ArcticZymes Technologies

dsDNases

For removal of unwanted dsDNA

www.arcticzymes.com

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Double-strand specific DNases (dsDNases) are unique endonucleases with strong preference for double-stranded DNA. As they have very low affinity to ssDNA or RNA, they can be used to specifically remove dsDNA in the presence of other nucleic acids. The enzymes are heat-labile, which makes them ideal for applications where the dsDNase must be inactivated.

There are two versions of this enzyme available:

dsDNase

For decontamination of PCR master mixes

HL-dsDNase

For removal of gDNA from RNA preparations

Degrades DNA from:

- PCR mixes
- RNA preps

Easily heat-inactivated

High specific activity

Double-Strand Specific DNase (dsDNase)

"For fast and effective removal of contaminating DNA from PCR master mixes"

The dsDNase from Arctic shrimp (*Pandalus borealis*) is recombinantly produced in *Pichia pastoris*. It cleaves phosphodiester linkages in DNA to yield oligonucleotides with 5'-phosphate and 3'-hydroxyl termini.

The specific activity is estimated to be 30 times higher than that of bovine DNase I. In the presence of magnesium as the only divalent cation and using oligos as substrate, the activity towards dsDNA is 5000-fold higher than towards ssDNA.

The unique double-strand specificity allows specific degradation of dsDNA while leaving shorter ssDNA as primers and probes essentially intact. Easy inactivation by moderate heat (65°C)* allows addition of DNA intended for analysis directly after removal of contaminating DNA.

Decontamination of PCR master mixes

Taq polymerases are commonly contaminated by bacterial DNA. This is a problem in PCR-based bacterial typing and detection as it might cause false positive results. The unique properties of dsDNase make it suitable for removal of contaminating DNA from PCR master mixes prior to addition of DNA template.

In figure 1, a PCR master mix was treated with different amounts of dsDNase before performing a qPCR to measure the contaminating bacterial DNA in the master mix. ArcticZymes dsDNase effectively removed contaminating DNA below levels of the assay detection limits.

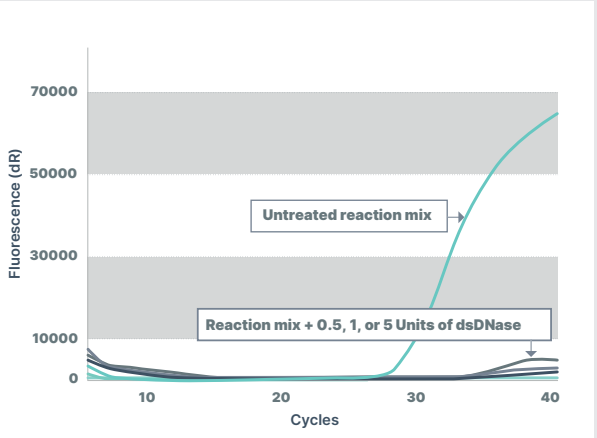
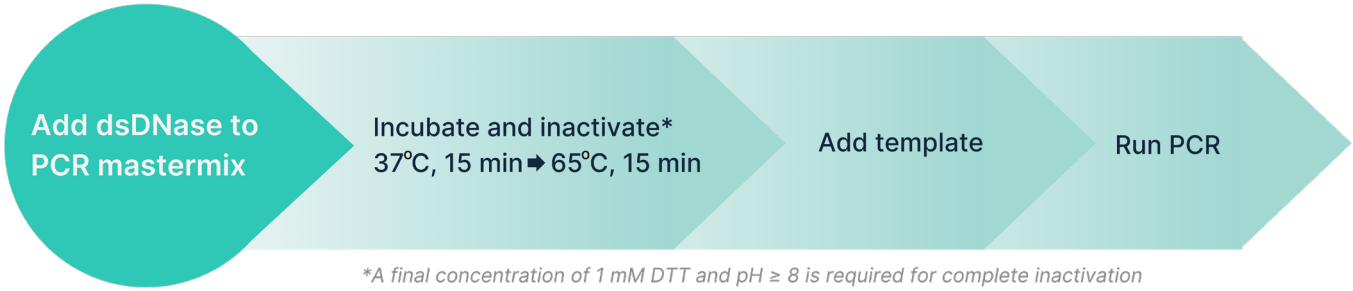


Fig 1. The dsDNase effectively removes contaminating DNA

A PCR master mix was preincubated with various concentrations of dsDNase. After treatment, no DNA was amplified in non-template controls.

Workflow – Decontamination of PCR master mixes



**A final concentration of 1 mM DTT and pH ≥ 8 is required for complete inactivation*

Heat-Labile Double-Strand Specific DNase (HL-dsDNase)

"For removal of gDNA from RNA preparations"

HL-dsDNase is an engineered version of dsDNase that is rapidly and completely inactivated by incubation for 5 minutes at 58°C in presence of 1 mM DTT and at pH 8.0 or above. By using specifically composed RT or PCR buffers after enzyme treatment, the enzyme can be chemically inactivated. This allows for milder heat inactivation or, in some cases, eliminates the need for heat inactivation altogether. The HL-dsDNase is therefore highly suitable for removing DNA from RNA preparations, while reducing the risk of RNA auto-degradation in the presence of magnesium.

