

The Science of Cleaning

Revolutionizing Contamination Control
with NZYtech's Cutting-edge Laboratory
Cleaners



Whitepaper

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The Significance of Contamination Control

Contamination control is crucial in upholding the precision and integrity of molecular biology techniques within research and diagnostic laboratories.

The sensitivity of these techniques, particularly those based on the detection and analysis of nucleic acids such as PCR, qPCR, RT-qPCR, LAMP, RT-LAMP, and others, makes the presence of even a single contaminated DNA molecule a serious threat to the amplification processes. This contaminant can result in erroneous data and compromised outcomes. Unfortunately, research laboratories and molecular diagnostic facilities are persistently confronted with potential contaminations, primarily stemming from microbial and DNA cross-contamination. Furthermore, RNA workstations introduce another category of contaminants, specifically RNases. These ubiquitous enzymes possess the ability to

degrade highly sensitive RNA and display resistance to metal-chelating agents. Certain types, like the RNase A family enzymes, can even endure prolonged boiling or autoclaving. As contamination sources encompass laboratory personnel, surfaces, equipment, and aerosols, it becomes evident that stringent cleaning protocols are imperative. The selection of a decontamination reagent holds utmost importance due to the potential risks of undesirable effects or insufficient performance. Choosing the appropriate decontamination reagents involves considering various factors such as material compatibility, type of surface, application method, type and quantity of contaminant and other relevant considerations. While traditional disinfectants like ethanol, bleach, and hydrogen peroxide are commonly employed in molecular biology and diagnostic workflows, they possess limitations in terms of decontamination effica-

cy and potential hazards. Their effectiveness in eliminating contaminants may be insufficient, also posing a risk of surface corrosion and potential inhibitory effects on PCR if residues are not thoroughly removed. Therefore, cautious handling is required, particularly with bleach. Moreover, employing a multi-step disinfection procedure or optimizing the effectiveness based on dosage and time can be inconvenient for researchers.

This white paper explores the significance of contamination control and the limitations of conventional methods while introducing NZYtech Cleaners as an innovative solution. By addressing the need for effective cleaning protocols, NZYtech Cleaners offer a reliable approach to maintain a clean laboratory environment, enhancing experimental outcomes and laboratory efficiency.

NZYtech Cleaners: A Game-Changer for Contamination Control

NZYtech Cleaners offer unparalleled versatility and superior performance, playing a crucial role in ensuring accurate and reliable results in molecular biology research and diagnostics by effectively eliminating contaminants. Developed with user-friendliness in mind, these surface disinfectants provide a comprehensive solution for everyday laboratory workflows.

DNA & RNA Cleaner provides a comprehensive solution for combating DNA and microorganisms contamination, eradicating unwanted DNA and RNA molecules from laboratory surfaces, instruments, and equipment. Our advanced formula specifically targets and eliminates nucleic acid contaminants, enabling you to maintain the integrity of your molecular biology techniques and achieve trustworthy and reproducible results.

RNase & DNase Cleaner is the ultimate solution for eliminating both RNase and DNase enzymes from laboratory surfaces and instruments. It is particularly effective in decontaminating pipettes, gel boxes, and RNA or DNA preparation areas. Say goodbye to time-consuming procedures like DEPC treatments, as our cleaner offers a convenient and efficient alternative.

The **Mycoplasma Cleaner** targets and eliminates *Mycoplasma* species, notorious contaminants in cell cultures as well as in diagnostic settings. These small organisms are often undetectable using standard microscopy techniques, leading to unnoticed infections and detrimen-

tal effects in cell culture laboratories or false positives that compromise the precision of diagnostic assays. The Mycoplasma Cleaner's highly effective formula eradicates *Mycoplasma* contamination, ensuring the integrity of cell cultures and diagnostic assays. Additionally, its broad-spectrum activity eliminates other potential contaminants, such as viruses, bacteria, and fungi, safeguarding experimental and diagnostic accuracy.



