Amplify your Scientific Discoveries

ISO
13485: 2003
13485: 2012

Next Generation Polymerase Chain Reaction

Developed by Nobel laureate Kary Mullis in the 1980s, Polymerase Chain Reaction (PCR) is a molecular technology that allows fast and [redacted] *in vitro*. It has since *become a fundamental tool in genetic and molecular research as large amounts of the target DNA are often required for DNA experimentation. Some applications relying on the technology of PCR include DNA sequencing (e.g. Human Genome Project),* DNA fingerprinting, forensics, detection of bacteria or viruses (particularly AIDS) and diagnosis of hereditary diseases.

crb

1 Next Generation PCR

Polymerase Chain Reaction (PCR) is a molecular technology developed by Nobel laureate Kary Mullis in the 1980s that allows fast and inexpensive amplification of DNA fragments *in vitro*. It has since become a fundamental tool in genetic and molecular research as large amounts of the target DNA are often required for DNA experimentation. Some applications relying on the technology of PCR include DNA sequencing (e.g. Human Genome Project), DNA fingerprinting, forensics, detection of bacteria or viruses (particularly AIDS) and diagnosis of hereditary diseases. Due to its ability to generate large quantities of DNA from a small amount of nucleic acid, PCR is a very efficient way to amplify DNA and thus is sometimes referred to as "molecular photocopying".

As an industry-leading and global biotech company, **crb** offers a wide range of PCR, RT-PCR and qPCR enzyme products. Over the years, our scientists have engineered the highest quality enzymes and most advanced and sophisticated formulations for PCR related applications. In addition, all of **crb**'s products have been well validated by researchers around the world with an increasing number of citations available in scientific publications.

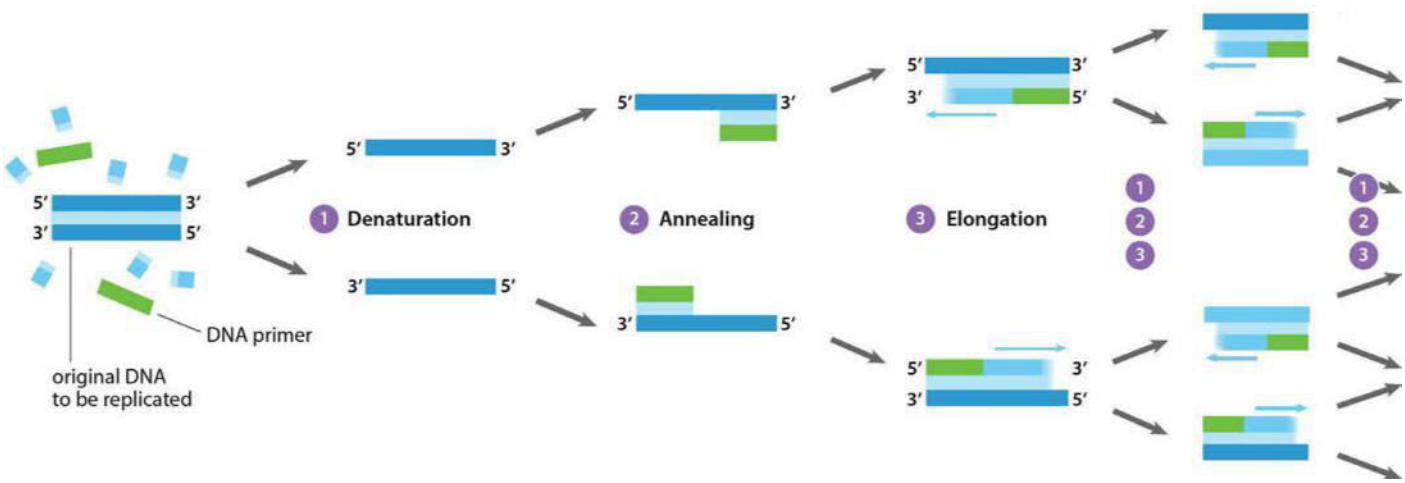

Figure 1. How Polymerase Chain Reaction works: 1) Denaturation: the reaction is heated to break the hydrogen bonds between the strands. 2) Annealing: the reaction temperature is lowered to allow primers to anneal to the template strands. 3) Elongation: the temperature is increased (optimal temperature dependent on DNA Polymerase used) to allow for the addition of dNTPs.

