bp ladder. Lane 11: no-template control (negative control). Lanes 12–14: replicates of nine-plex PCR.

Titanium *Taq* has demonstrated high performance in multiplex PCR and amplification of rare targets

Titanium *Taq* has been validated on various multiplexing platforms, such as Affymetrix's microarray kits and the MassARRAY System from Agena Biosciences.

Schwartz, S., Kohan, M., Pasion, R., Papenhausen, P. R. & Platt, L. D. Clinical experience of laboratory follow-up with noninvasive prenatal testing using cell-free DNA and positive microdeletion results in 349 cases. *Prenat. Diagn.* **38**, 210–218 (2018).

Titanium *Taq* was used in multiplex PCR amplification using cell-free DNA samples to analyze over 2.6 million markers across the entire human genome with the CytoScan HD array from Affymetrix.

Cat. #	Product	Size	Details
639208/09/42	Titanium Taq DNA Polymerase	100/500/1,000 Rxns	dNTPs need to be purchased separately
639210/11	Titanium Taq PCR Kit	30/100 Rxns	Includes dNTPs, positive control primers and templates
638517	50X Titanium Taq SP (Glycerol-Free)	250 µl	dNTPs need to be purchased separately
639276/8	High Yield PCR EcoDry™ Premix	48/24 Rxns	Lyophilized premix, includes dNTPs

If you plan to amplify longer (>5 kb) or more complex templates, we recommend our Advantage 2 Polymerase Mix (Page 5) for increased fidelity.

Advantage 2 DNA polymerase

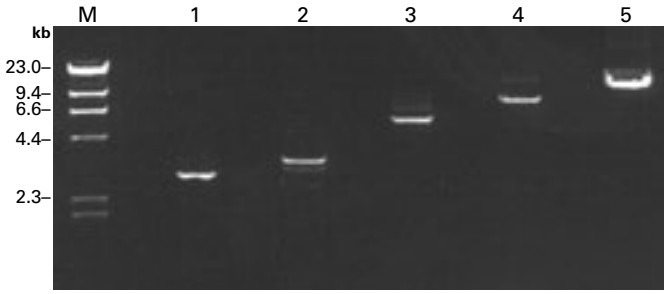
Added level of confidence for clinical and environmental samples

Advantage 2 DNA polymerase combines the sensitivity and high yield of Titanium *Taq* with the fidelity of a proofreading enzyme. You can achieve high-yield PCR amplification without sacrificing fidelity when analyzing precious clinical or environmental samples.

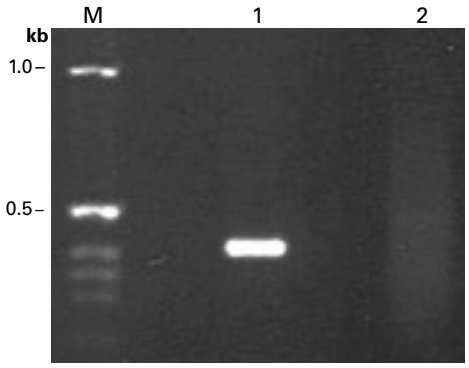
With Advantage 2 polymerase, you can:

- Amplify non-complex targets up to 18 kb and complex targets up to 6 kb
- Achieve the same sensitivity and yield as Titanium *Taq* with added fidelity
- Accurately detect target sequences even in the presence of low amounts of starting material

Advantage 2 DNA polymerase is a blend of Titanium *Taq*, a small amount of proofreading enzyme, and TaqStart Antibody. Advantage 2 Polymerase Mix is supplied with two different buffers optimized to support a wide range of amplicon sizes.



Successful amplification of various large templates from different sources using Advantage 2 Polymerase Mix. Lane 1: 2.5-kb *E. coli* DNA polymerase gene amplified from genomic DNA. Lane 2: 3.5-kb bovine pancreatic trypsin inhibitor gene amplified from calf thymus genomic DNA. Lane 3: 5.9-kb human *IL-1*β gene amplified from human genomic DNA. Lane 4: 8.5-kb human titin cDNA amplified from a human skeletal muscle cDNA library. Lane 5: 18.5-kb λ insert amplified from a λ clone. Lane M: λ/HindIII DNA size marker.