The infographic is a light green rounded rectangle containing four rows of benefits, each with a title and three circular icons. The first row is for 'DNA & RNA Cleaner' with icons for 'PCR & LAMP applications', 'High Purity', and 'Efficient Cleaning'. The second row is for 'RNase & DNase Cleaner' with icons for 'DNase / RNase Free', 'High Quality RNA · DNA', and 'Precise Cleaning'. The third row is for 'Mycoplasma Cleaner' with icons for 'Infection Defense', 'Culture Protection', and 'Contaminant Removal'. The fourth row is for 'Nucleases & Nucleic Acid Cleaner' with icons for 'Ready to Use', 'Quick Safeguard', and 'Ease of Use'.

- DNA & RNA Cleaner**
 - PCR & LAMP applications
 - High Purity
 - Efficient Cleaning
- RNase & DNase Cleaner**
 - DNase / RNase Free
 - High Quality RNA · DNA
 - Precise Cleaning
- Mycoplasma Cleaner**
 - Infection Defense
 - Culture Protection
 - Contaminant Removal
- Nucleases & Nucleic Acid Cleaner**
 - Ready to Use
 - Quick Safeguard
 - Ease of Use





Evaluating the Efficacy of NZYtech Cleaners: Controlled Experiments

To assess the effectiveness of NZYtech Cleaners, we conducted controlled experiments on the surfaces of a PCR workstation or a laboratory bench. The laboratory surfaces were divided into two groups: the control group, which underwent standard disinfection using a combination of ethanol at 70% and hydrogen peroxide, and the experimental group, treated with NZYtech Cleaner. Prior to any treatment, we collected samples as a negative control (untreated) and subsequently contaminated them with a common laboratory contaminant. The disinfectant solutions were meticulously and uniformly applied to the designat-

ed areas of the contaminated surfaces, following specific incubation periods and contact times. Throughout the incubation period, strict measures were implemented to maintain a controlled environment, preventing external contamination or interference. All sample collection was performed in quadruplicates using sterile tips, ensuring proper handling, and minimizing the risk of cross-contamination. The collected samples were then subjected to real-time PCR assays to evaluate the levels of nucleic acid contamination or analysed through agarose gel electrophoresis to assess the levels of nucleases, depending on the specific NZYtech

Cleaner being tested. Positive controls were included to confirm the effectiveness of the assay and to rule out possible inhibition of the reactions by the disinfectants used. This rigorous experimental approach allowed us to accurately measure the efficacy of NZYtech Cleaners in eliminating contamination and preserving the integrity of nucleic acids, providing robust scientific evidence for its performance.

DNA & RNA Cleaner: A breakthrough solution for DNA and Microbial culture removal

Data collected here demonstrate the remarkable efficacy of DNA & RNA Cleaner in eliminating contaminating *E. coli* DNA, surpassing the performance of traditional disinfectant solutions that only reduced contamination levels (Figure 1-I and II - B). Notably, samples collected after treatment with DNA & RNA Cleaner exhibited an absence of amplification for the *E. coli* 16S rRNA gene, indicating complete removal of contamination. Conversely, samples collected after treatment with traditional disinfectant solutions showed a slight increase in the Ct value (compared to the positive control), indicating a partial reduction of contamination but not complete eradication.

To confirm that DNA & RNA Cleaner does not hinder qPCR assay, a sample collected after DNA & RNA Cleaner application was spiked with PC. This reaction displayed an expected amplification (data not shown) demonstrating that DNA & RNA Cleaner does not interfere with the performance of the qPCR. A similar experiment was conducted using a microbial culture (Figure 1-II), where samples treated with DNA & RNA Cleaner exhibited no amplification for the *E. coli* 16S rRNA gene, further confirming the successful decontamination of the microbial contaminating surfaces.