Characteristics and Formats of **crb** DNA Polymerases

Cat. No.	G008 G009 G126	G456 G457	G498 G499	G078	G011 G039	G012 G040	G277 G278	G460 G461	G462 G463
Characteristic	**Taq**	**Bestaq™**	**Kodaq**	**Precision™**	**HotStart Taq**	**Taq Plus**	**TaqFast**	**Long-Range**	**Bloodi-rect**
Proofreading	No	Yes	Yes	Yes	No	Yes	Yes	No	No
Fidelity (vs Native Taq)	1X	50X	50X	60X	1X	5X	10X	1X	1X
Specificity	●●	●●●	●●●	●●●	●●●●	●●	●●●	●●●	●●
Extension Speed (per minute)	1 kb	3-4 kb	1 kb	1 kb	1 kb	1 kb	4-6 kb	3-4 kb	1 kb
Target Length	6 kb	15 kb	12 kb	6 kb	6 kb	6 kb	12 kb	20 kb	2 kb
MasterMix available	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Special Feature	Routine PCR	All PCR Applications	Difficult Template	High Fidelity PCR	High Specificity	Improved Fidelity	Fast PCR	Long Amplicons	Extraction Free

Kodaq DNA Polymerase and MasterMix

crb's Kodaq DNA Polymerase has strategically engineered mutations that make it a robust, high fidelity polymerase. Kodaq has exceptional 3' to 5' exonuclease activity, endowing it with superior accuracy over competitor polymerases. Our advanced Kodaq 2X PCR buffer system tolerates high A/T and G/C content as well as many common PCR inhibitors found in typical DNA samples, making it the ultimate choice for amplifying challenging templates such as plant or tissue samples. Kodaq is available as an independent enzyme in optimized buffer, or in a convenient, ready-to-use MasterMix solution.

- High fidelity PCR
- Robust PCR performance, resistant to most PCR inhibitors commonly found in samples (including plant samples)
- PCR success with A/T and G/C rich templates
- High processivity, for excellent yield amplifications

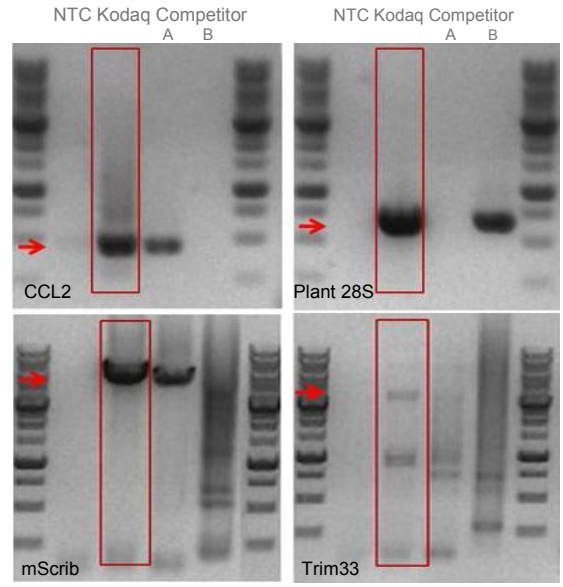

Figure 2: Robustness of Kodaq DNA Polymerase
Four difficult templates, including a plant gDNA sample, were amplified with **crb**'s Kodaq vs. competitor's DNA Polymerases. (Red arrows indicate the expected products size)

Plant and Tissue Ex-Amp PCR Kits (Cat. No. G923 & G927)

Plant and Tissue Ex-Amp PCR kits come with **crb**'s Kodaq 2X PCR MasterMix with dye to offer the ultimate convenience of obtaining PCR-ready templates in 15 minutes from challenging plant and tissue samples.

- Simple universal protocol for various plant or animal tissue samples
- No time-consuming and complicated DNA purification needed
- Only a small amount of sample required
- Robust PCR and gel-loading-ready PCR products

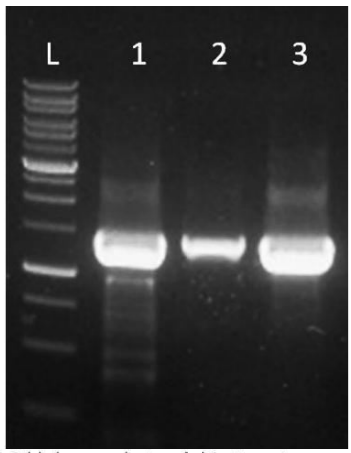

Figure 3: A 1.3 kb human beta-globin target was amplified from 50 ng of human gDNA using different Taq DNA Polymerases as stated: (Lane: L = Ladder, 1 = Regular Taq, 2 = Chemically HotStart Taq, and 3 = Antibody HotStart Taq). Chemically HotStart Taq yields weaker amplification and only Antibody HotStart Taq would fully regain its activity upon activation. The increased specificity in Antibody HotStart PCR leads to a stronger amplification of the target band.

HotStart Taq DNA Polymerase and MasterMix

HotStart Taq DNA Polymerase is an antibody mediated form of Taq DNA Polymerase that is inactivated when bound to **crb**'s Anti-Taq Antibody at room temperature, requiring thermal activation (at 94°C for 3 - 5 minutes) to attain full functionality. This feature significantly reduces non-specific product formations that would otherwise compete for reagent availability, offering improved yield of designed products. HotStart DNA Polymerase is available as an independent enzyme in optimized buffer, or a ready-to-use MasterMix solution which provides all ingredients necessary for PCR in a premixed and optimized format that simplifies the PCR workflow.