Successful amplification of a fragment from rare tumor necrosis factor receptor II (*TNFR II*) cDNA with Advantage 2 Polymerase Mix and a competitor's *Taq* polymerase mix. Lane 1: The 0.4-kb *TNFR II* fragment is readily obtained with Advantage 2. Lane 2: No product is seen with *Taq* polymerase. Lane M: DNA size marker.

cDNA amplification and whole transcriptome amplification with Advantage 2 DNA polymerase

Kohn, A. B., Moroz, T. P., Barnes, J. P., Netherton, M. & Moroz, L. L. Single-cell semiconductor sequencing. *Methods Mol. Biol.* **1048**, 247–284 (2013).

This protocol uses Advantage 2 polymerase to amplify cDNA for downstream sequencing on an Ion Torrent Personal Genome Machine sequencer.

Trombetta, J. J. *et al.* Preparation of single-cell RNA-Seq libraries for next generation sequencing. *Curr. Protoc. Mol. Biol.* **11**, 3643–3649 (2014).

Advantage 2 polymerase is used for whole transcriptome amplification of cDNA prepared from a single-cell lysate for downstream sequencing.

Cat. #	Product	Size	Details
639201/2	Advantage 2 Polymerase Mix	100/500 Rxns	dNTPs need to be purchased separately
639207/6	Advantage 2 PCR Kit	30/100 Rxns	Includes dNTPs, positive control primers and templates
639282/0	High Fidelity PCR EcoDry™ Premix	24/48 Rxns	Lyophilized premix, includes dNTPs

For targets with GC content >65%, use Advantage GC 2 Polymerase Mix (Cat. # 639114).

PrimeSTAR GXL DNA polymerase

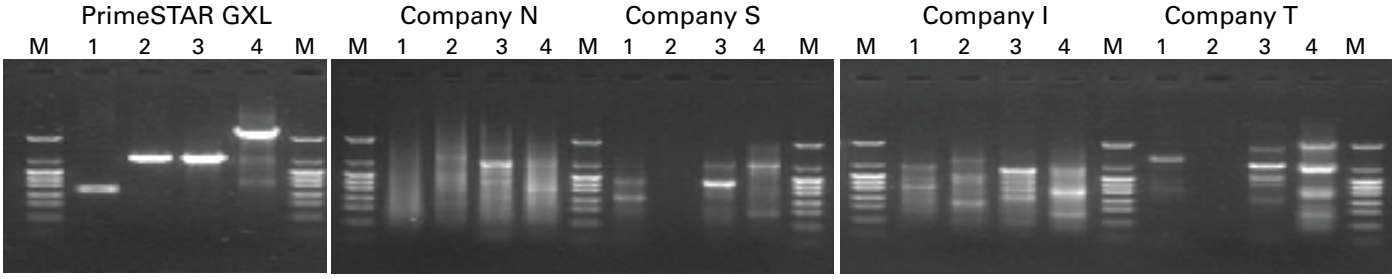
Reliable amplification of complex and long templates for NGS library preparation

You can trust PrimeSTAR GXL DNA polymerase for your long-range PCR on complex targets without having to worry about repeating your experiments. Not every template has the same % GC content, and many commercially available polymerases struggle to amplify GC-rich targets. Not so with PrimeSTAR GXL DNA polymerase, which is capable of amplifying even the most challenging GC- or AT-rich regions, making it ideal for analyzing highly polymorphic or regulatory gene regions.

With PrimeSTAR GXL polymerase you can:

- Amplify products up to 30 kb with high fidelity
- Work with GC- or AT-rich regions without needing additional buffer
- Prepare NGS libraries without amplification bias

PrimeSTAR GXL DNA polymerase is based on a modified B-family polymerase and includes an elongation factor. This combination enables unsurpassed processivity and fidelity to successfully amplify extremely long PCR amplicons.



Superior amplification of GC-rich targets using PrimeSTAR GXL DNA polymerase compared to other commercially available high-fidelity DNA polymerases. Excellent results were achieved using PrimeSTAR GXL DNA polymerase without requiring special buffers or reaction conditions. Template (Lanes 1 and 2): Human genomic DNA (100 ng/50 µl reaction). Lane 1: *APOE* gene (746 bp; GC content = 74%). Lane 2: *TGF-ß1* gene (2,005 bp; GC content = 69%). Template (Lanes 3 and 4): *T. thermophilus HB8* genomic DNA (10 ng/50 µl reaction). Lane 3: 2,029 bp (GC content = 74%). Lane 4: 4,988 bp (GC content = 74%). Lane M: pHY molecular size marker.

