DIACARTA®

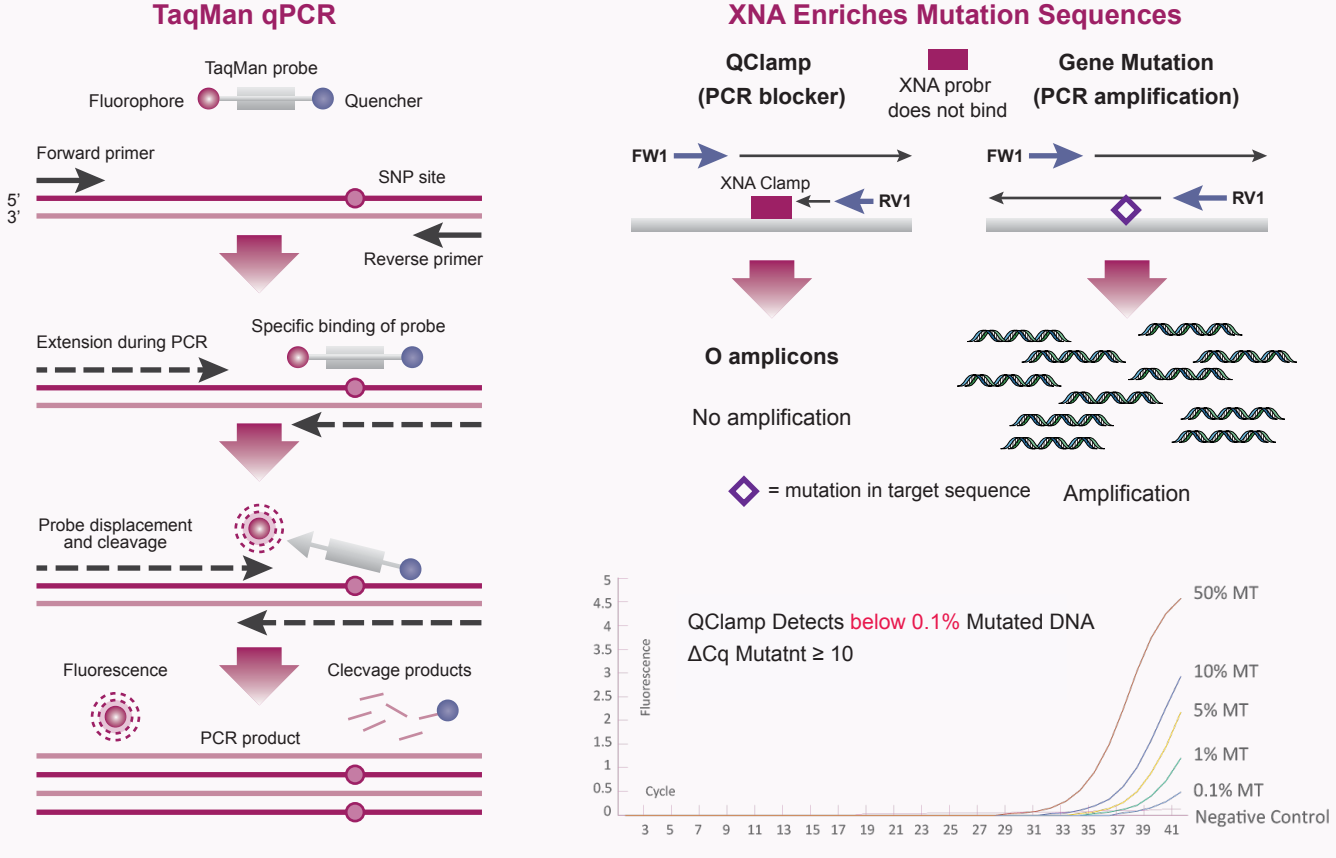
XNA Customized Service for Your Mutation Detection and Screening

DiaCarta has developed and patented the XNA molecular clamps technology for DNA mutation detection and CRISPR mutant screening. To allow the technology to be widely used for biological research, we provide customized XNA services so the researchers can leverage our technology in their mutation detection and screening studies.

The XNA Molecular Clamp Technology

XNA, xenonucleic acids, are innovative new nucleic acid molecular oligomers that hybridize with target DNA sequences and can be employed as molecular clamps in quantitative real-time polymerase chain reactions (qPCR). The XNA tightly binds to the wild-type sequence but loosely to the mutant sequences, thereby allowing mutant sequences to be amplified in a PCR reaction while blocking wild-type sequence amplification.

