PCR

Trusted polymerases expedite discoveries

Turn your challenges into success stories

TaKaRa

Powerful polymerases for breakthrough results

Exceptional enzymes backed by proven expertise

Making experimental progress doesn't always have to be challenging. Our PCR polymerases work the first time, so you can spend less on optimization and focus more on your key scientific questions. The proof is in the publications: scientists have widely used our enzymes to expedite projects and make discoveries described in a myriad of peer-reviewed studies.

An extensive history and dedication to developing high-quality products are the basis for the reliable performance of our PCR polymerases. We have 100 years of expertise in enzymology, beginning in 1925 with the improvement of fermentation techniques for cultivating microbes. In 1950, we launched a biotech R&D center, which established a practice of quality and innovation that continues today.

Take advantage of our deep expertise and delve into your scientific inquiry, trusting that our PCR polymerases will deliver breakthrough results.

Our history

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

1925
Formally incorporated as Takara Shuzo Co., Ltd.

1950
Takara Bio founded a biotechnology R&D center

1984
Clontech Laboratories, Inc. established in the United States

1993
Takara Bio began selling PCR products

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

Features of top PCR polymerases

	All-purpose PCR	High-fidelity PCR		Routine PCR		Direct PCR	Multiplexing PCR	Clinical PCR
	Takara Ex Premier™	**PrimeSTAR® Max**	**PrimeSTAR GXL**	**Takara Ex Taq®**	**Takara *LA Taq***	**Terra™ PCR Direct**	**Titanium® Taq**	**Advantage® 2**
Amplicon size (gDNA)	≤30 kb (long)	≤6 kb	≤30 kb (long)	≤20 kb	≤30 kb (long)	≤2 kb	≤2 kb	≤6 kb
Fidelity vs. wild-type *Taq*	+++	+++++	++++	++	+++	N/A	+	++++
Yield	++++	+	+	++++	++	++++	+++++	+++++
Speed	30 sec/kb	5 sec/kb (fast)	30 sec/kb	60 sec/kb	60 sec/kb	60 sec/kb	60 sec/kb	60 sec/kb
Exonuclease activity	3'–5'	3'–5'	3'–5'	3'–5' and 5'–3'	3'–5' and 5'–3'	–	–	3'–5'
Suitable for AT- or GC-rich templates	✔	–	✔	–	–	✔	–	–
PCR product	Blunt end	Blunt end	Blunt end	T/A overhang	T/A overhang	T/A overhang	T/A overhang	T/A overhang
Available formulations								
Antibody-mediated hot-start	✔	✔	✔	✔ (non-hot-start also available)	✔ (non-hot-start also available)	✔	✔	✔
Glycerol-free	–	–	–	–	–	–	✔	–
2X premix	✔	✔	✔	✔	✔	✔	–	–
Lyophilized format	–	–	–	–	–	–	✔	✔

1998

Clontech Laboratories, Inc. launched Titanium *Taq* DNA polymerase

2005

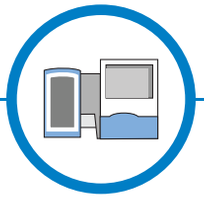
Takara Bio acquired Clontech Laboratories, Inc.

2011

Takara Bio launched PrimeSTAR DNA polymerases

2017

Takara Bio USA, Inc. (formerly Clontech) acquired WaferGen Bio-systems, Inc. and the SmartChip® Real-Time PCR System