- Eliminates non-specific priming events
- Prevents primer degradation during PCR setup
- Increases sensitivity, specificity, and yield

Taq DNA Polymerase and MasterMix

crb 's Taq DNA polymerase offers consistent, high-yield, and sensitive results across a range of DNA templates. This widely-used polymerase is most suitable for routine PCR amplifications of templates up to 6 kb where less emphasis is required on fidelity. It also comes in a ready-to-use MasterMix solution that provides all ingredients necessary for PCR in a premixed and for optimized format that simplifies the PCR workflow.

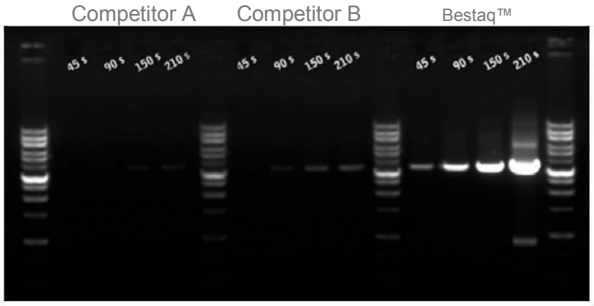

Figure 4: Bestaq™ combines high speed with efficiency
A 3.5 kb target gene was amplified using Bestaq™ vs. two competitor polymerases. Bestaq™ was able to amplify the target with superior yields in a shorter time compared to competitor enzymes.

Bestaq™ DNA Polymerase and MasterMix

Our Bestaq™ DNA Polymerase's industry-leading performance is due to proprietary engineering that conveys intrinsically enhanced fidelity and processivity—increasing yield, speed, and amplification length during PCR. This innovative enzyme reduces extension steps and reaction times, making it ideal for a variety of PCR applications over a wide range of templates, especially difficult templates or long range amplifications. Bestaq™ is available as an independent enzyme in its optimized buffer, or in a ready-to-use MasterMix solution.

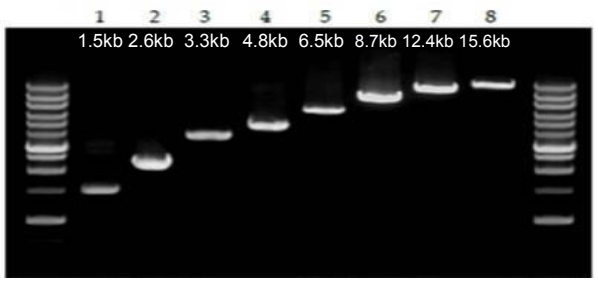

Figure 5: Bestaq™ specifically amplifies genomic template DNA up to 15.6 kb
PCR amplification with Bestaq™ of various targets, ranging from 1.5 kb to 15.6 kb, from genomic DNA, followed by electrophoresis on a 1% agarose gel.

Taq Plus DNA Polymerase and MasterMix

Taq Plus DNA Polymerase is a two-polymerase blend system characterized by highly sensitive template detection and significantly improved fidelity compared to Taq DNA Polymerase. Available as an independent enzyme in its optimized buffer, or in a ready-to-use MasterMix solution, Taq Plus is the ideal system for any PCR application that requires accuracy without compromising sensitivity and yield.

Precision™ DNA Polymerase and MasterMix

crb's Precision™ High Fidelity DNA Polymerase has a 60-fold higher accuracy than Taq DNA Polymerase, setting a new standard for high fidelity PCR applications. Highly accurate PCR is critical for downstream applications such as cloning, whole-genome sequencing, standard sequencing, site-directed mutagenesis, and protein expression. With its exceptional proofreading and processivity, as well as an optimized reaction buffer system and protocol, Precision™ is the perfect choice for high fidelity PCR. Precision™ is available as an independent enzyme in its optimized buffer, or in a ready-to-use MasterMix solution.

Figure 6: Exceptionally high fidelity of Precision™
Precision™ DNA Polymerase has the highest accuracy rate compared to other DNA polymerases. Shown as relative fidelity compared to Taq DNA Polymerase (Taq = 1X).