The diagram shows how the XNA is combined with qPCR to increase the assay sensitivity by enriching the mutation sequences.



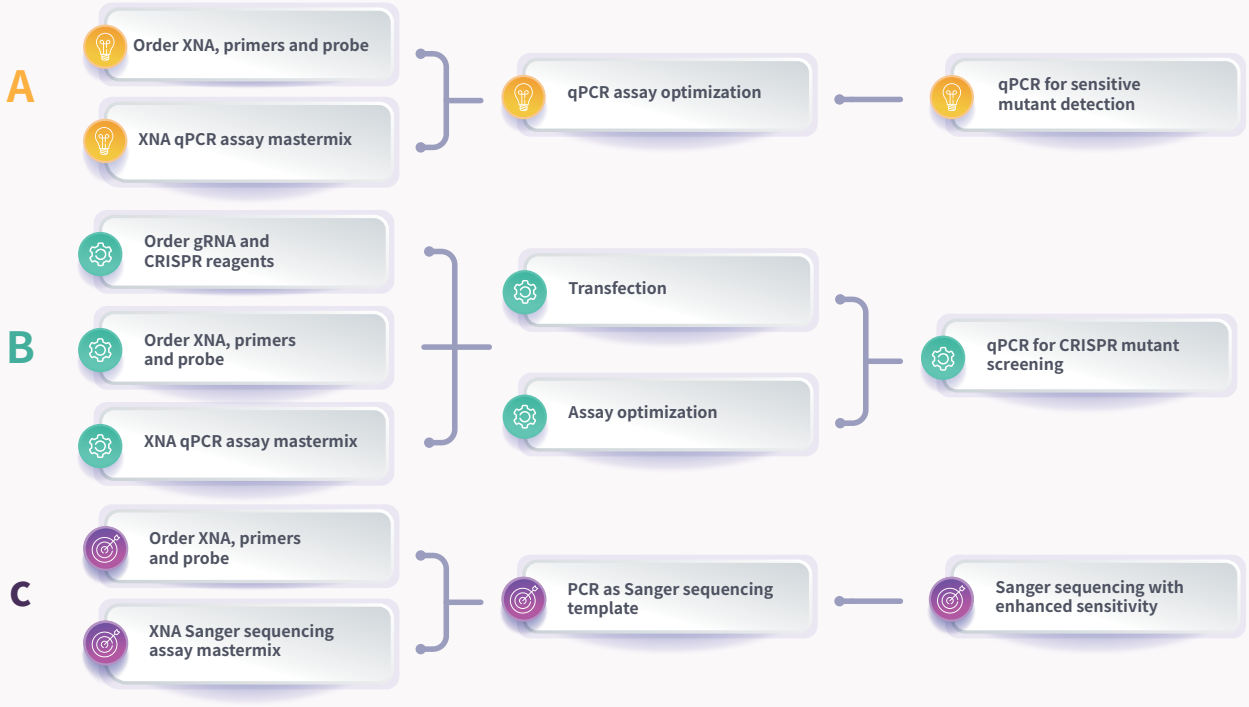
Applications of the XNA Technology

There are multiple applications for the XNA technology.

XNA technology can be combined with the commonly available detection techniques such as Sanger sequencing, qPCR, and NGS to increase assay sensitivity significantly.

For instance, when combined with Sanger sequencing, the assay sensitivity increases to <0.1% from the standard 15 to 20% variant allele frequency (VAF). The standard qPCR has an analytical sensitivity around 1%, but when XNA is included in the reaction, the assay sensitivity increases to 0.1% or lower. When combined with the NGS technique, the XNA can significantly reduce the requirement of sequencing depth to find the mutation, significantly lowering the sequencing cost, and saving time.