HL-dsDNase removes genomic DNA with minimal impact on RNA integrity

HL-dsDNase is especially developed to remove contaminating genomic DNA from RNA preparations. Figure 2 shows that HL-dsDNase removes genomic DNA from RNA to levels below the detection limit in a qPCR. HL-dsDNase treatment is a superior alternative when treating small volumes of RNA. In figure 3, a human total RNA sample was treated with HL-dsDNase and analysed on the Bio-Rad Experion™ System. The results indicate that HL-dsDNase has minimal impact on both RNA quality and quantity.

Furthermore, as illustrated in figure 4, the HL-dsDNase treatment efficiently removes DNA from RNA preparations without introducing quantification bias in qPCR.

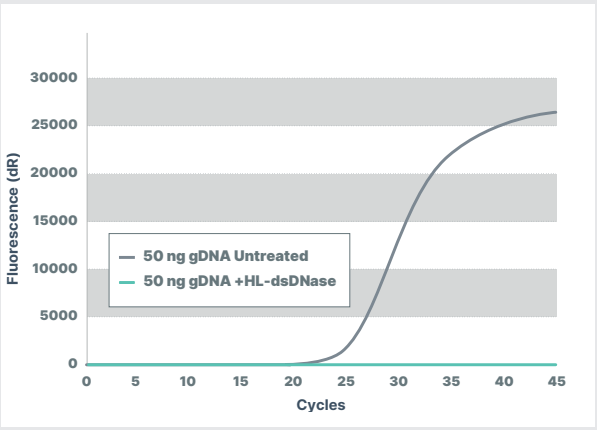


Fig 2. HL-dsDNase effectively removes gDNA

HL-dsDNase removes at least 50 ng of gDNA in a 10 µl reaction volume at pH 7.5.

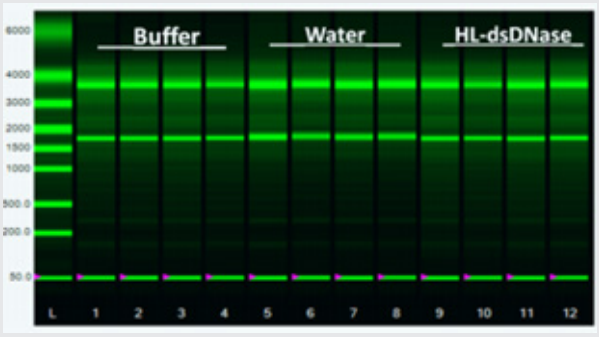


Fig 3. HL-dsDNase treatment has minimal impact on RNA integrity

RNA incubated in buffer (lanes 1-4), water (lanes 5-8) or 0.1 U/µl HL-dsDNase (lane 9-12). Samples were analysed using Bio-Rad Experion™ RNA Eukaryote Total RNA StdSens Assay.

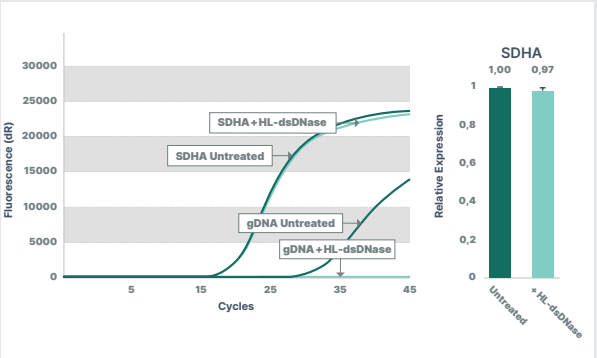


Fig 4. HL-dsDNase has minimal impact on RNA quantity

HL-dsDNase effectively removes gDNA from RNA preparations without affecting SDHA (mRNA) quantification.

dsDNases: Glycerol Free

"Suitable for lyophilisation and automation"

Lyophilisation-ready format

One of the major challenges that manufacturing companies face is the handling of kit components, such as enzymes or proteins, during process optimisation and shipping. When handled incorrectly they can aggregate, denature, degrade, and lose activity. A general practice to improve user experience and reduce cold chain shipping costs is lyophilisation.

For easier adaptation to lyophilisation, the dsDNases are also offered in a Glycerol Free version.

The tolerance to lyophilization was tested by lyophilizing, reconsititing and measuring the activity of dsDNase and HL-dsDNase, see Figure 5. The results shows that the nucleases retain excellent activity after lyophilization and reconstitution.

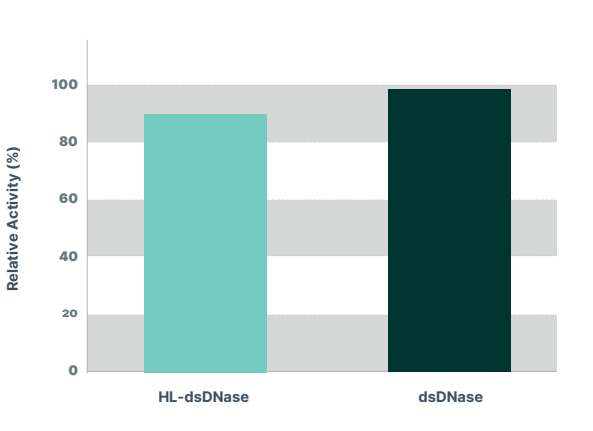


Fig 5. The dsDNases Glycerol Free retained excellent activity after lyophilisation and reconstitution

Activity was measured using a Kunitz assay and calculated based on the activity measured before lyophilization.