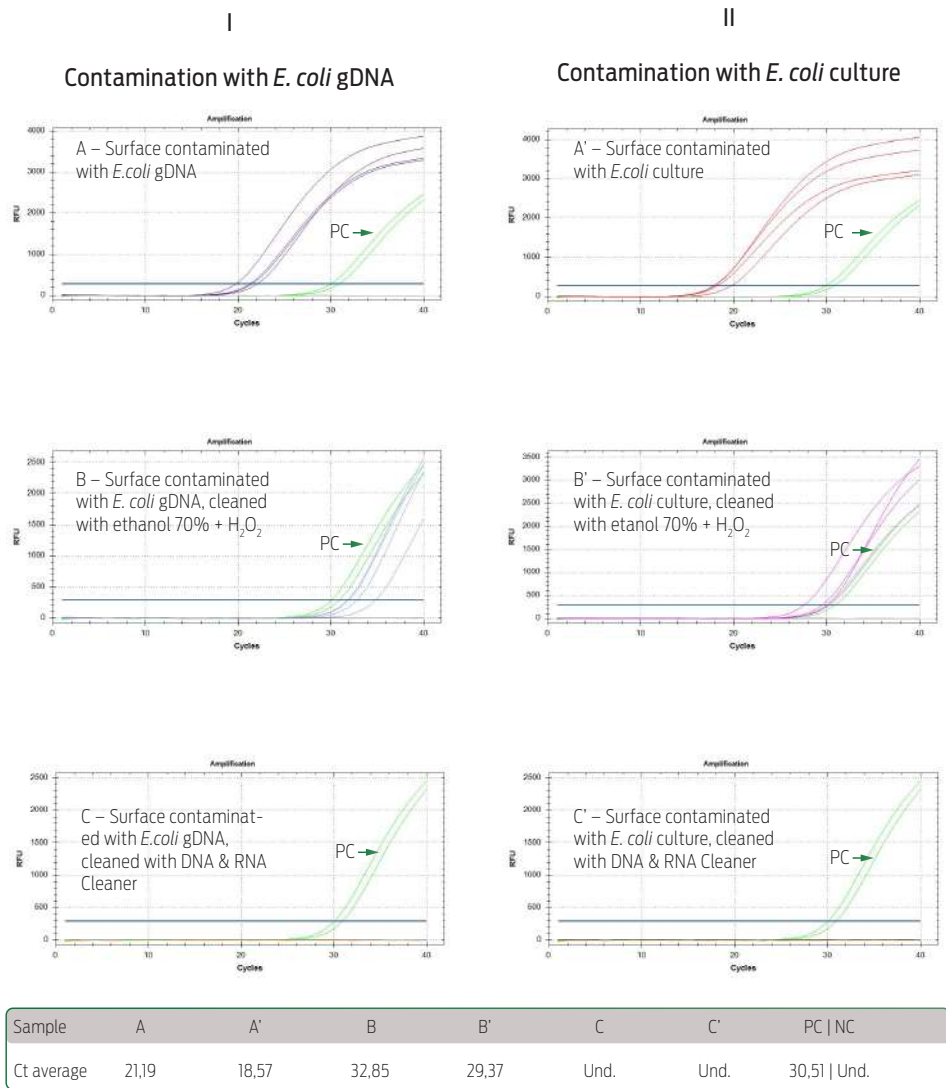


Figure 1. Efficacy of DNA & RNA Cleaner in two types of decontamination scenarios: DNA decontamination (I) and microbial culture decontamination (II). In scenario I, the surface was intentionally contaminated with a specific quantity of *E. coli* genomic DNA (150 ng per unit area), whereas in scenario II, the surface was contaminated with growing *E. coli* culture (A and A'). The contamination was controlled by cleaning with either traditional disinfectant solutions (B and B') or DNA & RNA Cleaner (C and C'). The assays also included positive controls (PC), with the addition of 0.01 ng *E. coli* genomic DNA (~2000 copies), and negative controls (NC), with no added template.

These findings establish DNA & RNA Cleaner as a highly effective solution for removing DNA and microbial culture contamination from laboratory surfaces. These experiments clearly demonstrate its superior performance compared to traditional disinfectant solutions. DNA & RNA Cleaner offers a reliable and efficient approach to maintaining a clean and uncontaminated laboratory environment, ensuring the accuracy and integrity of experimental results.