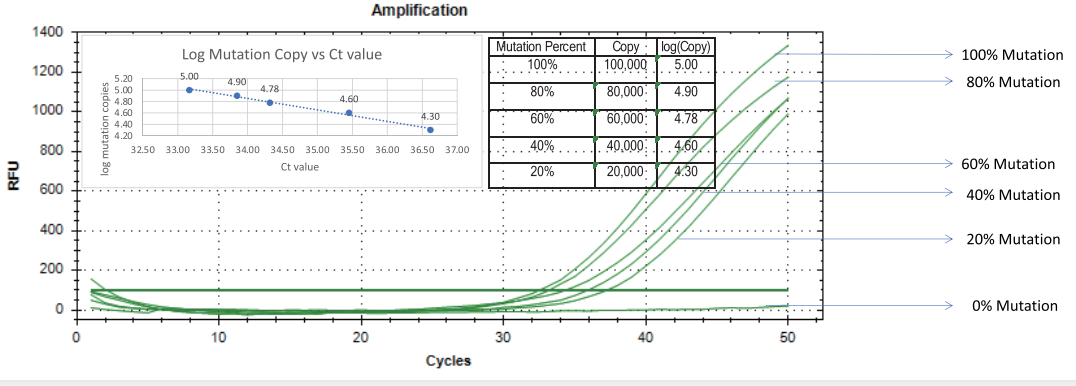
Workflow for mutant detection by qPCR (A), CRISPR mutant screening by qPCR (B), or Sanger sequencing (C).

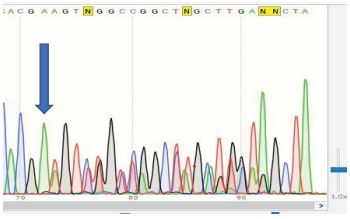


XNA can also be used to screen mutants generated from the CRISPR technique.

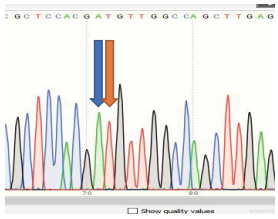
By blocking the wildtype sequence amplification, the mutant can be screened with high sensitivity in pooled DNA from multiple clones or easily identified in individual clones. Traditional methods such as T7E1 for mutant screening are either tedious, less sensitive, or both. Our XNA-based qPCR assay can rapidly screen hundreds of clones in a few hours.

XNA-based qPCR for CRISPR mutant screening and confirmed by Sanger sequencing.

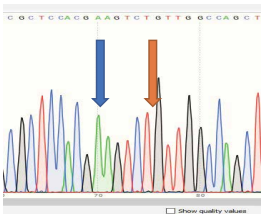




Wild type + Mutant type (heterozygous)



Wild type (homozygous)



Mutant type (homozygous)

XNA technology has also been applied for COVID-19 variant identification.

Based on the signature mutations from various variants of concern, different variants were identified in the population. The identification of different variants is critical for downstream antibody treatment.

Customized XNA services

We provide different packages for your selection depending on what applications you would like to use the XNA. The customized XNA service can be summarized in the table below:

Service Packages		CRISPR	TaqMan qPCR	Sanger Sequencing
Service package 1: XNA Only	• XNA is synthesized; • Other components are designed; • Optimization is not provided.	DC-02-1101R (100 rxns) DC-02-1102R (500 rxns)	DC-02-1103R (100 rxns) DC-02-1104R (500 rxns)	DC-02-1105R (100 rxns) DC-02-1106R (500 rxns)
		Delivery: • XNA • Designed components	Delivery: • XNA • Designed components	Delivery: • XNA • Designed components
Service package 2: Synthesis only	• All components are provided; • Optimization is not provided.	DC-02-1201R (100rxns) DC-02-1202R (500 rxns)	DC-02-1203R (100 rxns) DC-02-1204R (500 rxns)	DC-02-1205R (100 rxns) DC-02-1206R (500 rxns)
		Delivery: • XNA • Primers • Positive control • Master mix with SYBR Green	Delivery: • XNA • Primers • Positive control • Probe • Master mix	Delivery: • XNA • Primers • Positive control • Master mix
Service package 3: Optimized and ready-to-use	• All components are provided; • Optimization is provided.	DC-02-1301R (100rxns) DC-02-1302R (500 rxns)	DC-02-1303R (100rxns) DC-02-1304R (500 rxns)	DC-02-1305R (100 rxns) DC-02-1306R (500 rxns)
		Delivery: • XNA • Primers • Positive control • Master mix with SYBR Green • Optimized protocol	Delivery: • XNA • Primers • Positive control • Probe • Master mix • Optimized protocol	Delivery: • XNA • Primers • Positive control • Master mix • Optimized protocol

For services that do not include synthesized primers, probes, or positive control, we design the sequence and provide our preferred vendor for synthesis. We offer detailed procedures to guide the optimization process for services that do not have optimization included.