High-fidelity, long-range PCR for downstream sequencing and multiplex HLA typing with PrimeSTAR GXL DNA polymerase

Jia, H., Guo, Y., Zhao, W. & Wang, K. Long-range PCR in next-generation sequencing: comparison of six enzymes and evaluation on the MiSeq® sequencer. *Sci. Rep.* **4**, 5737 (2015).

PrimeSTAR GXL polymerase provided the best amplification of long amplicons using the PCR conditions described in the paper and required minimal PCR optimization for successful downstream targeted sequencing.

Ozaki, Y. *et al.* Cost-efficient multiplex PCR for routine genotyping of up to nine classical HLA loci in a single analytical run of multiple samples by next generation sequencing. *BMC Genomics* **16**, 318 (2015).

PrimeSTAR GXL polymerase was used to amplify the highly polymorphic region of the HLA gene in multiplex PCR prior to next-generation sequencing on an Ion Torrent PGM system.

Other published studies show that PrimeSTAR GXL DNA polymerase also works on purified plant DNA, FFPE samples, and circulating cell-free DNA.

Cat. #	Product	Size	Details
R050A/B	PrimeSTAR GXL DNA Polymerase	250/1,000 Units	Hot-start
R051A/B	PrimeSTAR GXL Premix	200/800 Units	Hot-start, 2X premix

PrimeSTAR Max DNA polymerase

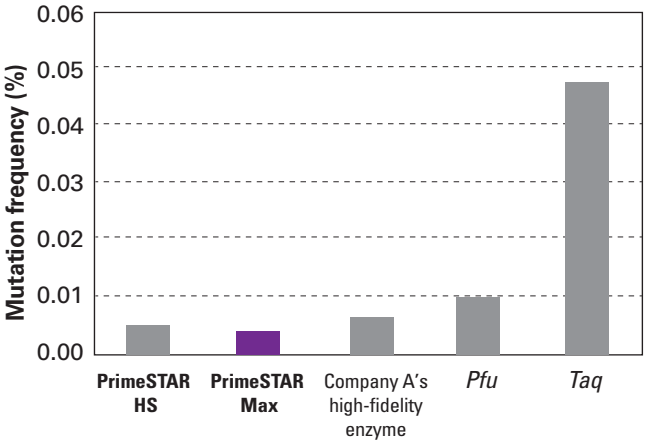
Ideal for downstream cloning, antibody engineering, and sequencing applications

Conventional proofreading DNA polymerases have much lower processivity compared to non-proofreading enzymes, leading to a tradeoff between high-fidelity and fast PCR. With PrimeSTAR Max DNA polymerase, you can have both—the fastest extension rate (5 sec/kb) with the highest fidelity (29X higher than wild-type *Taq*).

With PrimeSTAR Max DNA polymerase, you can:

- Shorten PCR time and streamline high-throughput workflows
- Obtain the correct clone of a complex target for downstream processes, as in antibody engineering
- Amplify complex structure with confidence

PrimeSTAR Max DNA polymerase is a blend of a B-family polymerase and an elongation factor in a convenient, hot-start, 2X master mix.



Lowest mutation rate detected when using PrimeSTAR Max DNA polymerase, as measured by sequencing. Eight arbitrarily selected GC-rich regions were amplified with PrimeSTAR Max DNA polymerase or other DNA polymerases, using *T. thermophilus HB8* genomic DNA as template. PCR products (~500 bp each) were each cloned into a suitable plasmid. Multiple clones were selected per respective amplification product and subjected to sequence analysis. DNA fragments amplified using PrimeSTAR Max DNA polymerase demonstrated only nine mismatched bases per 230,129 total bases.

PrimeSTAR Max DNA polymerase reliably amplified variable domains and streamlined workflows

Banu, N. *et al.* Building and optimizing a virus-specific T cell receptor library for targeted immunotherapy in viral infections. *Sci. Rep.* **4**, 4166 (2014).

PrimeSTAR Max DNA polymerase was successfully used to clone the TCRα and TCRβ chains from FACS-sorted T-cell lines.