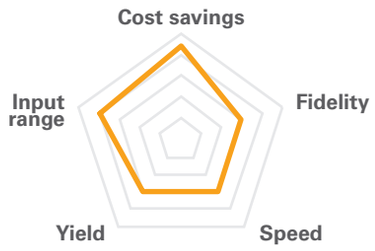


2025

Takara Holdings Inc. celebrated the 100th anniversary of its foundation

Takara Ex Premier DNA Polymerase

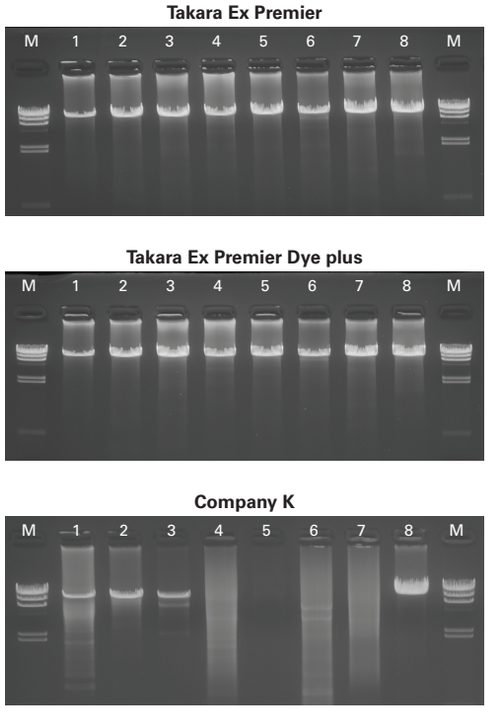
All-around performance from routine PCR to NGS



- Achieve a high success rate for long (up to 30 kb) and GC/AT-rich amplicons, or crude samples
- Obtain high fidelity suitable for various applications, including cloning and sequencing
- Shorten PCR time with high-speed amplification (10 sec/kb for targets up to 10 kb)

Takara Ex Premier DNA Polymerase is a high-fidelity α-type DNA polymerase derived from *Thermococcus sp.* with a hot-start antibody. This 2X premix does not freeze at –20°C, making setup quick and easy.

Amplification of various sequences



Takara Ex Premier DNA Polymerase amplified long, complex targets more successfully than Company K's enzyme. Human genomic DNA (100 ng) was used as a template. All amplicons are approximately 10 kb. Lane 1: *HBB*. Lane 2: *TP53*. Lane 3: *BCL2*. Lane 4: *TFRC*. Lane 5: *EGFR*. Lane 6: *FGFR*. Lane 7: *IRS1*. Lane 8: *DMD*. Lane M: Marker.

Publication highlights on versatility in applications ranging from NGS to sequence-based genotyping

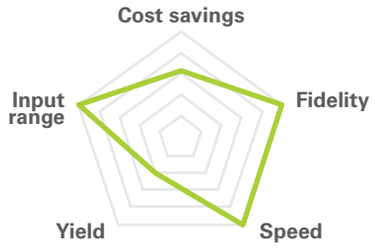
- Identifying the best PCR enzyme for library amplification in NGS (Quail et al. 2024; *Microbial Genomics*)
- Involvement of the kisspeptin system in regulation of sexual behaviors in medaka (Oka et al. 2024; *iScience*)
- Morphological and molecular identification of hard ticks in Hainan Island, China (Intirach et al. 2023; *Genes*)

PRODUCTS

Cat. #	Size	Details
TaKaRa Ex Premier DNA Polymerase		
RR370A RR370B	200 Rxns 800 Rxns	Hot-start, 2X premix
TaKaRa Ex Premier DNA Polymerase Dye plus		
RR371A RR371B	200 Rxns 800 Rxns	Hot-start, 2X premix, dye added

PrimeSTAR Max DNA polymerase

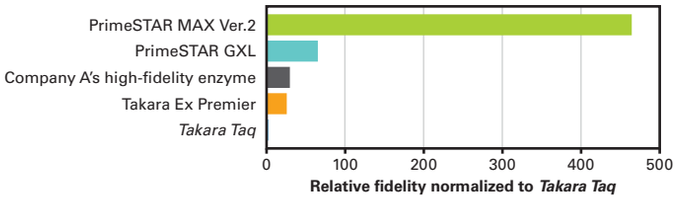
Accuracy and speed for downstream applications requiring high fidelity



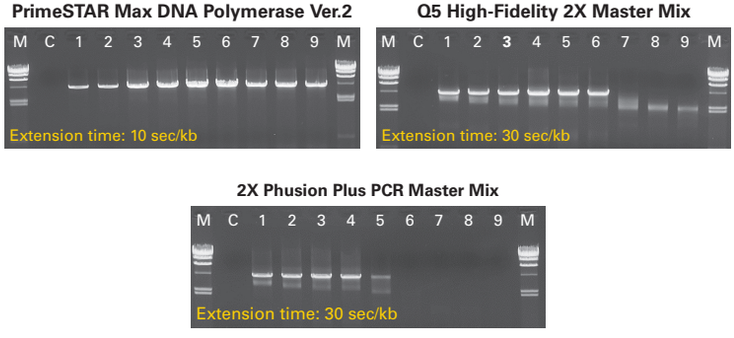
- Shorten PCR time with the fastest extension rate (as low as 5 sec/kb) while keeping the highest fidelity (420X higher than wild-type *Taq*)
- Obtain the correct clone of a complex target for antibody engineering or sequencing applications
- Achieve a higher capacity with PrimeSTAR Max DNA Polymerase Ver.2 (up to 1,000 ng total RNA input) than the original PrimeSTAR Max DNA Polymerase (up to 200 ng)

