

Biofilm Neutralizer*

with EDTA

Bacteria often grow within biofilm, a slimy coating that adheres to living tissues. Biofilm is a thick and sticky substance comprising proteins, polysaccharides and other biomaterials along with divalent cations. This self-made matrix surrounds and shields the microbes from exposure to immune cells and antimicrobial molecules.* Biofilm complexes are notoriously difficult to disrupt.*

Biofilm Neutralizer* comprises two orally-available enzymes, trypsin and serrapeptidase, along with alpha-lipoic acid and EDTA (ethylenediaminetetraacetic acid), in a delayed-release capsule (DRCaps®). This mixture is designed to disrupt the bonds that hold biofilm together.*

Key Features

- May help reduce biofilm adhesion, viscosity, and stability*
- May increase the penetration of antimicrobial molecules into biofilm complexes*
- Improves the oxidative stress associated with biofilm formation*



Item #78290
60 delayed-release
vegetarian capsules

Biofilm Neutralizer*

Serrapeptidase (serratiopeptidase) is a proteolytic enzyme produced by *Serratia*, a microbe that lives in the digestive tract of various species.* Originally isolated from the silk worm, serrapeptidase allows the emerging moth to dissolve its cocoon.* Purified serrapeptidase has been shown to break down biofilm-associated proteins without harming human tissues.* Serrapeptidase is orally available, and it has systemic fibrinolytic effects.*

Trypsin is a proteolytic enzyme made by the pancreas.* It digests a wide range of substrates including bacterial proteins.* Trypsin has been shown to reduce the viscosity and permeability of the biofilm matrix, and to loosen the attachment of biofilm to living tissues.* Additionally, trypsin removes bacterial surface proteins.* Supplemental trypsin is orally available, with the active enzyme appearing in the bloodstream shortly after ingestion.*

Alpha-lipoic acid (ALA) is a potent antioxidant found in plants and animals.* Low antioxidant capacity leads to oxidative stress, which triggers microorganisms to shift to a biofilm-producing state.* In clinical trials, ALA has been shown to improve total antioxidant capacity by increasing glutathione, the master antioxidant within cells.* Adequate glutathione levels are associated with healthy immune function.* Additionally, both ALA and glutathione have direct biofilm-disrupting effects.*

EDTA Calcium Disodium Salt: EDTA (ethylenediaminetetraacetic acid) is a chelator that binds divalent cations.* Oral EDTA formulations are sometimes used to remove heavy metals, such as lead, from the body.* EDTA loosens the bonds between calcium and alginate, a polysaccharide that strengthens the biofilm matrix.* The addition of EDTA enhances the penetration of antimicrobial molecules into biofilm complexes.* The calcium disodium form of EDTA is preferred because it protects serum calcium levels.*

