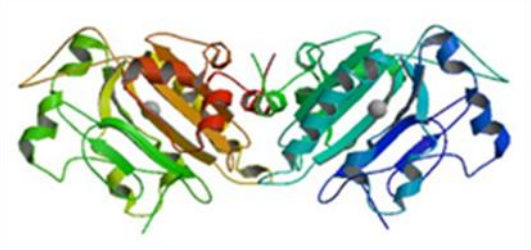
Universal Nuclease

Introduction

Universal Nuclease is a genetically engineered enzyme derived from Serratia Marcescen. It can degrade all forms of DNA and RNA, including single-stranded, double-stranded, linear, circular, natural and denatured nucleic acids, and digest them into 5-monophosphate oligonucleotides with a length of 3-8 bases and it has no base recognition specificity. In addition, the universal nuclease can maintain high stability and digestive activity under a very wide range of conditions (6M urea, 0.1 M Guanidine HCl, 0.4% Triton ×100, 0.1% SDS, 1 mM EDTA, 1 mM PMSF). It is suitable for all kinds of scientific research and the preferred enzyme preparation in the pharmaceutical industry of vaccines, protein and polysaccharides, to remove nucleic acid residues in samples or products, and to improve sample purity and product biological efficacy.



Structure of Universal Nuclease

Application

1. DNA/RNA removal in biological products

   WHO, US FDA and Chinese Pharmacopoeia (2020 edition) all limit the host nucleic acid, and the requirement is less than 100 pg/ dose for cell-based products, and less than 10ng/ dose for monoclonal antibodies and biological products produced by non-tumorigenic cells. Universal nucleases can be used to remove nucleic acids from industrial biological products such as vaccines, polysaccharides, proteins, etc.

2. Viscosity reduction after cell disruption

   Universal nuclease can degrade all forms of nucleic acid, reduce the viscosity of cell lysate, increase protein yield, improve separation effect, make it easy to filter (especially ultrafiltration), which is beneficial to downstream chromatography purification operations.

3. Purification process of products derived from cell culture

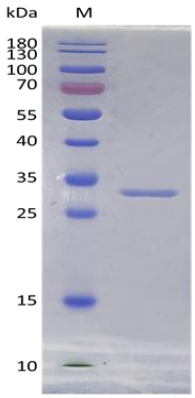
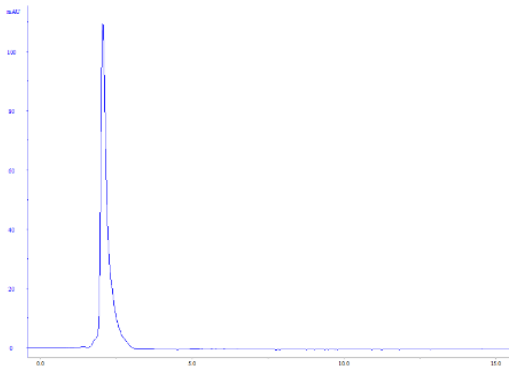
   Nucleic acid is easy to adhere to the surface of virus-like particles (VLP), virus particles, and other cell-generated particles, changing the size or charge of the particles, causing the aggregation of these particles. The universal nuclease can effectively degrade nucleic acid, and help improve the purification efficiency of cell products.

4. Preparation of samples for biochemical analysis

   In the process of ELISA, chromatographic analysis, biphasic electrophoresis and footprint analysis, processing protein samples containing nucleic acid with universal nuclease can improve the resolution and increase the

recovery rate.

Table 1. Table of Product Properties

English Synonym	**BenzNuclease; Universal Nuclease; Benzonase endonuclease**
CAS NO.	9025-65-4
Molecular Weight	28.9 kDa
Source	E. coli
Purity SDS-PAGE  SEC-HPLC 
Enzyme Activity	≥250 U/μL
Specific Activity	≥1.0×10^{6}U/mg
Endotoxin	≤0.01EU/KU(LAL)Note1
Optimum pH	8.0（effective pH 6-10）
Optimum Temperature	37℃（effective 0-42℃）
Cofactor	1-10 mM Mg^{2+}
Storage Buffer	20 mM Tris-Cl pH8.0,2 mM $MgCl_2$,20 mM NaCl,50% Glycerol
Dilution Buffer	20 mM Tris-Cl pH8.0,2 mM $MgCl_2$,20 mM NaCl
Unit Definition	One activity unit (U) was defined as the amount of enzyme required to change △A260 absorbance value by 1.0within 30 min at 37℃, pH 8.0 in 2.625 mL reaction system.

Note1：Refer to the United States FDA DMF type II file for Benzonase® endonuclease (Reg. No. BBMF 5403; current version 2013).No. BBMF 5403; current version 2013)。

Applicatio

1. Conditions of use
   a) Appropriate amount of $MgCl_2$ should be added to the reaction solution to adjust the concentration of Mg^{2+} in the reaction system within the range of 1-5 mM, and the pH should be adjusted to 8-9.
   b) According to the 250 Units will be digested, the proportion of mammalian cells to precipitate add 1 g universal nuclease, more than 37 ℃ for 30 min incubation.

Universal nuclease can maintain high stability and digestive activity under a very wide range of conditions. Table 1 lists some of the condition parameters under which universal nuclease can digest nucleic acids. In addition, universal nuclease can tolerate 6 M Urea, 0.1 M Guanidine HCl, 0.4% Triton X100, 0.1% SDS, 1 mM EDTA, 1 mM PMSF, 0.4% Sodium deoxycholate.

Table 2 Universal nuclease reaction conditions

Condition	Optimal[1]	Effective[2]
Mg^{2+}	1-2 mM	1-10 mM
pH	8.0-9.2	6.0-10.0
Temp	37℃	0-42℃
Monovalent cation（Na+，K+）	0-20 mM	0-150 mM

1:"Optimal" is defined as the condition under which Universal nuclease retains > 90% of its activity.

2:"Effective" is defined as the condition under which Universal nuclease retains > 15% of its activity.

2. Enzyme activity

One unit nuclease corresponds to the amount of enzyme required to produce a change in absorbance at 260 nm of 1.0 in the time of 30 minutes, under optimum conditions with excess substrate. Universal nuclease enzyme activity≥250U/ul, specific activity ≥1.0×10^6 U/mg

3. Transportation, Storage and Stability

The solid enzyme can be transported at room temperature, and the recommended storage temperature is lower than 4°C. Liquid enzymes should be refrigerated and transported, and storage at -20°C is recommended. Liquid enzyme is valid for 1 year at -20°C. After opening the package, if it is placed at 2-8°C for more than a week, it is recommended to filter and sterilize to prevent microbial contamination. The storage period of solid enzyme is 3 years. Use it in time after opening the package to avoid moisture.