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

High-fidelity amplification



PrimeSTAR Max DNA Polymerase Ver.2 has 420X higher fidelity than wild-type *Taq*. The fidelity of these polymerases was measured by the sequencing method. 10 kb of λ DNA was amplified using various PCR polymerases, and PCR products were cloned into a vector and transformed into *E. coli*. Multiple clones were picked to isolate plasmid DNA, and mutation rates in purified DNA were measured by Sanger sequencing.



Better amplification efficiency of PrimeSTAR Max DNA Polymerase Ver.2 compared with other commercially available high-fidelity enzymes. The target gene, transferrin receptor (*TFR*, 4 kb), was amplified using cDNA templates obtained from 10 ng to 1 µg of total RNA (50 µl reaction volume) under conditions recommended by the respective manufacturers. PrimeSTAR Max DNA Polymerase Ver.2 improved amplification for amounts up to 1 µg of total RNA. Lane 1: 10 ng. Lane 2: 20 ng. Lane 3: 50 ng. Lane 4: 100 ng. Lane 5: 200 ng. Lane 6: 400 ng. Lane 7: 600 ng. Lane 8: 800 ng. Lane 9: 1 µg. Lane M: Marker. Lane C: No template.

Publication highlights on a range of genes and domains, ensuring accurate gene assembly

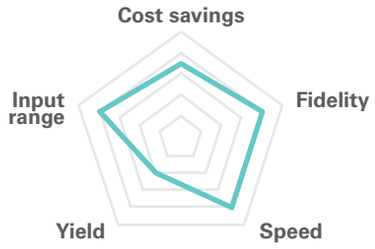
- Multimodal analysis of composition and spatial architecture in human squamous cell carcinoma (Ji et al. 2022; *Cell*)
- A gut-derived metabolite alters brain activity and anxiety behaviour in mice (Needham et al. 2022; *Nature*)
- Barcoded sequencing workflow for high throughput digitization of hybridoma antibody variable domain sequences (Chen et al. 2018; *J. Immunol. Methods*)

PRODUCTS

Cat. #	Size	Details
PrimeSTAR Max DNA Polymerase		
R045A R045B	100 Rxns 400 Rxns	Hot-start, 2X premix
PrimeSTAR Max DNA Polymerase Ver.2		
R047A R047B	100 Rxns 400 Rxns	Hot-start, 2X premix

PrimeSTAR GXL DNA polymerase

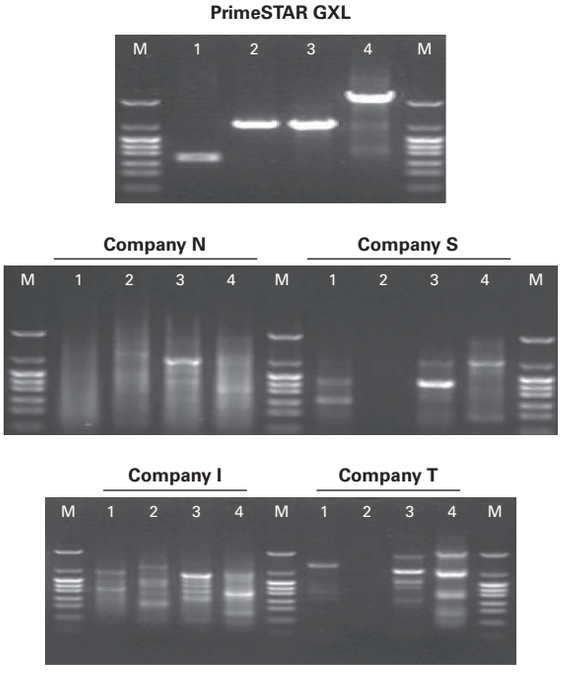
Amplification of long GC-rich templates



- Achieve successful amplification of long template regions (up to 30 kb) with high fidelity
- Manage GC- or AT-rich polymorphic or regulatory regions without extensive optimization
- Prepare highly variable NGS libraries without amplification bias

PrimeSTAR GXL DNA polymerase is based on a modified B-family polymerase and includes an elongation factor. It works on many samples, such as purified plant DNA, FFPE samples, and circulating cell-free DNA.