References

Ambrus JL, et al. *Clin Pharmacol Ther.* 1967 May;8(3):362-8.
Andrea Moura F, et al. *Curr Top Med Chem.* 2015 Mar 1;15(5):458-83.
Artini M, et al. *J Appl Microbiol.* 2013;114(1):266-77.
Artini M, et al. *Int J Immunopathol Pharmacol.* Jul-Sep 2011;24(3):661-72.
Banar M, et al. *PLoS One.* 2016 Oct 13;11(10):e0164622.
Banin E, et al. *Appl Environ Microbiol.* 2006;72:2064-9.
Biewenga GP, et al. *Gen Pharmacol.* 1997 Sep;29(3):315-31.
Bjarnsholt T. *APMIS.* 2013;121:1-58.
Berndtson K. *Int J Gen Med.* 2013;6:291.
Boyd A, Chakrabarty AM. *J Ind Microbiol.* 1995 Sep;15(3):162-8.
Cavaliere R, et al. *Microbiologymopen.* 2014 Aug;3(4):557-67.
Çevik K, Ulusoy S. *Iran J Basic Med Sci.* 2015 Aug;18(8):758.
Chandanwale A, et al. *Adv Ther.* 2017 Jan 1;34(1):180-98.
Das T, et al. *Front Microbiol.* 2019 Aug 30;10:2000.
Davis MM, et al. *PLoS Pathog.* 2021 May 13;17(5):e1009546.
Di Domenico EG, et al. *Front Neurol.* 2018 Dec 3;9:1048.
Di Martino P. *AIMS Microbiol.* 2018;4(2):274.
Drams S, et al. *FEMS Microbiol Rev.* 2008 Feb 11;32(2):307-20.
Earnhart CG, et al. *Clin Vaccine Immunol.* 2011 Jun;18(6):901-6.
El-Beshbishy HA, et al. *Eur J Pharmacol.* 2011;668(1e2):278e284.
Esbelin J, et al. *OMICS.* 2018 Dec 1;22(12):779-87.
Firoz A, et al. *Cureus.* 2021 Mar 5;13(3):e13716.
Flemming HC, Wingender J. *Nat Rev Microbiol.* 2010 Sep;8(9):623-33.
Gambino M, Cappitelli F. *Biofouling.* 2016;32(2):167-78.
Goc A, Rath M. *Ther Adv Infect Dis.* 2016 Jun;3(3-4):75-82.
Goraça A, et al. *Pharmacol Rep.* 2011 Jul;63(4):849-58.
Guerra C, et al. *PLoS One.* 2011 Dec 2;6(12):e28378.
Guerra C, et al. *Clin Exp Immunol.* 2012 Apr;168(1):142-52.
Gupta PV, et al. *Nanomedicine.* 2017;13(7):2371-84.
Gupte V, Luthra U. *J Pharm Anal.* 2017 Aug 1;7(4):203-7.
Han Y, et al. *Minerva Endocrinol.* 2018 Mar;43(1):11-18.
Hathroubi S, et al. *Microb Drug Resist.* 2017 Mar;23(2):147-56.
Hegazy SK, et al. *Rev Diabet Stud.* Spring 2013;10(1):58-67.
Hogan S, et al. *J Hosp Infect.* 2017 Jun 1;96(2):177-82.
Ishihara Y, et al. *Jpn J Antibiot.* 1983 Oct 1;36(10):2665-70.
Jadav SP, et al. *J Pharmacol Pharmacother.* 2010 Jul;1(2):116.
Jadhav SB, et al. *Biotechnol Rep (Amst).* 2020 Oct 17:e00544.
Jariwalla RJ, et al. *J Altern Complement Med.* 2008 Mar;14(2):139-46.
Jones WL, et al. *Biofouling.* 2011 Feb;27(2):207-15.

Supplement Facts

Serving Size	1 Capsule
Servings Per Container	60
Amount Per Serving	% Daily Value*
Calcium (from 100 mg of EDTA Calcium Disodium salt)	6 mg <1%
Sodium (from 100 mg of EDTA Calcium Disodium salt)	9 mg <1%
Alpha Lipoic Acid	150 mg †
Trypsin 1:150 Powder (containing at least 15,000 units of protease)	50 mg †
Serrapeptidase 70,000 SPU	35 mg †


† Daily Value not established.

* Percent Daily Value are based on a 2,000 calorie diet.

Other ingredients: Hydroxypropyl methylcellulose, microcrystalline cellulose, stearic acid, silicon dioxide.

Suggested Use: As a dietary supplement, 1 capsule one or two times daily between meals, or as directed by a healthcare practitioner.

Caution: EDTA is known to deplete minerals, so repletion is suggested. Higher doses or long-term use require the guidance of a qualified healthcare practitioner with ongoing monitoring of liver and kidney function.