DNA & RNA Cleaner proved to be a highly effective solution for removing DNA and microbial culture contamination from laboratory surfaces. The experiments highlighted its superior performance compared to traditional disinfectant solutions.

RNase & DNase Cleaner: Thorough eradication of RNase Contamination

RNase contamination presents a significant obstacle in RNA-based experiments and diagnostics. The vulnerability of RNA to degradation combined with the remarkable resistance of RNases to inactivation creates a challenging scenario. These enzymes, capable of renaturing and regaining activity even after autoclaving, remain active at a wide range of temperatures, including to -20 °C and below. Their ubiquitous presence and remarkable stability enable them to cause extensive damage to all types of RNA, even in minimal amounts of contamination. Typical sources of RNase contamination in laboratories include aqueous solutions, experimental reagents, environmental exposure (such as lab surfaces,

aerosols from pipetting, and ungloved hands), and contaminated reagents. Despite diligent efforts, eliminating RNase contamination continues to be a persistent and demanding endeavour.

NZYtech has developed an innovative and highly potent disinfectant solution, the RNase & DNase Cleaner, specially designed to target and eliminate nucleases. This remarkable cleaner demonstrates exceptional efficacy in removing high levels of RNase A contamination, surpassing the combined effect of ethanol and hydrogen peroxide (Figure 2). No RNase activity was detected after treatment with RNase & DNase Cleaner in any of the four replicates collected. In contrast, traditional disinfect-

ant solutions allowed residual traces of RNase A, as observed in one of the replicates where RNA degradation occurred. This highlights the exceptional capacity of the RNase & DNase Cleaner to eradicate RNase contamination thoroughly, ensuring the integrity and stability of RNA samples.

With the unrivalled power of RNase & DNase Cleaner, researchers can confidently combat the challenges of RNase contamination, enabling precise and reliable RNA-based experiments and diagnostics.