GC-rich PCR



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 extensive optimization. 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-β1* 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: Marker.

Publication highlights on amplification of viral genomes for downstream sequencing or gene expression applications

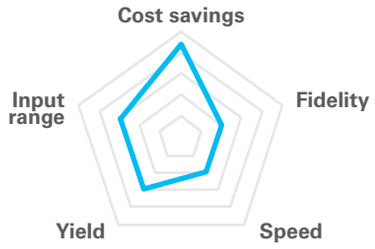
- A semi-automated and high-throughput approach for the detection of honey bee viruses in bee samples (Nikulin et al. 2024; *PLOS ONE*)
- SARS-CoV-2 reverse genetics reveals a variable infection gradient in the respiratory tract (Hou et al. 2020; *Cell*)
- Long-range PCR in next-generation sequencing: comparison of six enzymes and evaluation on the MiSeq® sequencer (Jia et al. 2015; *Sci. Rep.*)

PRODUCTS

Cat. #	Size	Details
PrimeSTAR GXL DNA Polymerase		
R050A R050B	250 Units 1,000 Units	Hot-start
PrimeSTAR LongSeq DNA Polymerase		
R055A R055B	200 Rxns 800 Rxns	Hot-start, 2X premix, ideal for long-read NGS applications
PrimeSTAR GXL Premix		
R051A R051B	200 Rxns 800 Rxns	Hot-start, 2X premix
PrimeSTAR GXL Premix Fast		
R053A R053B	200 Rxns 800 Rxns	Hot-start, 2X premix
PrimeSTAR GXL Premix Fast, Dye plus		
R052A	200 Rxns	Hot-start, 2X premix, dye added

Takara *Ex Taq* DNA polymerase

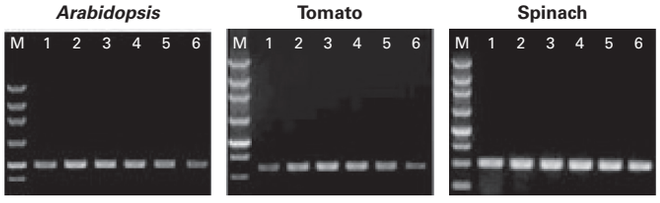
Routine PCR and qPCR for a wide range of sample types



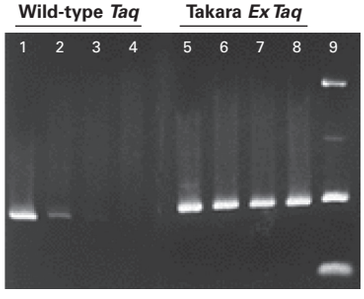
- Achieve exceptional results in endpoint PCR as well as probe-based qPCR assays
- Accommodate many different sample types, such as bacteria, biopsy tissue, fecal matter, *C. elegans,* plants, soil, and water
- Successfully amplify a range of amplicon sizes: <100 bp to 20 kb of genomic DNA, up to 30 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.

Amplification across sample types



TaKaRa *Ex Taq* DNA Polymerase Hot-Start Version 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: fivefold dilution. Lane 4: tenfold dilution. Lane 5: 20-fold dilution. Lane 6: 40-fold dilution. Lane M: marker.



Takara *Ex Taq* improved detection of *H. pylori* in gastric biopsy samples (410 bp) as compared to *Taq* polymerase. 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: Sample A. Lanes 3 and 7: Sample B. Lanes 4 and 8: Sample C. Lane 9: Marker.

Data provided courtesy of Dr. Kurokawa, Dr. Nukina, and Dr. Nakanishi, Public Health Research Institute of Kobe City.

