

BACTERIAL TOXINS FOR RESEARCH AND INDUSTRY

PRODUCT INFORMATION

APOPTOSIS

Several of the bacterial products that are produced by List Biological Laboratories, Inc. have been utilized in the study of apoptosis, a specifically orchestrated program of cell death. Some bacterial toxins actually induce apoptosis, while others block induction.

Several bacterial toxins have been shown to induce apoptosis. For example, the shiga like toxins,¹⁻⁶ staphylococcal enterotoxin type B,⁷⁻⁹ exotoxin A and cholera toxin¹⁰ induce apoptosis. Typical cellular reactions to these toxins include chromatin condensation and DNA fragmentation. Diphtheria toxin has also been reported to trigger programmed cell death possibly through a nuclease activity.^{11,12} Alpha toxin from *Staphylococcus aureus* has been shown to induce the pattern of DNA degradation typical of apoptosis.^{13,14} However, one report states that alpha toxin induces necrosis but not apoptosis.¹⁵

Inhibitors of Rho GTPases provoke the onset of apoptosis in certain cell types. Therefore, exoenzyme C3, as well as toxin A and toxin B from *Clostridium difficile* may promote apoptosis through this mechanism. In contrast, activators of Rho, like *Pasteurella multocida* toxin, protect cells from this pathway to apoptosis.¹⁶ Please refer to our product literature on signal transduction or the specific products for more details on the activities of these toxins.

Lipopolysaccharides (LPS) have also been used to induce apoptotic changes including internucleosomal DNA fragmentation and activation of a caspase. It is believed that the method of inducing apoptosis with lipopolysaccharides partially mimics the cellular response to a pathogenic host.^{14,17-20}

Both shiga like toxin²¹ and toxin B from *C. difficile*²² have been used to block the induction of apoptosis by other factors. Since an appropriate reaction of a multicellular host would be to attenuate infections by bacterial pathogens, studies on the regulation of apoptosis will have broad applications.

References

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These products are intended for research purposes only and are not for use in humans.

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ORDERING INFORMATION

| PRODUCT NO. | DESCRIPTION | SIZE |
|-------------|--|---------|
| 120 | Alpha Toxin from <i>Staphylococcus aureus</i> | 0.25 mg |
| 100B | Cholera Toxin | 1.0 mg |
| 150 | Diphtheria Toxin (unnicked) | 1.0 mg |
| 122 | Enterotoxin Type B from <i>Staphylococcus aureus</i> | 0.5 mg |
| 143 | Exoenzyme C3 from <i>Clostridium botulinum</i> | 50.0 µg |
| 160 | Exotoxin A from <i>Pseudomonas aeruginosa</i> | 1.0 mg |
| 301 | LPS <i>Escherichia coli</i> J5 (Rc) | 5.0 mg |
| 302 | LPS <i>Escherichia coli</i> K12, D31m4 (Re) | 5.0 mg |
| 201 | LPS <i>Escherichia coli</i> O111:B4 | 5.0 mg |
| 203 | LPS <i>Escherichia coli</i> O55:B5 | 5.0 mg |
| 304 | LPS <i>Salmonella minnesota</i> R595 (Re) | 5.0 mg |
| 225 | LPS <i>Salmonella typhimurium</i> | 5.0 mg |
| 156 | <i>Pasteurella multocida</i> Toxin | 50.0 µg |
| 163 | Shiga Like Toxin 1 (Verotoxin 1) | 10.0 µg |
| 164 | Shiga Like Toxin 2 (Verotoxin 2) | 10.0 µg |
| 152A | Toxin A from <i>Clostridium difficile</i> | 2.0 µg |
| 155 | Toxin B from <i>Clostridium difficile</i> | 2.0 µg |
| 434 | ULTRA PURE LPS <i>Salmonella minnesota</i> R595 (Re) | 1.0 mg |