Chen, Y. *et al.* Barcoded sequencing workflow for high throughput digitization of hybridoma antibody variable domain sequences. *J. Immunol. Methods* **455**, 88 (2018).

This workflow relied on PrimeSTAR Max DNA polymerase to amplify variable domains from the cDNA of hybridoma cells.

Jia, X., Lin, X. & Chen, J. Linear and exponential TAIL-PCR: a method for efficient and quick amplification of flanking sequences adjacent to Tn5 transposon insertion sites. *AMB Express* **7**, 195 (2017).

Using PrimeSTAR Max DNA polymerase with a fast extension speed of 5 sec/kb, this protocol was shortened from seven hours down to three hours.

Cat. #	Product	Size	Details
R045A/B	PrimeSTAR Max DNA Polymerase	100/400 Rxns	Hot-start, 2X premix

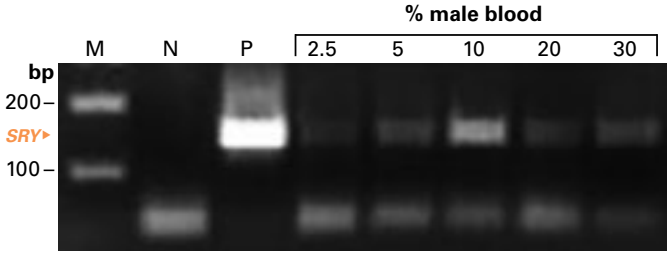
Terra PCR direct polymerase

Streamlined workflows with direct PCR from tissue samples or crude DNA extracts

Our Terra product family enables you to perform PCR directly on tissue samples, crude extracts, or dirty samples. Skipping DNA extraction and purification can minimize sample loss, save time, and reduce cost. Terra polymerase is ideal for amplifying DNA targets up to 2 kb, even with GC content up to 70%.

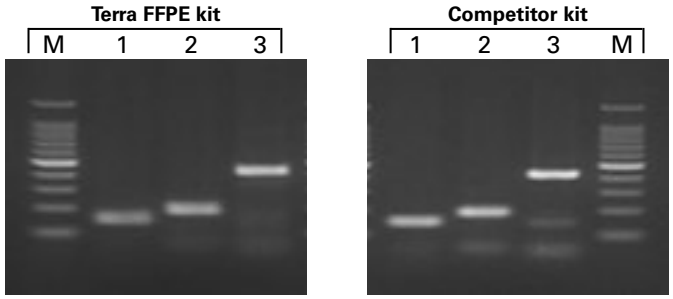
With Terra PCR direct polymerase, you can perform PCR directly on:

- Blood or blood containing heparin
- Buccal cells
- *C. elegans*
- *Drosophila*
- FFPE samples
- Human nail
- Mouse tail snips
- Plant tissues
- Raw meat
- And more...



Successful amplification of *SRY* target (148 bp) directly from whole blood. Agarose gel depicting *SRY* amplicon detection by PCR with Terra PCR Direct Polymerase Mix. PCR was performed using increasing concentrations of human male whole blood. Lane M: molecular marker. Lane N: negative control. Lane P: positive control. Data provided courtesy of Dr. Connelly, Research and Development Division, Streck Inc., LaVista, NE.

Terra PCR direct polymerase is a hot-start DNA polymerase specially formulated to tolerate PCR inhibitors. Specific kits are available for blood and FFPE samples. Proteinase K is included in all kits for sample digestion.



Faster DNA amplification with the Terra PCR Direct FFPE Kit. The Terra FFPE kit and a competitor's kit were both used to amplify fragments of the *GAPDH* gene from FFPE rat leg. Lane 1: 152-bp fragment. Lane 2: 193-bp fragment. Lane 3: 429-bp fragment. Lane M: 100-bp ladder.

Direct PCR from a variety of sample types using Terra products

Bagnoli, J.W. *et al.* Sensitive and powerful single-cell RNA sequencing using mcSCRB-seq. *Nat. Commun.* **9,** 2937 (2018).

In a single-cell RNA sequencing protocol, Terra DNA polymerase yielded more complex libraries than other polymerases during cDNA amplification from samples that had been digested with restriction enzymes.