Publication highlights on a variety of samples and sequence mismatches

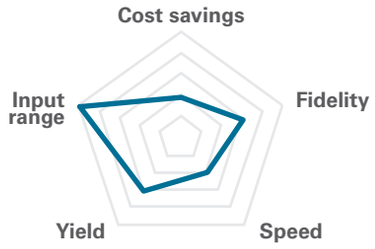
- Exploring the impact of primer–template mismatches on PCR performance of DNA polymerases varying in proofreading activity (Huang et al. 2024; *Genes*)
- Application of eDNA as a tool for assessing fish population abundance (Spear et al. 2021; *Environmental DNA*)
- The Genetic Perturbation Platform of the Broad Institute recommends using Takara *Ex Taq* for PCR amplification of sgRNAs from gDNA for sequencing

PRODUCTS

Cat. #	Size	Details
TaKaRa *Ex Taq* DNA Polymerase		
RR001A RR001B RR001C	250 Units 1,000 Units 3,000 Units	Include dNTP mix
TaKaRa *Ex Taq* DNA Polymerase (Mg^{2+} free buffer)		
RR01AM RR01BM RR01CM	250 Units 1,000 Units 3,000 Units	Include Mg^{2+}-free buffer and dNTP mix
TaKaRa *Ex Taq* DNA Polymerase Hot-Start Version		
RR006A RR006B	250 Units 1,000 Units	Hot-start
Premix *Taq*™ DNA Polymerase (*Ex Taq* Version 2.0)		
RR003A	120 Rxns	2X premix
Premix *Ex Taq* DNA Polymerase Hot-Start Version		
RR030A	100 Rxns	Hot-start, 2X premix

Takara *LA Taq* DNA polymerase

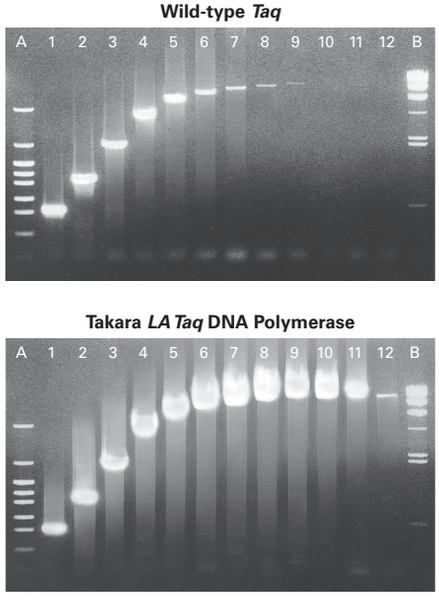
Amplification of lengthy and homologous targets



- Efficiently amplify up to 30 kb from genomic DNA and long λ DNA templates
- Achieve high yield and accuracy with highly homologous sequences such as pseudogenes

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.

Long-range PCR



More efficient amplification of long targets (up to 35 kb) with Takara *LA Taq* DNA Polymerase (bottom panel) compared to wild-type *Taq* (top panel). 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.
Lanes A and B: Marker.

Publication highlights on long-range mitochondrial DNA and full-length cDNA amplification

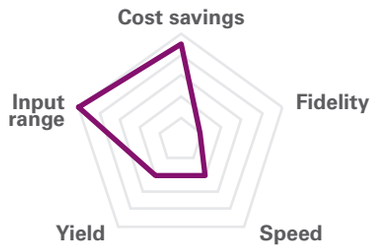
- Novel insights into adaptive evolution based on the unusual AT-skew in Acheilognathus gracilis mitogenome and phylogenetic relationships of bitterling (Li et al. 2024; *Gene*)
- Single-cell multiomics reveal the scale of multilayered adaptations enabling CLL relapse during venetoclax therapy (Thijssen et al. 2022; *Blood*)
- MitoTALEN reduces mutant mtDNA load and restores $tRNA^{Ala}$ levels in a mouse model of heteroplasmic mtDNA mutation (Bacman et al. 2020; *Nature Medicine*)

PRODUCTS

Cat. #	Size	Details
TaKaRa *LA Taq* DNA Polymerase (Mg^{2+} plus buffer)		
RR002A RR002M RR002B RR002C	125 Units 250 Units 1,000 Units 3,000 Units	Include dNTP mix and Mg^{2+} plus buffer
TaKaRa *LA Taq* DNA Polymerase Hot-Start Version		
RR042A RR042B	125 Units 500 Units	Hot-start, include dNTP mix
TaKaRa *LA Taq* DNA Polymerase with GC Buffer		
RR02AG	125 Units	Ideal for targets with GC content >65%
LA PCR™ Kit, Version 2.1		
RR013A RR013B	50 Rxns 100 Rxns	Include dNTPs, positive control template, and primer mix
One Shot LA PCR Mix Ver. 2.0		
RR004	1 set (24 Rxns)	2X premix