Properties

Activity

The dsDNases are highly active in a temperature range of 20-40°C, with optimum being at 37°C. A minimum of 2.5 mM Mg^{2+} is required for optimal activity at pH 7.5.

Inactivation

Irreversible inactivation is achieved following 5 minutes incubation at 58°C for the HL-dsDNase and 15 minutes incubation at 65°C for the dsDNase. A final concentration of 1 mM DTT and pH ≥ 8 is required for complete inactivation. EDTA can also be used to inactivate the enzymes.

Specificity

The dsDNases have a high specificity towards dsDNA, leaving other nucleic acids essentially intact, as shown in the table below. The specificity of the dsDNases have been measured using 15-mer oligonucleotides labelled with 5'-FAM and 3'-DarkQuencher®, see Table 1.

Table 1: The substrate specificity of the dsDNases was measured using 15-mer oligonucleotides labelled with 5'-FAM and 3'-DarkQuencher®.

Substrate	Relative activity
dsDNA	100 %
ssDNA	< 0.03%
dsRNA	< 0.01%
ssRNA	< 0.01%

No license required

At ArcticZymes, we pride ourselves on always offering seamless accessibility to our high-quality products. Produced under ISO 13485, our enzymes are sold under a “no license required” policy to ensure that our customers are not restricted by legal burdens, now or with their future use. In addition, we offer our dsDNases in a flexible format and are readily available to discuss your custom needs.

	Article no.	Pack size*	Concentration
dsDNase	70600-201	250 U	2 U/µl
	70600-202	1000 U	2 U/µl
	70600-203	2500 U	5 U/µl
	70600-150	50 kU	50 U/µl
	70600-110	100 kU	2 U/µl
dsDNase Triton Free	70601-201	250 U	2 U/µl
	70601-202	1000 U	2 U/µl
	70601-203	2500 U	5 U/µl
	70601-150	50 kU	50 U/µl
	70601-110	100 kU	2 U/µl
dsDNase Glycerol Free	70610-50	5000 U	80-140 U/µl
dsDNase Glycerol Free (Triton Free)	70611-50	5000 U	>50 U/µl
HL-dsDNase	70800-201	250 U	2 U/µl
	70800-202	1000 U	2 U/µl
	70800-203	2500 U	5 U/µl
HL-dsDNase Triton Free	70801-201	250 U	2 U/µl
	70801-202	1000 U	2 U/µl
	70801-203	2500 U	5 U/µl
HL-dsDNase Glycerol Free	70810-50	5000 U	80 - 140 U/µl
HL-dsDNase Glycerol Free (Triton Free)	70811-50	5000 U	> 50 U/µl

*One unit of enzyme is defined as an increase in absorbance at 260 nm of 0.001 per minute, using 50 µg/ml of high MW DNA in 50 mM Na-acetate pH 5.0 and 5 mM $MgCl_2$ at 25°C.

Your OEM Partner to deliver novel solutions for genomics and proteomics

Quality

ArcticZymes is dedicated to the quality of our products and certified according to ISO 13485.

Additional information

We are pleased to provide data and information relating to dsDNases. For more information, please check our website www.arcticzymes.com or contact us.

Cutting-edge enzymes from Norway

ArcticZymes Technologies has a long history dating back to the early 1990s. Based in Tromsø, Northern Norway, we use access to the marine Arctic to identify new cold-adapted enzymes for use in molecular research, *in vitro* diagnostics and biomanufacturing. We focus on strong and reliable relationships with our business partners and commercial innovators around the world. Therefore, we are constantly striving to work at the highest level and not only meet but exceed the expectations of our partners.

In the service of science

The knowledge of the important role our enzymes play in research, diagnostics and biomanufacturing drives us every day. Our team of highly motivated and experienced scientists is constantly developing further innovations in order to expand our portfolio of novel and high-quality solutions.

A partner you can trust

Security of supply
With us you are always on the safe side when it comes to the timely delivery of high-quality enzymes. We strive for a reliable and uninterrupted supply of whatever enzyme technology you need.

Partnership approach
Our focus is on cooperative B2B partnerships which means that we put our customers' needs at the center of what we do. We strive to provide innovative solutions in order to help them to succeed in whatever they do.

Unique enzyme features
Enzymes play a decisive role in molecular research, in vitro diagnostics and biomanufacturing. This makes it all the more important that they have a consistently high quality. Our novel enzymes are reproducible and have unique properties that make them particularly robust.

Unique access
Direct access to unique and diverse resources for bioprospecting allows us to continuously develop novel enzyme technologies with unique features and make them available to our partners.

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