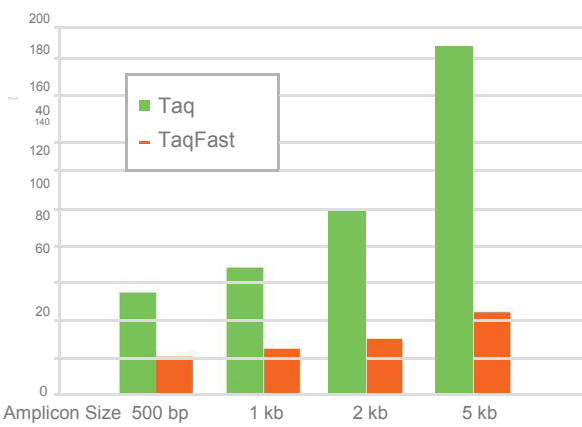

Figure 7: TaqFast significantly reduces PCR elongation times
Total reaction times of TaqFast and Taq were determined for the generation of different sized amplicons; 500 bp, 1 kb, 2 kb and 5 kb. Reaction times are based on a 30- cycle program using the recommended reaction protocol for each enzyme.

TaqFast DNA Polymerase and MasterMix

TaqFast DNA Polymerase is an optimized mutational derivative of Taq DNA Polymerase developed to achieve high-speed PCR, with exceptionally short extension times of 10 - 15 seconds/kb. Due to its improved processivity and moderate 3'-5' proofreading activity, TaqFast DNA polymerase is well-suited for high-throughput PCR and other PCR applications from very low amounts of template. TaqFast is available as an independent enzyme in its optimized buffer, or in a ready-to-use MasterMix solution.

Bloodirect DNA Polymerase and MasterMix

Our Bloodirect DNA Polymerase is an optimized mutational derivative of Taq DNA Polymerase developed for direct PCR amplification from blood. Bloodirect is available as an independent enzyme in its optimized buffer, or in a ready-to-use MasterMix solution.

- PCR amplification from blood that is:
  - fresh or frozen
  - preserved with EDTA, citrate, or heparin
  - dried onto commercial cards, or filter paper
- Reduces the risk of contamination
- Saves sample preparation time and cuts costs in genetic testing of humans and animals

Long-Range DNA Polymerase

Our Long-Range DNA Polymerase is a blend of two thermostable polymerases in **crb**'s proprietary buffer and allows for the amplification of templates up to 20 kb.

- High yield of very long amplicons
- Improved fidelity over Taq DNA Polymerase
- Full amplification of long templates—No truncated products

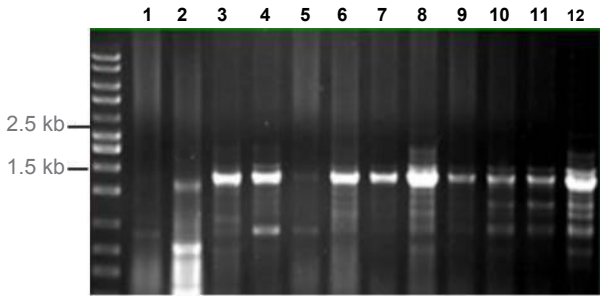

Figure 8. Amplification of 1.7 kb human E1Fα promoter using the PCR-Sure™ optimization kit.
The promoter has been previously shown to be difficult to amplify under standard PCR conditions using Taq polymerases from Invitrogen, Qiagen, and others. Using the PCR-Sure™ kit, the promoter can be easily amplified under several conditions including lane 3, 6, 7 and 8.

PCR-Sure™ Kit (Cat. No. G065)

Many variables affect the outcome of a particular PCR reaction: template structures, primer design, annealing temperature, concentration of Mg_{2+} and etc..

Your best solution to quickly find the optimal conditions for a difficult PCR, **crb**'s unique PCR-**Sure™ Kit consists of multiple thermo-stable DNA polymerases** pre-mixed with 12 optimized buffers in a ready-to-use MasterMix solution, saving a great amount of time in PCR set-up compared to the non-MasterMix PCR optimization format. After the optimal reaction condition is identified, the Individual Reaction Mixes may be ordered separately.

PCR Mycoplasma Detection Kit (Cat. No. G238)

crb's PCR Mycoplasma Detection Kit allows for fast and reliable identification of mycoplasma contamination in cell cultures. Mycoplasma DNA in the cell culture supernatant is amplified via PCR and visualized using gel electrophoresis. In addition to the short detection process (less than 2 hours), the easy handling and high sensitivity makes this PCR Mycoplasma Detection Kit a convenient tool for routine examination of cell cultures and media.

- No DNA isolation/purification steps required
- Ready-to-use primer mix reduces variability
- High sensitivity for numerous mycoplasma species

CRISPR Genomic Cleavage Detection Kit (Cat. No. G932)

Precision is a key quality in genome editing and gene modification methods. **crb**'s CRISPR Genomic Cleavage Detection Kit is designed as an easy, yet effective way to verify your genome-editing process. A great addition to any genome-editing toolbox, the kit conveniently contains all the necessary reagents required to catch any experimental insufficiencies within a rapid 4 hour processing time.

- Ease of use with simple steps
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- Rapid set-up
- Streamlined protocol suitable for high-throughput applications
- Quantitative assay

CODEREGENESIS