Zhao, G. *et al.* Rapid and sensitive diagnosis of fungal keratitis with direct PCR without template DNA extraction. *Clin. Microbiol. Infect.* **20**, 0776–0782 (2014).

Terra PCR direct polymerase provided a highly sensitive and specific method to quickly identify infectious keratitis directly from patients' corneal scrapings.

Cat. #	Product[1]	Size	Details[2]
639270/1	Terra PCR Direct Polymerase Mix	200/800 Rxns	Hot-start polymerase mix and buffer (dNTP included)
639286	Terra PCR Direct Red Dye Premix	200 Rxns	Dye-added, hot-start, 2X master mix
639285	Terra PCR Direct Genotyping Kit	200 Rxns	Same as 639270, extraction buffer included
639284	Terra PCR Direct FFPE Kit	200 Rxns	Same as 639270, DNA Recovery Buffer included
639287	Terra PCR Direct Card Kit	200 Rxns	Hot-start, for genotyping on FTA cards

[1]Note that Terra products are branded as MightyAmp™ products outside the U.S., Canada, and Europe.
[2]All Terra products are supplied with a tube of Proteinase K.

Takara *LA Taq* DNA polymerase

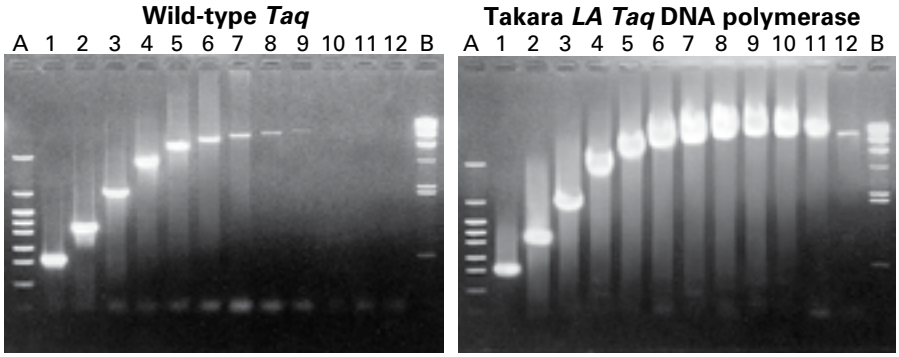
Reliable amplification of long and homologous targets

Takara *LA Taq* DNA polymerase enables you to amplify long and highly homologous sequences in a single reaction. This significantly reduces time and reagent cost, and gives you confidence when performing long-range PCR for downstream analysis, such as mitochondrial DNA sequencing or pseudogene identification.

With the Takara *LA Taq* DNA polymerase, you can:

- Efficiently amplify up to 30 kb from genomic DNA and up to 48 kb from λ DNA templates
- Achieve higher yield and accuracy than with wild-type *Taq*
- Amplify highly homologous sequences with confidence

Takara *LA Taq* DNA polymerase is formulated with a proofreading polymerase and a buffer optimized for long-range PCR. It is available with or without a hot-start antibody and as a 2X premix formulation. Optimized GC buffers are also available for amplifying GC rich targets.



More efficient amplification of long targets (up to 35 kb) with Takara *LA Taq* DNA polymerase (right panel) compared to wild-type *Taq* (left panel). Lanes A and B contain molecular weight markers (pHY and λHindIII digest markers, respectively). Lanes 1 through 12 contain amplification products.

Lane 1: 0.5 kb. Lane 2: 1 kb. Lane 3: 2 kb. Lane 4: 4 kb. Lane 5: 6 kb. Lane 6: 8 kb. Lane 7: 10 kb. Lane 8: 12 kb. Lane 9: 15 kb. Lane 10: 20 kb. Lane 11: 28 kb. Lane 12: 35 kb.

Examples of pseudogene and mitochondrial DNA sequencing with Takara *LA Taq* DNA polymerase

Li, J. *et al.* A Comprehensive Strategy for Accurate Mutation Detection of the Highly Homologous PMS2. *J. Mol. Diagnostics* **17**, 545–553 (2015).

Takara *LA Taq* DNA polymerase accurately amplified highly homologous pseudogenes in long-range PCR for downstream sequencing on the Illumina® HiSeq™ 2000 platform, which potentially improves genetic analysis for Lynch syndrome patients.