Terra PCR direct polymerase

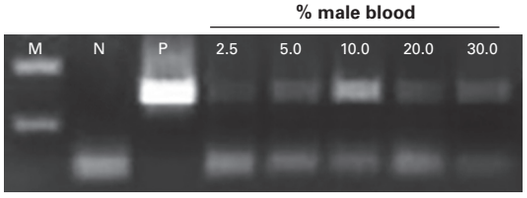
Streamlined workflows with direct PCR from tissue samples or crude DNA extracts



- Perform PCR directly on tissue samples, crude extracts, or dirty samples without DNA extraction
- Minimize sample loss, save time, and reduce cost
- Amplify DNA targets up to 2 kb, even with GC content up to 70%

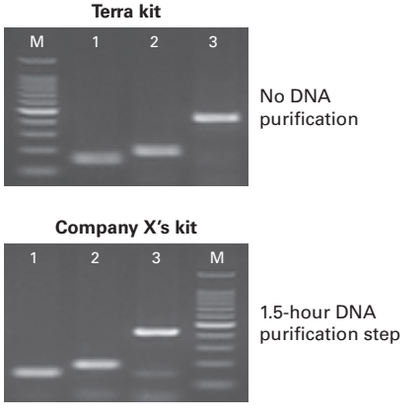
Terra PCR direct polymerase is a hot-start DNA polymerase specially formulated to tolerate PCR inhibitors. Proteinase K is included in all kits for sample digestion.

Amplification directly from blood and FFPE tissues



Amplification of *SRY* target (148 bp) directly from whole blood with Terra PCR Direct Polymerase Mix. PCR was performed using increasing concentrations of human male whole blood. Lane M: marker. Lane N: negative control. Lane P: positive control.

Data provided courtesy of Dr. Connelly, Research and Development Division, Streck Inc., LaVista, NE.



Faster DNA amplification with the Terra PCR Direct Kit. The Terra kit and Company X'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: Marker.

Publication highlights on direct PCR from a variety of sample types

- A time- and single-cell-resolved model of murine bone marrow hematopoiesis (Kucinski et al. 2024; *Cell Stem Cell*)
- Highly sensitive spatial transcriptomics at near-cellular resolution with Slide-seqV2 (Stickels et al. 2021; *Nature Biotechnology*)
- Rapid and sensitive diagnosis of fungal keratitis with direct PCR without template DNA extraction (Zhao et al. 2014; *Clin. Microbiol. Infect.*)

PRODUCTS

Cat. #	Size	Details*
Terra PCR Direct Polymerase Mix		
639270 639271	200 Rxns 800 Rxns	Hot-start, include dNTP mix
Terra PCR Direct Genotyping Kit		
639285	200 Rxns	Hot-start, includes dNTP mix and extraction buffer
Terra PCR Direct Red Dye Premix		
639286	200 Rxns	Hot-start, 2X premix, dye added
MightyPrep Reagent for DNA		
9182	20 mL	Extraction buffer for animal and plant tissues, blood, soil, etc.

* Note that Terra products are branded as MightyAmp™ products outside the US, Canada, and Europe. All Terra products are supplied with a tube of Proteinase K.

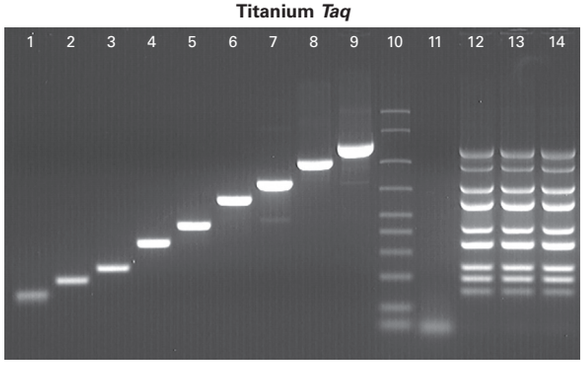
Titanium *Taq* DNA polymerase

Rare target amplification and efficient multiplexing

- Generate exceptionally high yields of PCR products, even from low-copy-number targets
- Tolerate a wide range of Mg^{2+} concentrations, making it versatile for multiplexing
- Lyophilize your own assays with a glycerol-free version or use lyophilized EcoDry™ premix

Titanium *Taq* is a mutant polymerase, based on wildtype *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, increasing specificity—especially useful for multiplex reactions.