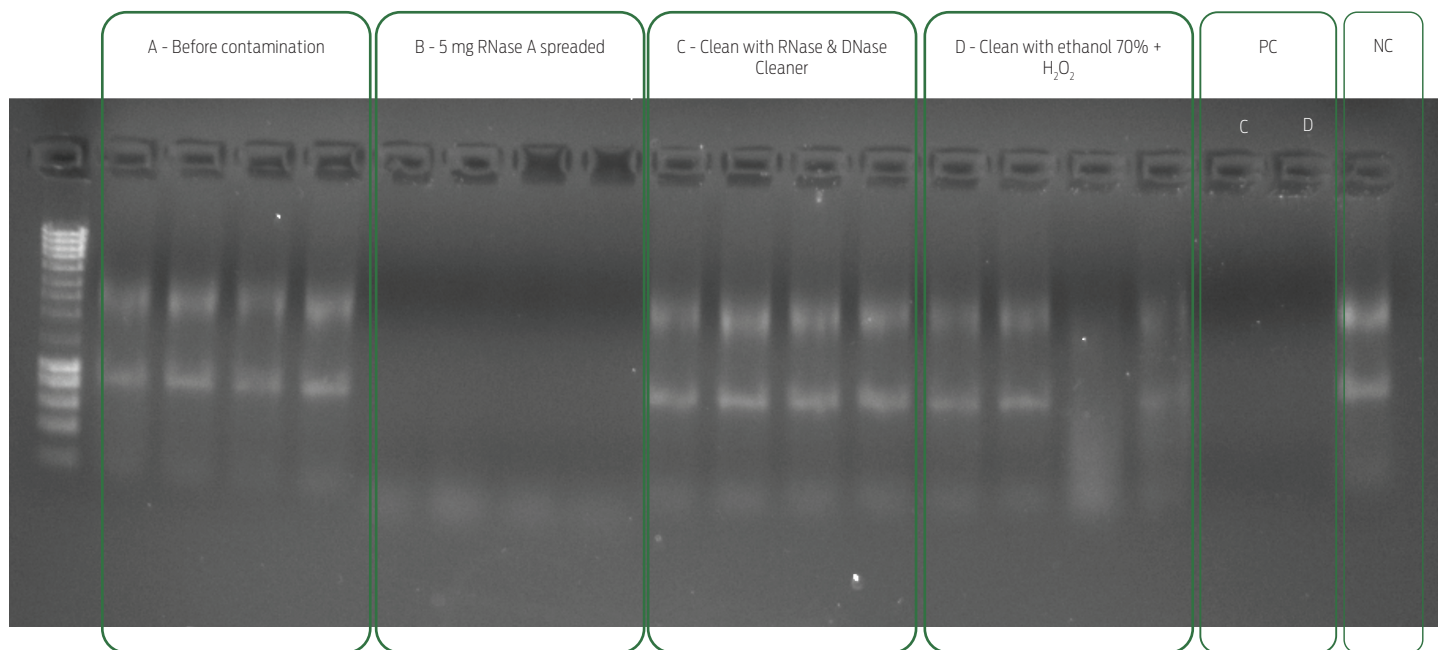


Figure 2. Efficacy of RNase & DNase Cleaner in RNase Decontamination. The surface was deliberately contaminated with 5 mg of RNase A. Collected samples were tested for RNase activity (1 hour incubation at 37 °C using 1 µg of total mouse RNA), before (A) and after (B) contamination. The contamination was controlled by cleaning with either RNase & DNase Cleaner (C) or traditional disinfectant solutions (D). The assay also included positive controls (PC), with the addition of 1 mg RNase after each disinfectant solution application (PC-C and PC-D). In addition, a negative control (NC) was introduced, with only RNA template, without adding RNase.

Conclusion

NZYtech's Cleaners represent a revolutionary solution for nucleic acids and nucleases contamination control in molecular biology research and diagnostic laboratories. Their advanced formula and targeted action effectively destroy and remove contaminants from surfaces, instruments, and laboratory equipment, ensuring reliable and accurate results. By incorporating NZYtech's Cleaners into laboratory protocols, researchers and diagnosticians can optimize the integrity of their molecular biology techniques. The compatibility with various methods, user-friendly application, and scientifically proven reliability make NZYtech's Cleaners indispensable tools for contamination

References

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DNA & RNA Cleaner

The DNA & RNA Cleaner by NZYtech offers a comprehensive solution for combating DNA contamination and eradicating unwanted DNA and RNA molecules from various laboratory surfaces, instruments, and equipment.

[View Product](#)



 **Storage Conditions:** 15 °C to 25 °C

Unit Size:	Price:	Catalogue Number:
250 mL	24 €	MB46201
500 mL (refill)	46 €	MB46202

RNase & DNase Cleaner

RNase & DNase Cleaner is the ultimate solution for effectively eliminating both RNase and DNase enzymes from laboratory surfaces, instruments, and apparatus.

[View Product](#)



 **Storage Conditions:** 15 °C to 25 °C

Unit Size:	Price:	Catalogue Number:
250 mL	24 €	MB46301
500 mL (refill)	46 €	MB46302

Mycoplasma Cleaner

The Mycoplasma Cleaner is a highly effective decontaminating solution with broad-spectrum activity, designed to target not only *Mycoplasma* but also viruses, bacteria, and fungi.

[View Product](#)



 **Storage Conditions:** 15 °C to 25 °C

Unit Size:	Price:	Catalogue Number:
250 mL	29 €	MB46401
500 mL (refill)	56 €	MB46402

Nucleases & Nucleic Acid Cleaner

The Nucleases & Nucleic Acid Cleaner is a all-in-one ready-to-use solution; it does not just remove RNase and DNase enzymes, as it also wipes out unwanted DNA and RNA guaranteeing the utmost purity of laboratory surfaces, instruments, and equipment.

[View Product](#)



 **Storage Conditions:** 15 °C to 25 °C

Unit Size:	Price:	Catalogue Number:
250 mL	32 €	MB48301
500 mL (refill)	59 €	MB48302