Zhang, W., Cui, H. & Wong, L.-J. C. Comprehensive One-Step Molecular Analyses of Mitochondrial Genome by Massively Parallel Sequencing. *Clin. Chem.* **58**, 1322–1331 (2012).

The entire mitochondrial genome was amplified in a single PCR product (~16.5 kb) by Takara *LA Taq* DNA polymerase, demonstrating that the enzyme is a cost-effective tool for molecular analysis of mitochondrial diseases.

Cat. #	Product	Size	Details
RR002M/B/C	TaKaRa LA Taq DNA Polymerase (Mg^{2+} plus buffer)	250/1,000/3,000 Units	Non-hot-start, includes dNTP mix
RR002A	TaKaRa LA Taq DNA Polymerase (Mg^{2+} free buffer)	125 Units	Non-hot-start, includes dNTP mix
RR042A/B	TaKaRa LA Taq DNA Polymerase Hot-Start Version	125/500 Units	Hot-start, includes dNTP mix
RR013A/B	LA PCR™ Kit, Version 2.1	50/100 Rxns	Non-hot-start, includes control primers and templates and dNTP mix
RR004	One Shot LA PCR Mix Ver. 2.0	1 set (24 Rxns)	Non-hot-start, 2X premix

For targets with GC content >65%, use TaKaRa *LA Taq* DNA Polymerase with GC Buffer (Cat. # RR02AG). For high-fidelity applications with high GC content, we recommend PrimeSTAR GXL DNA Polymerase (see Page 6).

Takara *Ex Taq* DNA polymerase

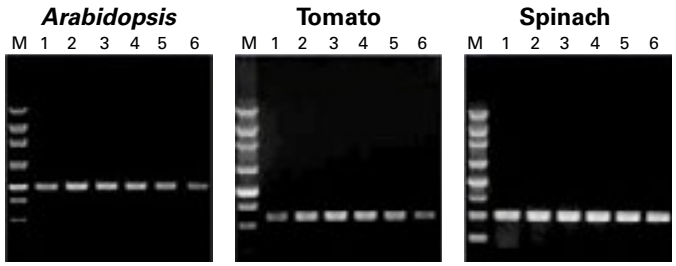
For routine PCR and qPCR from a wide range of sample types

Whether you are performing PCR or qPCR, Takara *Ex Taq* DNA polymerase is the enzyme you can rely on. It is proven to work with a wide variety of sample types, including DNA extracts contaminated by traces of PCR inhibitors, and to generate a wide range of amplicon sizes.

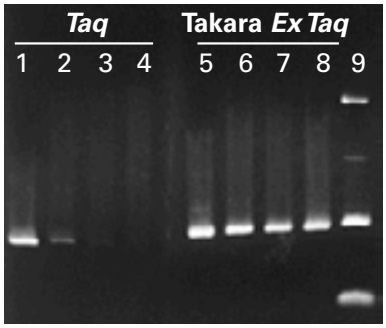
With Takara *Ex Taq* DNA polymerase, you can:

- Perform endpoint PCR as well as probe-based qPCR assays
- Utilize purified DNA from many different sample types, such as bacteria, biopsy tissue, fecal matter, *C. elegans*, plants, soil, and water
- Successfully amplify a wide range of amplicon sizes: <100 bp to 20 kb of genomic DNA, up to 30 kb from λ DNA templates

Takara *Ex Taq* DNA polymerase combines the proven performance of Takara *Taq*™ DNA polymerase with a proofreading enzyme to provide highly sensitive and efficient PCR amplification. It is also available with a hot-start antibody and as a 2X premix formulation.



***TaKaRa Ex Taq* DNA Polymerase Hot-Start Version successfully amplified target genes from different plant samples.** The targets include *Arabidopsis MER15B* (1 kb), tomato *XET* (0.6 kb), and spinach *COX1* (0.5 kb). Lane 1: undiluted DNA sample. Lane 2: twofold dilution. Lane 3: five-fold dilution. Lane 4: 10-fold solution. Lane 5: 20-fold dilution. Lane 6: 40-fold dilution. Lane M: 250-bp DNA ladder.