Multiplex PCR



Highly specific and efficient multiplexing with Titanium *Taq* DNA Polymerase. PCR was performed using human genomic DNA as a template and primer pairs for nine different targets. 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: Marker. Lane 11: No-template negative control. Lanes 12–14: Replicates of nine-plex PCR.

Publication highlights on genome-wide CRISPR screens and multiplex PCR

- Genome-wide CRISPR screens reveal host factors critical for SARS-CoV-2 infection (Wei et al. 2021; *Cell*)
- Clinical experience of laboratory follow-up with noninvasive prenatal testing using cell-free DNA and positive microdeletion results in 349 cases (Schwartz et al. 2018; *Prenat. Diagn.*)
- Titanium *Taq* has been validated on various multiplexing platforms, such as Affymetrix's microarray kits and the MassARRAY System from Agena Bioscience

PRODUCTS

Cat. #	Size	Details
Titanium *Taq* DNA Polymerase		
639208 639209 639242	100 Rxns 500 Rxns 1,000 Rxns	dNTPs need to be purchased separately
50X Titanium *Taq* DNA Polymerase (Glycerol-Free)		
639246	50 µl	dNTPs need to be purchased separately
Titanium *Taq* PCR Kit		
639210 639211	30 Rxns 100 Rxns	Include dNTPs, positive control template, and primer mix
High Yield PCR EcoDry Premix		
639278 639276	24 Rxns 48 Rxns	Lyophilized premix in 8-tube strips

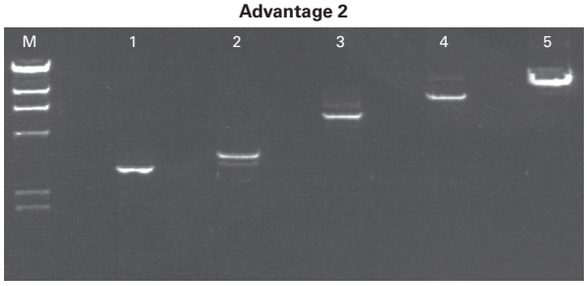
Advantage 2 DNA polymerase

Confidence with clinical and environmental samples

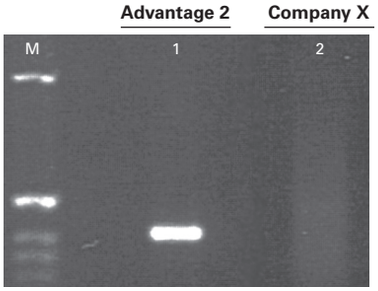
- Leverage a blend of Titanium *Taq,* a proofreading enzyme, and TaqStart Antibody for high sensitivity, yield, and fidelity
- Amplify noncomplex targets up to 18 kb and complex targets up to 6 kb
- Accurately detect target sequences even in the presence of low amounts of starting material

Advantage 2 DNA polymerase consists 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.

Amplification of various and rare targets



Amplification of various 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-1β* 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: Marker.



Amplification of a fragment from rare tumor necrosis factor receptor II (*TNFR II*) cDNA with Advantage 2 Polymerase Mix and a Company X'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: Marker.

Publication highlights on viral cDNA and whole-transcriptome amplification

- Identification and quantitation of multiple variants in RNA virus genomes (Sena et al. 2024; *Biol. Methods and Protoc.*)
- A cancer cell program promotes T cell exclusion and resistance to checkpoint blockade (Jerby-Arnon et al. 2018; *Cell*)
- Preparation of single-cell RNA-seq libraries for next generation sequencing (Trombetta et al. 2014; *Curr. Protoc. Mol. Biol.*)

PRODUCTS

Cat. #	Size	Details
Advantage 2 Polymerase Mix		
639201 639202	100 Rxns 500 Rxns	dNTPs need to be purchased separately
Advantage 2 PCR Kit		
639207 639206	30 Rxns 100 Rxns	Include dNTPs, positive control template, and primer mix
Advantage GC 2 Polymerase Mix		
639114	100 Rxns	Ideal for targets with GC content >65%; dNTPs need to be purchased separately
High Fidelity PCR EcoDry Premix		
639282 639280	24 Rxns 48 Rxns	Lyophilized premix in 8-tube strips

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