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Kase Y, et al. *Arzneimittelforschung.* 1982 Jan 1;32(4):374-8.
Khalili M, et al. *Nutr Neurosci.* 2014 Jan;17(1):16-20.
Klare W, et al. *Antimicrob Agents Chemother.* 2016 Jul 22;60(8):4539-51.
Körstgens V, et al. *Water Sci Technol.* 2001;43(6):49-57.
Kotb E. *Appl Microbiol Biotechnol.* 2013 Aug;97(15):6647-65.
Koyama A, et al. *Jpn J Antibiot.* 1986 Mar 1;39(3):761-71.
Ku JW, Gan YH. *Redox Biol.* 2021 May 29;102012.
Latha B, et al. *Burns.* 1997 Mar 1;23:53-7.
Lee RL, et al. *Am J Physiol Lung Cell Mol Physiol.* 2005 Nov;289(5):L875-82.
Lefebvre E, et al. *Int J Antimicrob Agents.* 2016 Aug;48(2):181-8.
Longhi C, et al. *Microb Pathog.* 2008 Jul;45(1):45-52.
Lorkowski G. *Int J Physiol Pathophysiol Pharmacol.* 2012;4(1):10.
Luczaj W, et al. *Eur J Clin Microbiol Infect Dis.* 2011 Mar;30(3):415-22.
Majima Y, et al. *Arch. Otorhinolaryngol.* 1988;244:355-9.
Majima Y, et al. *Am Rev Respir Dis.* 1990;141:79-83.
Marangon K, et al. *Free Radic Biol Med.* 1999;27:1114-21.
Mazzone A, et al. *J Int Med Res.* 1990 Sep;18(5):379-88.
Meçikoglu M, et al. *J Bone Joint Surg Am.* 2006 Jun 1;88(6):1208-14.
Middelveen MJ, et al. *Healthcare (Basel).* 2018 Apr 14;6(2):33.
Miyata K, et al. *Agric Biol Chem.* 1970 Feb 1;34(2):310-8.
Miyata K, et al. *J Appl Biochem.* 1980;2(2):111-6.
Molobela IP, et al. *Afr J Microbiol Res.* 2010;4(14):1515-24.
Moniuszko-Malinowska A, et al. *Free Radic Biol Med.* 2016 Jul 1;96:255-63.
Moroni A, et al. *Microbiologica.* 1992 Apr 1;15(2):99-106.
Morris D, et al. *Clin Dev Immunol.* 2013 Jan 1;2013:959650.
Morris D, et al. *Biochim Biophys Acta.* 2013 May 1;1830(5):3329-49.
Nakamura S, et al. *Respirology.* 2003;8:316-20.
Olsen JV, et al. *Mol Cell Proteomics.* 2004 Jun 1;3(6):608-14.
Ong KS, et al. *Expert Rev Anti Infect Ther.* 2018 Nov;16(11):855-64.
Orgad O, et al. *Biofouling.* 2011 Jul 28;27(7):787-98.
Packer L, et al. *Free Radic Biol Med.* 1997;22:359-78.
Pancewicz SA, et al. *Med Sci Monit.* 2001 Nov 1;7(6):1230-5.
Papa R, et al. *Microb Pathog.* 2013;63:44-53.
Passariello C, et al. *Eur J Inflamm.* 2012;10(3):463-72.
Peacock BN, et al. *Redox Biol.* 2015 Aug 1;5:66-70.
Percival SL, Salisbury AM. *Adv Exp Med Biol.* 2018;1057:101-10.
Piriar RF, et al. *PLoS One.* 2020 Jun 25;15(6):e0235093.
Raad II, et al. *Curr Opin Infect Dis.* 2008 Aug 1;21(4):385-92.
Salehi B, et al. *Biomolecules.* 2019 Aug 9;9(8):356.
Sapi E, et al. *Infect Drug Resist.* 2011;4:97-113.
Sapi E, et al. *PLoS One.* 2012;7(10):e48277.
Sears ME. *ScientificWorldJournal.* 2013 Apr 18;2013:219840.
Selan L, et al. *Antimicrob Agents Chemother.* 1993 Dec;37(12):2618-21.
Selan L, et al. *BMC Microbiol.* 2015 Dec;15(1):1-6.
Shah D, Mital K. *Adv Ther.* 2018 Jan;35(1):31-42.
Shay KP, et al. *IUBMB Life.* 2008 Jun;60(6):362-7.
Shi C, et al. *Food Control.* 2016 Jan 1;59:352-8.
Siddbury JE, et al. *Proc Soc Exp Biol Med.* 1953 Feb;82(2):226-8.
Sitwari M. *Asian J Pharm Sci.* 2017 May 1;12(3):209-15.
Vachher M, et al. *Curr Res Biotechnol.* 2021 Jun;3:195-208.
Vallianou N, et al. *Rev Diabet Stud.* Winter 2009;6(4):230-6.
Venketaraman V, et al. *Infect Immun.* 2005 Mar;73(3):1886-9.
Xavier JB, et al. *Microbiology.* 2005;151(12):3817-32.
Zhou W, et al. *Bioorg Med Chem.* 2020 Oct 1;28(19):115682.
Zrelli K, et al. *New J Phys.* 2013 Dec 20;15(12):125026.