Successful detection of *H. pylori* (HPUA) in gastric biopsy samples (410 bp). Three gastric biopsy samples (A, B, and C) and *H. pylori* NCTC11637 (positive control, Lanes 1 and 5) were amplified with either *Taq* (Lanes 1–4) or Takara *Ex Taq* DNA polymerase (Lanes 5–8). Lanes 2 and 6 contain Sample A. Lanes 3 and 7 contain Sample B. Lanes 4 and 8 contain Sample C. Lane 9: size marker. Data provided courtesy of Dr. Kurokawa, Dr. Nukina, and Dr. Nakanishi, Public Health Research Institute of Kobe City.

Reliable results with a wide variety of samples and in screening protocols with Takara *Ex Taq* DNA polymerase

Klos, K. L. E., Vásquez-Siller, L. M., Wetzel, H. C. & Murray, T. D. PCR-Based Detection of *Cephalosporium gramineum* in Winter Wheat. *Plant Dis.* **96**, 437-442 (2012).

Takara *Ex Taq* DNA polymerase consistently amplified the desired target sequence without the need for additives to counteract PCR inhibitors present in plant extracts, and outperformed Promega's GoTaq DNA Polymerase in this study.

Seo, S. B. *et al.* Improvement of short tandem repeat analysis of samples highly contaminated by humic acid. *J. Forensic Leg. Med.* **20**, 922-8 (2013).

Takara *Ex Taq* DNA polymerase was shown to be more resistant to humic acid, a known PCR inhibitor, as compared to AmpliTaq Gold.

The Genetic Perturbation Platform of the Broad Institute recommends using Takara *Ex Taq* for PCR amplification of sgRNAs from gDNA for sequencing.

Cat. #	Product	Size	Details
RR001A/B/C	TaKaRa Ex Taq DNA Polymerase	250/1,000/3,000 Units	Non-hot-start
RR01AM/BM/CM	TaKaRa Ex Taq DNA Polymerase (Mg^{2+} free buffer)	250/1,000/3,000 Units	Mg^{2+}-free buffer
RR006A/B	TaKaRa Ex Taq DNA Polymerase Hot-Start Version	250/1,000 Units	Hot-start
RR030A	Premix Ex Taq DNA Polymerase Hot-Start Version	100 Rxns	2X premix

Custom business-friendly and automation-ready solutions

Our products, your way

Life science research often requires something above and beyond a one-size-fits-all approach. Our dedication to customer support brings unique and effective solutions to your specific experimental challenges. Partnering with Takara Bio allows you to:

- Include our enzymes into your own formulations, workflows, or kits and consumables
- Collaborate with our experts to develop reagent formulations that integrate into your workflow
- Leverage our ISO-certified manufacturing capabilities (under ISO 13485:2016) to ensure the quality of your product
- Benchmark and validate the best enzyme for your dry-down or automation applications by sampling highly concentrated enzyme formulations (with or without glycerol)

Whether you seek custom formulation, bulk purchasing, or OEM partnership, our entire team stands behind one promise: we will help you achieve your goals. Contact us at bd_oem@takarabio.com.

Additional DNA polymerases for different PCR needs

Applications	Product	Cat. #	Size
Economical endpoint PCR	TaKaRa Taq DNA Polymerase TaKaRa Taq DNA Polymerase Hot-Start Version	R001A/B/C R007A/B	250/1,000/3,000 Units 250/1,000 Units
Streamlined colony PCR screening	SapphireAmp® Fast PCR Master Mix	RR350A/B	160/800 Rxns
Convenient routine genotyping	EmeraldAmp® MAX GT (dye-added PCR master mix)	RR310A/B	160/800 Rxns
Ideal for use with many of Takara Bio's SMARTer® kits for NGS	SeqAmp™ DNA Polymerase	638504/9	50/200 Rxns

Related PCR reagents and accessories

Cat. #	Product	Size
639250/1	TaqStart Antibody	200/500 Rxns
639125	Advantage UltraPure PCR Deoxynucleotide Mix (10 mM each dNTP)	4 x 100 µl
639132	Advantage UltraPure dNTP Combination Kit (100 mM each dNTP)	250 µl/dNTP
740668	NucleoSpin® 8 PCR Clean-up	12 x 8 preps
740609	NucleoSpin Gel and PCR Clean-up	50 preps

Expert support and resources facilitate your PCR success

- Selection guides
- References
- Technical notes
- Experienced technical support scientists

Learn more at: takarabio.com/pcr

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